Government of **Western Australia**
Department of **Water**

Field sampling guidelines:

A guideline for field sampling for surface water quality monitoring programs

Looking after all our water needs

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Department of Water

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1 Correct sampling procedures

Considerable time and effort has been invested in the development of a standardised set of sampling procedures to ensure that data collected are useful, and comparable to other data, allowing us to draw accurate conclusions about what is actually happening in the environment. Use of standard procedures allows us to:

- avoid (or at least minimise) contamination of samples;
- compare between samples at different times, by different people and at different sites, and;
- draw meaningful conclusions from the data.

These standard operating procedures outline the correct methods to use in the field and so avoid, or at least minimise, the risk of sample contamination – a major source of error.

When sampling it is important that the samples are collected in this order:

1 Water samples for chemical analysis.

2 Measurement of physical parameters.

3 Any other samples (i.e. stream width measurements, macroinvertebrates etc).

Chemistry samples are the most sensitive to contamination and, therefore, are sampled first. Further, these should ideally be taken using a grab pole sampler so there will only be limited disturbance of the sediments; whereas it may be necessary to wade into the stream to take the physical samples. However, this is not always possible and alternative arrangements will be discussed later, but please note, a comment or note should be made against any and all samples where any part of the sample collection is different from the standard method. For example, if there was a covering of macrophytes that had to be moved before you could sample at a particular site, make note of that on the field observation form.

In addition, if you are sampling a number of sites on a single stream (i.e. sites upstream of each other) you should always start sampling at the most downstream site and work your way up during the day. Again, this is to reduce the risk of contamination. If you stir something up in the sediments of an upstream site, you don’t want to be sampling it at a downstream site later on in the day.

If you have a number of sites to sample during the day and one is obviously heavily contaminated, then it is best to sample that site last. This will prevent your physical probes from being knocked out of calibration from the site in question; it will also stop you from using dirty equipment at other sites during the day and thereby introducing contaminants to those sites and samples.

An appendix at the end of this document contains step-by-step summary information to standard operating procedures for surface water sampling in the field. This publication also contains technical information, in a tabular format, regarding sample collection, container types, and storage and holding time for a wide range of parameters. This is a very useful reference to take into the field on sampling trips.

The rest of the document is a table of technical information regarding sample collection, appropriate containers for samples, and sample storage and holding times for a wide range of parameters. This is an extremely useful field guide and in the Water Science Branch we use this as a quick reference in the field.

It is very important that you do not smoke during sampling, as this will increase the risk of sample contamination. If you are a smoker, you must ensure you wear powder-free, nitrile gloves during sample collection to minimise the risk of sample contamination.

2 Safety aspects of sampling

All personnel must be trained in identification of potential hazards at a sampling site. This involves listing potential dangers to sampling personnel when at the sampling site, such as: collapse of stream bank; falling into the stream; contact with contaminated water from waterways; and exposure to heat, wind and rain.

The following table outlines common risks associated with stream and drain sampling and associated prevention methods. Note that this list is not exhaustive and it is up to the sampling team to assess each site before taking a sample to ensure it is safe to do so.

We recommend that sampling should always be conducted in teams of at least two, for occupational health and safety (OH&S) reasons. It is recommended that a map to, and the address of, the nearest emergency department are included in a safety plan as well as a list of emergency contacts.

Table 1 Example of a hazard identification and precautions table

Identified risk	Precautions
Exposure to chemicals and handling of contaminated samples: Some drains and even natural waterways may present a significant bacterial or viral risk to the sampler; consult with an OH&S representative if unsure of potential risks.	Wear protective clothing at all times: field boots or gumboots; waders (if expecting to go into water at above ankle level); nitrile gloves. Maintain good hygiene standards; always wash hands before eating or drinking after field work.
Physical injury from falling into the drains (especially steep slopes with sandy banks).	Inspect accessibility to site before transferring equipment from car. If site is too steep or unstable – do not sample.
HNO_3 (nitric acid) used as preservative in metal bottle.	This bottle should have a 'hazardous contents' warning label. Take care when handling these bottles that no acid spills onto exposed skin (use gloves and personal protective equipment), or eyes (use safety glasses). Further, when pouring sample into the bottle take care that there is no splash back. Always open these bottles in well-ventilated areas.
Insect, spider, rodent or snake bites.	Inspect site prior to sampling, especially drain culvert openings and wear long pants and high boots for walking through long grass.
Manual handling of heavy equipment and eskies/samples.	Wear safety boots and lift heavy objects ensuring no risk to back. If necessary, use two people to lift larger eskies.
Sampling at sites where algal scum is present.	Always wear longer nitrile gloves when sampling and avoid contact with water. Take care when handling food after sampling.
Sunburn, exposure (dehydration and heatstroke; exposure to cold).	Apply sunscreen, wear hats, rain jackets, work pants, jumpers as appropriate. Take plenty of drinking water (labelled as drinking water and kept separate from sample bottles).

Identified risk	Precautions
Traffic hazards on roads near sites: Main Roads WA has specific requirements under the Road Traffic Code.	Follow the requirements as stipulated under the Road Traffic Code, Main Roads WA. However, it is simpler to select sampling sites that don't require working or stopping on the side of the road.

3 Where to take a sample

Where you take a sample can potentially have a large impact on the results of analysis. Below are a number of images of situations that you may come across, which will require you to make a judgement call as to where to sample.

Table 2 Examples of influences at sampling locations

	**Backwater** Generally do not sample backwaters; the golden rule is that your sample should be representative of the waterway. Water in backwaters tends to be stagnant (even though it may be connected to a flowing water body) and as such is not representative of the waterway you are sampling.
	**Confluence** The most important thing to remember is to allow adequate distance for mixing of the two water bodies downstream of the confluence; this may take several hundred meters. Also consider which waterway/catchment you want to sample; for example, if it were one of the two tributaries, ensure you are far enough upstream to avoid any influence from the other tributary, i.e. not right at the confluence.
	**Weir** Again, consider what is representative of the catchment, and the parameters you are sampling. Sampling downstream of the weir, the water will be turbulent and mixed with air and sediment, resulting in non-representative physical and chemical samples. In this case, samples should be collected and/or measured as close to, or just above, the point where the water is flowing over the weir.

	**Macrophytes** Try to find some open (clear) water, as sampling in the macrophytes will affect your samples. If there is no clear water then try to make a hole in the macrophytes in which to sample, as gently as possible, so as not to dislodge too much debris and detritus from the plants; and then sample once water is as clear as you think it will get. Remember to make a note on the field observation form that this is how you sampled.
	**Floating macrophytes** As for macrophytes, sample in clear water if there is any. If not and plants cover the whole of the water's surface then gently make a small hole in the macrophytes through which to sample and make a note on the field observation form that this is the method you used to sample the water.
	**Algal bloom** Again; sample in clear water if there is any. If not, and the bloom extends across the whole surface of the water body, then gently make a small hole in the algae through which to sample and make a note on the field observation form that this is the method you used to sample the water.

	**Cattle crossing** Generally sample upstream of the crossing, as downstream will be contaminated by animal faeces and eroded sediment. Remember to select a site that is representative of the catchment as a whole.
	**Riffle** Again; be sure to select a section of water that represents the whole catchment. Generally do not sample in, or close to the riffle for the same reason as for the weir (turbulence and sediment mixing). Select an area above or below the riffle with smooth flow (fast is acceptable, just not turbulent and mixed).

4 Bottle labelling

It is important that all bottles are appropriately labelled. Whenever possible, labelling should be carried out before heading out into the field, as this will make life easier once you are gathering samples. Either hand-write onto the bottle or pre-print labels and stick them on. If you pre-print make sure you note the following.

- That the label will stick to the bottle and won't disintegrate/come loose when the bottle gets wet. Plastic labels are better than paper ones for this reason.
- That you use a printer which prints with a waterproof ink (i.e. don't use a bubble-jet as the ink will run when the label gets wet). One method is to print the labels, in the correct layout on to paper; then use a photocopier to print on to the labels themselves.
- That the date is correct! If sampling is postponed, the dates on your pre-printed labels will suddenly be incorrect and will need to be altered.

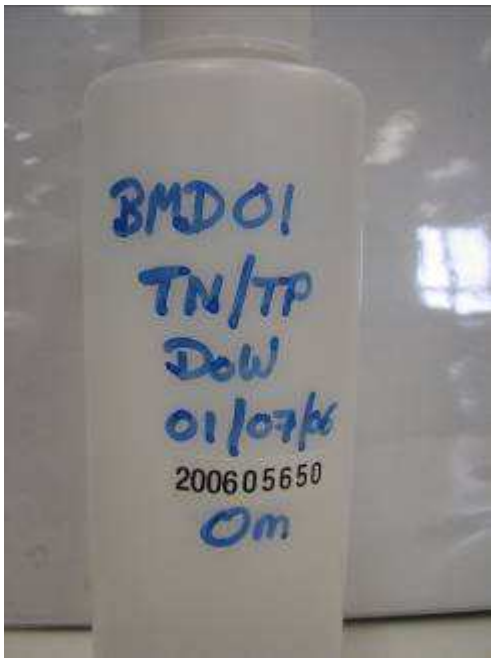


Figure 1 Example of labelled sample bottle

Each bottle needs to be labelled with:

- The site code.
- The parameter(s) to be measured.
- The collection agency (the agency or group for which the sample was collected).
- The date of collection.
- A unique sample number.
- The depth at which sample was collected (zero (0) meters for surface waters).

Pre-prepared unique sample number stickers are available from the Measurement and Water Information Branch. If you don't have access to such stickers, an option for generating a unique sample number is to use the date and time in reverse order, in the format YYYYMMDDHHMM, e.g. 200711091622 for 4.22 pm on 9 November 2007. It is highly unlikely anyone else will be taking a sample at exactly the same time and using this system.

5 How to take a surface water sample

Surface water samples are collected from just below the surface, avoiding any surface scum and debris. Always remember that the order in which sampling is performed is important. You should always take samples in the following order:

1 Water samples for chemical analysis.

2 Measurement of physical parameters.

3 Any other samples (i.e. stream width measurements, macroinvertebrates etc).

5.1 Direct sampling

1 Ensure that labelling on the bottle to be filled is correct and that the sample number matches the number on the paperwork (field observation form and chain of custody form).

2 Take the sample from the bank, or wade into the water in waders or wellington boots, minimising disturbance as much as possible.

3 Don't uncap the bottle until just before the sample is to be taken.

4 When filling the bottle (both for rinsing and for the final sample) take the sample upstream and to the side of you.

5 Uncap the bottle to be filled, immerse the bottle in the water (to a depth of ~15 cm) lying it flat with its mouth towards the flow of the water, then slowly move the bottle forwards into the flowing water.

6 If rinsing is required (make sure you check the standard operating procedure) allow approximately 20 mL of water to enter the bottle. Cap, shake well and pour the rinsate downstream of yourself.

7 Repeat twice so the bottle is rinsed a total of three times (if required).

8 Then fill the bottle, again upstream and to the side of yourself at a depth of ~15 cm, moving it slowly forwards through the water to the required level (generally the shoulder of the bottle, but always check the sampling and analysis plan). Cap, and store the sample container as required for transport to the laboratory.

9 If bottles contain preservatives (i.e. for metal analysis), they must not be rinsed and should be filled by decanting from another, rinsed bottle.

5.2 Grab pole sampling

1 Ensure that labelling on bottle to be filled is correct and that the sample number matches the number on the paperwork (field observation form and chain of custody form).

2 Check that the grab pole sampler is clean; this should be done at the completion of each day's sampling, normally by simply rinsing in tap water.

3 Extend the grab pole sampler so that it will reach to the point that you wish to sample.

4 Carefully lower the grab sampler into the water with the mouth of the bottle facing upstream into the flow of water to a depth of ~15 cm. Keep the bottle moving forward into the flow of water while it is filling (Standards Australia AS/NZS 5667.6:1998 5.3.1).

5 Allow the bottle to partially fill, take it out of the water, swirl around, and tip out rinsate downstream of sampling site.

6 Repeat twice so that the grab pole sampler has been rinsed three times.

7 Then, fill the grab sampler at a depth of ~15 cm, with the mouth of the bottle facing upstream, slowly moving the bottle forward into the flow of water.

8 Use this sample to rinse the labelled sample container three times using the same procedure as for taking a direct sample.

9 Then, fill the rinsed, labelled sample container from the grab sample bottle. It may be necessary to refill the grab sample bottle to obtain enough water to fill the sample container. If this is necessary, recap the sample container between top-ups. Fill the sample container to the required level (generally the shoulder, but check the sampling and analysis plan, as this may vary).

10 Take care not to touch the opening of the sample container with any part of the grab pole bottle or your hands as this can easily introduce contaminants to the sample.

11 If the sample container contains a preservative, be careful when filling to prevent any splash back.

12 Cap (tightly) and store the sample container as required for transport to the laboratory.

5.3 Other sampling guidelines

- Certain parameters require direct collection into the sample container (with no transfer allowed), and include polycyclic aromatic hydrocarbons (PAH), biological oxygen demand (BOD), total recoverable hydrocarbons (TRH), total petroleum hydrocarbons (TPH), and various pesticides and herbicides.
- No sample container pre-rinse should occur when sampling for metals, total organic carbon, benzene-toluene-ethyl benzene-xylene (BTEX) and volatile organic carbon species (VOC); this includes bottles containing acid preservative.
- Unless otherwise stated, all sample containers should be filled to just below the shoulder of the bottle (~80% of capacity) to leave an airspace which will allow for freezing (except for turbidity and total suspended solids (TSS) which can’t be frozen). Samples that need to be filled completely, to exclude all air, must never be frozen (e.g. BTEX, BOD, VOCs, total acidity, total alkalinity and surfactants).
- Samples that require filtration should be filtered as soon as possible after sample collection. Take care never to handle the filter paper. The filter papers should never be reused.

- If in any doubt about any aspect of sample collection, treatment, storage or analysis for particular parameters, then consult the analytical laboratory for up-to-date advice/techniques.

6 Physical parameter sampling

Take great care when handling the Hydrolab or Quanta (or whatever probe you are using) as they are delicate and can easily be damaged if not treated very carefully. Take care not to bump them in transit or while deploying. In the case of multi-probes there are several components that are easily damaged.

The dissolved oxygen membrane is particularly susceptible to damage from underwater snags and debris. It is also prone to being dislodged, as the O-ring can easily be flicked off when you change the water-filled probe cover with the protective cover used when the probe is deployed – take care here. If the membrane is moved in the slightest, not even totally removed, the dissolved oxygen probe will be rendered useless until the internal fluid and a new membrane are put in place and the probe is recalibrated. This takes at least 24 hours.

The pH probe also has a fragile glass bulb component, which is obviously quite easily damaged.

6.1 Instrument maintenance and calibration

This is critical to ensure the accuracy and precision of your probes and the physical data you collect using them. Regular maintenance (e.g. monthly for Department of Water instruments) will keep your probes in good working order, as well as identifying faults before the day you need to use the probe for sampling!

However, you must also perform daily calibration of the probes before you go out into the field and as soon as you return from sampling. These pre and post-field calibrations allow you to verify the physical data you have collected using the probe that day, so ensuring that the physical data can be used with confidence.

It is also important to keep a written record of these calibrations. This will provide a back-up copy of information vital to verifying the quality of data captured by the instruments, as well as helping to identify minor problems and, hopefully, prevent them becoming more serious equipment malfunctions.

6.2 Instructions for physical parameter sampling

- Lower the clean, well-maintained and calibrated instrument into the water body near or at the same site where the water samples were taken. Take care to minimise disturbance of the sediments if you have to wade into the water.
- Ensure that all probes are fully submerged (you don’t want to measure the air!). To achieve this in shallow waters the probe may need to be held on an angle. Ideally, the probes should be ~10 cm under the water surface, but this may not be possible in shallower waters. In addition, in ideal circumstances you don’t want the probes within ~10 cm of the sediments. If the waters are very shallow (<20 cm) you will have to place the probes in the middle of the water column.

- If you are sampling in a very shallow water body, the probes should be kept in a gentle motion while taking care not to stir up the sediments.
- If the probe has a built-in circulator, ensure this is turned on.
- Allow sufficient time for the probe to stabilise (normally a few minutes), then take the readings.
- Physical results should be stored electronically on the instrument's console (if it has this function) as well as being recorded on the field observation form (as a back-up in case the electronic file is corrupted). Include the date and time.

7 How to filter a sample

7.1 Cleaning and assembling the filter tower

1 Preferably filter the samples on a level surface (the back of a ute is good). Avoid dusty conditions and rain; in both cases use the lid to cover the top funnel while filtering.

2 First, disassemble the filter tower being careful not to touch the filter holder. Place the top of the filter tower onto a flat surface, upside down. Place the filter holder on to the top of the filter tower.

3 Remove the bungs from the vacuum hose attachments.

4 Use a spray bottle of de-ionised water to rinse well the inside of the bottom part of the filter tower (the collection chamber), pouring out the rinsate. Make sure that you also rinse the neck of the container as well as the vacuum ports.

5 Then, carefully pick up the filter holder, making sure not to touch the centre of it, and rinse well with the de-ionised water. Check that there is nothing sticking to the filter holder.

6 Place the filter holder on to the rinsed collection chamber.

7 Carefully place the correct type of filter paper on to the filter holder taking care not to touch the filter holder or the filter paper.

8 Then, rinse the top of the filter tower well with the de-ionised water.

9 Screw the rinsed top section onto the filter tower taking care not to crease the filter paper. Check that it has screwed on properly.

10 Put a rubber bung on one of the two vacuum port adaptors on the side of the collection vessel.

11 Attach a vacuum pump to the other vacuum port adaptor.

Note that you need to clean your filter station prior to sampling at every site.

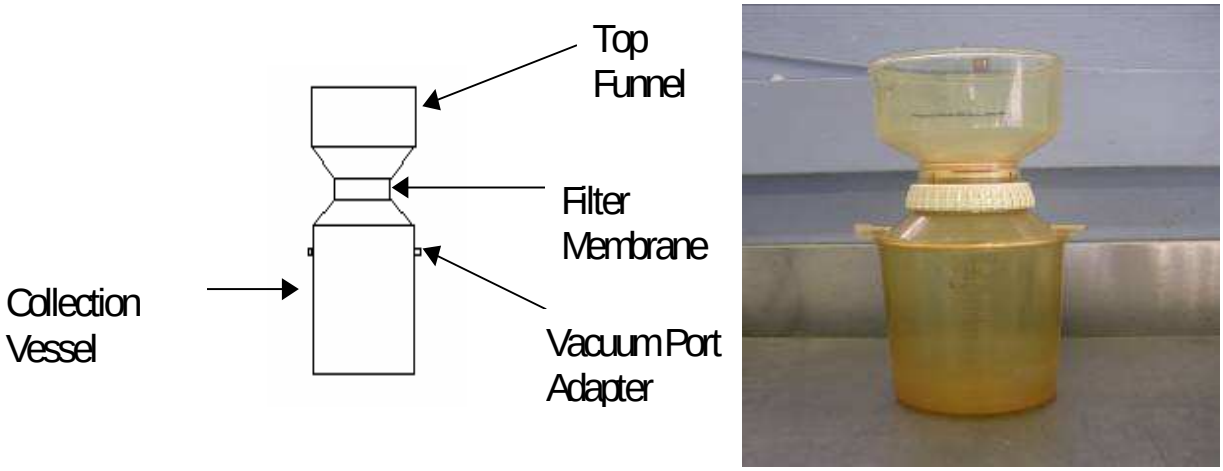


Figure 2 Diagram and photo of assembled filter tower

7.2 Filtering a nutrient sample

1 Shake your sample gently before filtering.

2 Pour a small amount of the sample into the top of the cleaned, assembled filter tower.

3 Use the vacuum pump to filter the water.

4 Remove the vacuum pump and the rubber bung.

5 Swirl the filtered sample around the collection chamber being careful not to splash the bottom of the filter holder.

6 Discard the filtered sample by carefully pouring it through both vacuum ports.

7 Put the rubber bung back on and re-attach the vacuum pump.

8 Pour the required amount of sample plus a bit extra (for rinsing the sample container) into the top of the filter tower.

9 Use the vacuum pump to filter the sample.

10 Once the sample is filtered, remove the vacuum from the collection chamber (this prevents the sample from splashing back up to the bottom of the filter holder).

11 Remove the bung and the vacuum pump.

12 Carefully pour a small amount of your filtered sample into your pre-labelled sample container. Always pour out the sample from the vacuum port, taking care not to touch any part of the filter tower to the sample container. Cap, swirl around the filtrate and discard.

13 Repeat this twice more, so that you have rinsed your sample container three times.

14 Then, fill your labelled sample container with the filtrate (pouring through a vacuum port) to the required level.

15 Cap and store the sample container in an esky on ice-bricks.

7.3 If your nutrient sample is difficult to filter

Your nutrient sample may prove difficult to filter if there is an algal bloom, or if the water at your site is particularly silty. If so, follow these steps.

1 Follow the instructions above in ‘filtering the sample’ until you get to step 8.

2 At step 8, do not pour the full amount of sample plus rinsate into the bottle; pour only a small amount of sample in.

3 Filter this small amount of sample. If it passes through the filter paper easily, add a little more sample and filter this.

4 Repeat step 3 until the water is only very slowly being filtered. At this point, do not add any more water and wait until the water has all been filtered through. If you have added too much water and the filter paper has become blocked so that no more water will pass through it, then you need to carefully remove the

excess water using a syringe; do not tip out the excess water. Take care not to touch the syringe to the filter paper as these are easily damaged. Then, allow the last bit of water that you cannot remove with the syringe to be filtered through the paper.

5 Remove the vacuum from the collection chamber.

6 Use the filtered sample from the collection chamber, first to rinse your labelled sample container three times, then to fill it as per steps 12 to 14 above. Always pour water out of the vacuum port of your still-assembled filter tower.

7 Unscrew the top section of the filter tower and carefully place it upside down, somewhere clean.

8 Remove the blocked filter paper using tweezers.

9 Replace the blocked filter paper with a new one, again making sure not to touch the filter paper or the filter holder.

10 Re-assemble the filtering tower.

11 You now need to rinse your filter paper and collection chamber again as per steps 1 to 7 above. The reason for this is so that if there is any dirt on the filter paper it will be rinsed out prior to filtering your actual sample that you will send to the lab for analysis.

12 Then, filter the remainder of your sample.

Notes

If your sample is especially difficult to filter, you may need to pre-filter it through a filter paper with a larger pore size. Before you do this, you must make sure that this will not have an impact on your analysis.

Never disassemble your filter tower prior to decanting the filtered sample to your sample container. Disassembling the filter tower introduces a number of ways that contaminants can get in.

8 How to store bottles for transport to the laboratory

How to store your sample will depend on the parameter to be measured.

Generally, samples are stored on ice (or ice-bricks) in an esky for transport to the laboratory. However, depending on holding times and how long it will take you to get your samples to the lab, you may need to freeze some of them (note that some samples should never be frozen).

If you do need to freeze your samples, make sure that they do not defrost again before they get to the laboratory. Always check the standard operating procedures to determine how to store your samples, and what the appropriate holding times are.

When sending the esky with samples to the laboratory, make sure you include copies of the appropriate chain of custody forms (the white and pink copies) stored in a zip-lock bag (or some other waterproof container). Ensure all container lids are screwed on tightly and try to store them upright. It is very frustrating to lose samples this way!

9 Filling out field observation forms and chain of custody forms

It is crucial that the paperwork is filled out in the field, at the time of sampling, and that care is taken to fill paperwork in correctly, as this is an important part of assuring the quality of the data you are trying to gather. Please ensure you fill in all relevant fields on all forms; it is not unusual to need some assistance with this if you are sampling for the first time!

If you are developing, or gathering data for a monitoring program for the first time, or just need a reminder, please contact the Water Science Branch or Measurement and Water Information Branch.

- While sampling, the field observation form should be filled out fully at each site before moving to the next site.
- Once sampling has been completed, the information on the field observation form should be transcribed to the chain of custody form and the second sampler should check the completed chain of custody form.
- If it is more convenient, the chain of custody form may be completed while sampling in the field, at the same time as the field observation form is filled out.
- Once completed, the white and pink copies of the chain of custody form should be forwarded to the laboratory with the samples. The yellow copy and the field observation form should be forwarded to the Measurement and Water Information Branch. You may fax or post the forms, whichever is more convenient; but not both.

10 Quality control samples

- There are a number of different types of quality control samples that may be collected; each designed to check different aspects of sampling and analysis (and having different sampling methodologies). Only the commonly used types will be discussed here.
- The location for quality control samples should be selected (using a random selection method) before you head out into the field. This prevents bias in site selection in the field.
- To gain a better understanding of the different types of blanks and ways to identify the source of contamination see *Quality control sample guidelines* published by the Measurement and Water Information Branch (the following table is from that publication). *Quality control sample guidelines* also explains how to record the sample details on chain of custody forms so they cannot be identified by the laboratory (but can be by database staff with correct identifying codes for the type of quality control sample, the site and the collection method). Do not take quality control samples without first referring to that publication.

10.1 Types of quality control samples

Table 3 Types of quality control samples and their uses

Sample type	Description	Purpose	Collection method
Field blank	Field blanks are clean samples of distilled de-ionised water prepared in the field, and treated as normal samples	The detection of analytes may indicate problems in one or more of the sampling, handling or analysis steps.	For field blanks, extra labelled, empty containers are taken to the site, along with suitable preservation contents. There, the containers are filled with distilled de-ionised water (ideally, this should be sourced from the laboratory that will be conducting the analysis). The bottle is closed and the contents are handled the same as real samples during transfer and storage.
Rinsate blank	Rinsate (or equipment) blanks are created from the water or solvent used to rinse the field equipment	Rinsate blanks measure contamination introduced through contact with sampling equipment or the sampler.	Sampling equipment is cleaned and then the final rinse water or solvent is collected in a clean container, preserved as per normal and analysed.

Sample type	Description	Purpose	Collection method
Trip blank	Trip (or transport) blanks are simulated samples created in the office laboratory with distilled de-ionised water (preferably from the lab that will be conducting the analysis). They accompany the sampler to the field but do not undergo sample collection, handling and preservation procedures.	Trip blanks can be used to assess gross cross-contamination of samples during transport and storage.	These are prepared in the office, laboratory or sampling preparation area, by adding distilled de-ionised water (preferably sourced from the laboratory that will be conducting the analysis) directly to the types of containers to be used in the field. These are then sealed and taken into the field and not opened until they arrive at the analytical laboratory. They are kept with the set of sample bottles both before and after sample collection. Trip blanks do not go through the sample collection, filtration or preservation process.
Replicate samples	These are obtained when two or more samples are taken from the same site at the same time, using exactly the same methods. They are representative of the same environmental condition.	Replicate samples can be used to detect both natural variations in the environment and variations caused by field sampling methods.	At least two but preferably three samples are collected simultaneously (same site, date, time, depth, matrix and method) to establish the reproducibility of sampling.
Field duplicate (or split) sample	A sample is split into two or more sub-samples and submitted as separate samples.	Duplicate samples reveal the magnitude of errors (contamination, random and systematic) occurring between sampling and sample analysis.	Obtained by dividing a sample into two or more sub-samples. Duplicate samples should return the same results.

11 Cleaning equipment

Generally, you will not need to clean sampling equipment in a special way, apart from rinsing it well on return to the lab at the end of each sampling trip. However, if you sample a site that is particularly dirty (i.e. there is an algal bloom, or the site smells strongly of hydrocarbons, sewage or something else) you will need to clean your equipment thoroughly. In addition, you will need to clean your equipment periodically to prevent a build up of dirt. To do this:

1. rinse your equipment well in tap water;
2. then clean with De-Con 90 (a phosphate free detergent), or equivalent;
3. rinse well with tap water;
4. rinse three times with de-ionised water, and finally;
5. allow to dry.

It is recommended that you take a spray bottle of de-ionised water and 2 L bottles of de-ionised water and tap water for washing equipment in the field, in case you encounter a particularly dirty site during a sampling run.

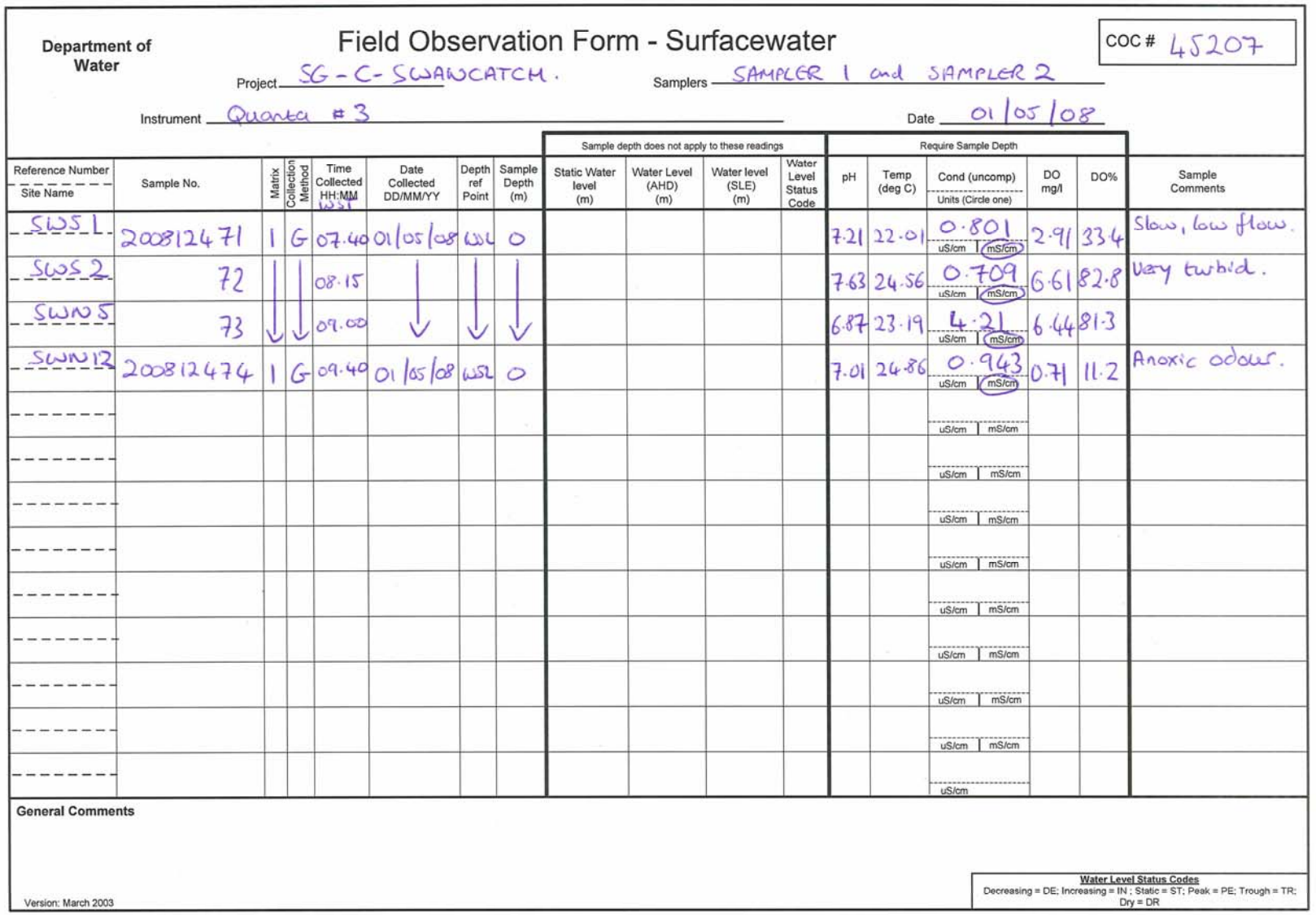
12 Forms

The following section shows some examples of how to fill in the paperwork (field observation forms and chain of custody forms) in the field, to accompany to sample to the laboratory as part of your quality assurance measures. It is quite easy to make mistakes and it's strongly recommended you get someone experienced to show you how to complete the forms if you are using them for the first time.

Figure three shows the front of a field observation form (FOF). Note that "matrix" refers to what is being sampled (always "1" for water) and the collection method for the FOF is "DR" (for direct reading) because using a probe in the field the physical parameters are recorded in situ and the other observations (e.g. stream flow status, wind speed and direction and weather conditions) are also taken in situ and recorded directly to the FOF (hence, a direct reading).

Figure four shows the back of the FOF with the instrument calibration information recorded in the table provided.

Figure five shows the chain of custody form which is quite detailed in what is required for it to be filled out correctly. Please refer to the information in section 13 "chain of custody information" for how to fill the form out and if in doubt seek assistance.



Department of Water

Field Observation Form - Surfacewater

COC # 45207

Project SG-C-SWANCATCH. Samplers SAMPLER 1 and SAMPLER 2

Instrument Quanta #3 Date 01/05/08

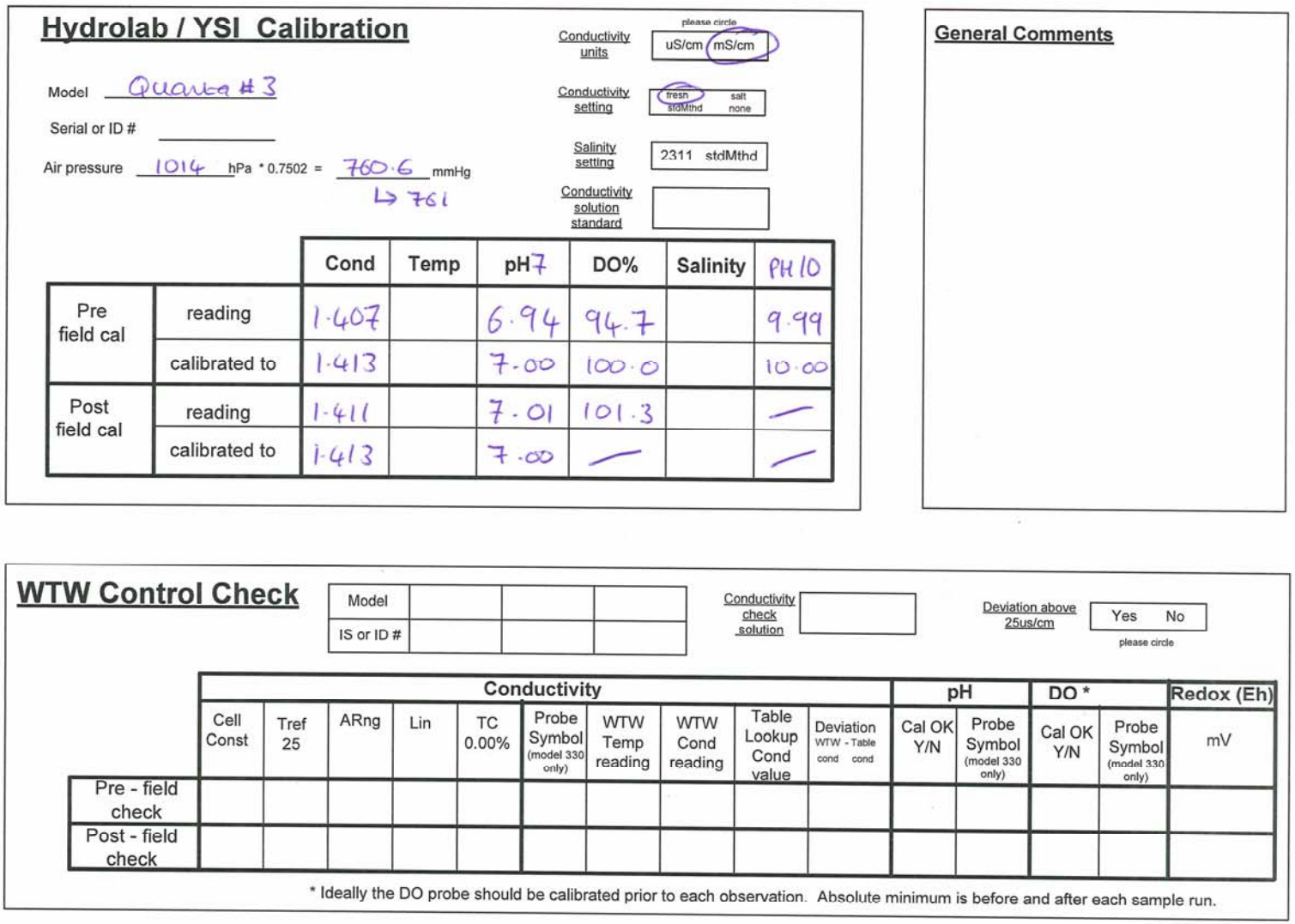
Reference Number / Site Name	Sample No.	Matrix	Collection Method	Time Collected HH:MM WST	Date Collected DD/MM/YY	Depth ref Point	Sample Depth (m)	Sample depth does not apply to these readings: Static Water level (m)	Water Level (AHD) (m)	Water level (SLE) (m)	Water Level Status Code	Require Sample Depth: pH	Temp (deg C)	Cond (uncomp) Units (Circle one)	DO mg/l	DO%	Sample Comments
SWS1	200812471	1	G	07.40	01/05/08	WSL	0					7.21	22.01	0.801 uS/cm / mS/cm	2.91	33.4	Slow, low flow.
SWS2	72	↓	↓	08.15	↓	↓	↓					7.63	24.56	0.709 uS/cm / mS/cm	6.61	82.8	Very turbid.
SWN5	73	↓	↓	09.00	↓	↓	↓					6.87	23.19	4.31 uS/cm / mS/cm	6.44	81.3	
SWN12	200812474	1	G	09.40	01/05/08	WSL	0					7.01	24.86	0.943 uS/cm / mS/cm	0.71	11.2	Anoxic odour.
														uS/cm / mS/cm			
														uS/cm / mS/cm			
														uS/cm / mS/cm			
														uS/cm / mS/cm			
														uS/cm / mS/cm			
														uS/cm / mS/cm			
														uS/cm / mS/cm			
														uS/cm / mS/cm			
														uS/cm			

General Comments

Water Level Status Codes
Decreasing = DE; Increasing = IN ; Static = ST; Peak = PE; Trough = TR; Dry = DR

Version: March 2003

Figure 3 Example of a surface water field observation form (front)



Hydrolab / YSI Calibration

Conductivity units (please circle): uS/cm **mS/cm**

Conductivity setting: **fresh** stdMthd salt none

Salinity setting: 2311 stdMthd

Conductivity solution standard:

Model: Quanta #3

Serial or ID #:

Air pressure: 1014 hPa * 0.7502 = 760.6 mmHg → 761

		Cond	Temp	pH7	DO%	Salinity	pH10
Pre field cal	reading	1.407		6.94	94.7		9.99
	calibrated to	1.413		7.00	100.0		10.00
Post field cal	reading	1.411		7.01	101.3		—
	calibrated to	1.413		7.00	—		—

General Comments

WTW Control Check

Model			
IS or ID #			

Conductivity check solution:

Deviation above 25us/cm: Yes No (please circle)

	Conductivity										pH		DO *		Redox (Eh)
	Cell Const	Tref 25	ARng	Lin	TC 0.00%	Probe Symbol (model 330 only)	WTW Temp reading	WTW Cond reading	Table Lookup Cond value	Deviation WTW - Table cond cond	Cal OK Y/N	Probe Symbol (model 330 only)	Cal OK Y/N	Probe Symbol (model 330 only)	mV
Pre - field check															
Post - field check															

* Ideally the DO probe should be calibrated prior to each observation. Absolute minimum is before and after each sample run.

Figure 4 Example of a surface water field observation form (back)

Page 1/1

Department of Water

COC# 45207

Chain of Custody Record

Send samples to: Add name of analytical lab here

Laboratory Quote Number:

Payment Code:

Send electronic results to: datain@water.wa.gov.au

Add extra e-mail addresses here

Instructions for laboratory
Provide laboratory QA/QC report with analysis results

Laboratory Use Only

Lab Batch Code:

Address correspondence to:
Add extra addresses here

QA Officer - Water Information Branch
PO Box K822
Perth WA 6842
Fax (08) 9426 4817

Lab remarks:

Sampling Program (WIN Project) e.g. SG - C - SWANCATCH

Remarks:

Is there a Sampling and Analysis Plan? (Yes) No

Collection Agency: eg. WSB.

Spatial pattern: eg. FIXED

Sampling frequency: (weekly, etc.) e.g. WEEKLY

Names of Samplers: (print first & last name) SAMPLER 1, SAMPLER 2

Sample details verified by: (sign) 1. S1 2. S2

Sample analysis (samples may contain hazardous substances)

Container	Volume	1L	250ml	250ml	125ml	
	Type *	P	P	P	P	
Treatment	Filtered	N	N	Y	N	
	Type	-	-	0.45µm	-	
	Porosity	-	-	Ac Cell	-	
	Preserved	N	N	N	Y	
Storage	Temp	1-4°c	1-4°c	1-4°c	1-4°c	
	Time	1day	1 day	1day	1day	
Lab to filter **		NO	NO	NO	NO	

Laboratory Sample Number	Sample Number	Matrix	Matrix Quality	Collection Method	Time 24 hr (HHMM) W/T	Date (DDMMYYYY)	Site Reference Number	Site Name	Depth Ref Point	Depth (m)	Number of containers/ filter papers	TSS	TN/TP	NO_x, NH_3/NH_4, SRP +diss. Organic N	Total Heavy Metals (see attachment)
	200812471	1	F	G	07.40	01/05/08	SWS1	Mills St.	WSL	0	4	✓	✓	✓	✓
	72	1	F	G	08.15	↓	SWS2	Anaconda Dr.	↓	↓	4	✓	✓	✓	✓
	73	1	B	G	09.00	↓	SWN5	Upper Swan Bridge	↓	↓	4	✓	✓	✓	✓
	200812474	1	F	G	09.40	01/05/08	SWN12	Slade St.	WSL	0	4	✓	✓	✓	✓
							Total number of sample containers / filter papers				16				

Distribution: White and pink copies accompany samples to lab. LAB: confirm condition and number of samples received; fax annotated copy to Department of Environment within 24 hours; return white copy to DoE with final report. FIELD: fax yellow copy to RIB.

Actual Sample QA — Use data quality guidelines to complete: 1 Sample collection, 2 COC, 3 Sample receipt, 4 Lab analysis, 5 Field QA, 6 Lab QA, 7 Data review, 8 Data transfer

Required turnaround time: 15 or ( ) working days

Relinquished by (print name): SAMPLER 1 Signature: S1	Date: 01/05/08 Time: 10.35	Received by (print name): Signature:	Date: Time:
Relinquished by (print name): Signature:	Date: Time:	Received by (print name): Signature: (Lab use only)	Date: Time:

All sample containers accounted for? Yes / No
All samples stored as described above? Yes / No

* P = plastic, e.g. high density polyethylene; AW = acid washed; DkGl = dark glass.

** Indicates the laboratory is required to filter samples prior to analysis

Generic: October 2005

Figure 5 Example of a chain of custody form

13 Chain of custody information

13.1 Header information

COC number:	Pre-allocated number providing unique identification of this chain of custody.
Send samples to:	Name and address of laboratory to send sample to.
Laboratory quote number:	Quote number from laboratory, following acceptance of quote by DOW.
Payment code:	DOW payment code used for this project, equivalent to cost code.
Send electronic results to:	Email address to which electronic analysis results will be sent.
Address correspondence to:	Address that all lab reports should be sent to.
Sampling program (WIN project):	The code or name for the WIN sampling program that defines the sampling requirements.
Remarks:	Note anything of interest or special instructions.
Is there a sampling and analysis plan? Yes/No	Indicates whether or not a sampling and analysis plan has been prepared prior to collecting the samples (circle Yes or No).
Collection agency:	Name of organisation undertaking the sampling (custodian of the data). One agency per COC.
Site selection strategy:	Defines the strategy used to select sampling sites (see codes). One per COC.
Sampling frequency (weekly, etc.):	Define how often the samples are required to be collected. One per COC.
Name of samplers (print first and last name):	The first and last names of all members of sampling party (please print). Only the first will be added to WIN.
Sample details verified by (sign):	Verification that all details on the COC are correct. Two signatures required (one sampler to complete the COC; both to check).

13.2 Sample information

Laboratory sample number:	For laboratory use. Identification number assigned to the sample bottles by the lab.
Sample number:	For field use. Identification number assigned to the sample bottles by samplers.
Matrix:	Defines the medium within which the analyte of interest is found.
Matrix quality:	Approximate quality of water – fresh (F), brackish (B) or saline (S). Guides the lab in the use of instrument appropriate to the range.
Collection method:	Defines the method used to collect the sample.
Time:	Time at which sample was collected, in 24 hr format.
Date:	Date on which sample was collected, in DD/MM/YYYY format.
Site reference number/code:	Sample location defined by site reference number or code.
Site name:	Sample location defined by the site name (not mandatory).
Depth ref point:	The point from which the sample depth was measured, e.g. WSL= water surface level, TOC = top of casing.
Depth (m):	Depth or depth range the sample was taken from, e.g. '0.5 m' or '10.2–12.6 m' (as a positive number if below the Depth Ref Point).
Number of containers (/ filter papers):	Number of sample bottles or filter papers submitted to laboratory for each sample. Number is checked by lab upon receipt.
Sample analysis (various suites):	Defines the analysis required on the samples, e.g. total nitrogen.
Container – volume:	Defines the volume of the container appropriate for the analysis required, e.g. 150 mL, 500 mL etc.
Container – type:	Defines the type of material used to construct the container, e.g. borosilicate glass (G), high-density polyethylene (HDPE).

13.3 Storage and handling

Filtered:	Indicates the nominal pore diameter of filter if used (example 0.45 µm); if not used indicate 'No'. (Indicate by printing the appropriate treatment if necessary or by circling where pre-printed options exist).
Preserved:	Indicates the preservative used (if any), such as sulphuric acid (H_2SO_4), hydrochloric acid (HCl), phosphoric acid (H_3PO_4).
Storage – temp:	Temperature at which the sample will be stored at prior to analyses (See Australian Standard 5667.1:1998 for guidance).
Storage – time:	Maximum allowable length of time for which sample will be stored at the storage temperature prior to analyses (See AS 5667.1:1998).
Lab to filter:	Indicates whether or not the laboratory is required to filter the sample before analysis (Yes or No).

13.4 Chain of custody codes

Matrix (common codes, see COC document for full list of codes)

1 = Water, 2 = Soil, 3 = Sediment, 4 = Sludge, 5 = Air, 16 = Animal tissue, 17 = Plant tissue, 21 = Regolith, 26 = Periphyton tissue, 27 = Pore water, 28 = Macro invertebrate tissue

Matrix quality

F = Fresh, B = Brackish, S = Saline

Collection methods (common codes, see COC document for full list of codes)

G = Grab, IN or DR = In situ (direct) reading or observation, OT = Over Time, ID = Integrated over Depth, CI = Composite sample of discrete sites integrated over depth, CS = Composite Sites

CTM = Composite over time, DA = Discrete Auto sampler, CA = Composite Auto sampler, PS = Pump Submersible, PP = Pump Peristaltic, PT = Pump Test, AL = Air Lift, VS = Vacuum Sampler

B = Bailer.

Depth ref points (common codes, see COC document for full list of codes)

GL = Ground Level, TOC = Top of Casing, TOCOL = Top of Collar, TOVAL = Top of Valve, PM = Permanent Mark, WSL = Water Surface Level

Spatial patterns (see WIN Codes document for explanations)

Point (single point, representing itself only), Line (transect), Grid, Area (sampled in entirety), Irregular points (multiple irregularly spaced points representing a wider area, e.g. snapshot)

14 Useful contacts

If you have questions, please feel free to contact the appropriate person. Here are some useful department contacts for surface water sampling, monitoring program design, parameter-based analysis and quality assurance and control.

Dom Heald (Water Science Branch): (08) 6364 7836

Kelli O'Neill (Water Science Branch): (08) 6364 7824

Emma van Looij (Water Science Branch): (08) 6364 7855

Steve Fisher (Water Science Branch): (08) 6364 7868

Trish Bunting (QA Officer, WIN): (08) 6364 7449

John Patten (WIN database manager): (08) 6364 7455

15 Glossary

AS/NZS	Australian/New Zealand Standard
BTEX	Benzene, toluene, ethyl benzene and xylene
DEC	Department of Environment and Conservation
PAH	Polycyclic aromatic hydrocarbons
TN	Total nitrogen
TP	Total phosphorus
TRH/TPH	Total recoverable hydrocarbons / Total petroleum hydrocarbons
TSS	Total suspended solids
WIN	Water information database

16 References

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AS/NZS (1998). Australian/New Zealand Standard AS/NZS 5667.4:1998. *Water quality – Sampling. Part 4: Guidance on sampling from lakes, natural and man-made*. AS/NZS 5667.4:1998. Standards Australia and Standards New Zealand: Homebush, NSW.

AS/NZS (1998). Australian/New Zealand Standard AS/NZS 5667.6:1998. *Water quality – Sampling. Part 6: Guidance on sampling of rivers and streams*. AS/NZS 5667.6:1998. Standards Australia and Standards New Zealand: Homebush, NSW.

AS/NZS (1999). Australian/New Zealand Standard AS/NZS 5667.12:1999. *Water quality – Sampling. Part 12: Guidance on sampling of bottom sediments*. AS/NZS 5667.12:1999. Standards Australia and Standards New Zealand: Homebush, NSW.

Department of Environment (2005). Hydrological measurement process: Quality control samples guidelines – draft. Department of Environment, WA.

Water and Rivers Commission (2002). *A community guideline to surface water quality investigations – version 1.0*. Water and Rivers Commission, WA.

Water watch Australia Steering Committee, Environment Australia (2002) *Module 2 - getting started: the team, monitoring plan and site*. Water watch Australia national technical manual.

17 Appendix: Essential water sampling practices

Sampling equipment

Ensure that sampling equipment is clean and is maintained in good working order before use. Use only new, pre-cleaned sample containers.

Use only specified equipment, including sample containers and other sampling equipment. In particular, laboratory-supplied containers must be used as specified. The use of alternative sample containers or sampling methods will make the sample unusable. The laboratory may reject incorrect samples.

Labelling

Attach sample container labels before taking the sample. Ensure the label is printed with water-resistant ink. This avoids mix-ups, loss of labels, and the difficulty of attempting to stick a label onto a wet container. A sample that cannot be correctly identified is of no value. All samples bottles must be labelled with sample site code, the agency collecting the sample, parameter requiring analysis (e.g. TN, TP) and date. A unique sample reference number must also be on the bottle. These are provided as stickers that can be obtained from the Measurement and Water Information Branch of the Department of Water. All the samples from a single site, of the same sample matrix, with the same sample collection method and depth, must have the same unique sample reference number. The unique sample reference number is printed on adhesive labels with one, two or five replicates. Since there are only a maximum of five stickers per sample number, there may be times when samplers need to write down the sample number on extra bottles.

Gloves

Always wear disposable, powder-free, nitrile gloves while sampling. A new set of gloves must be worn for sampling at each site, and disposed of at the end of sampling at each site to avoid cross-contamination. Latex and/or PVC gloves are not suitable for many organic compounds, including BTEX. Nitrile gloves are recommended. The use of gloves also prevents contamination of the sample from sunscreen or hand creams etc.

Container caps

Remove caps from the sample containers only at the time of sampling and replace the cap immediately after collection of the sample.

Never put the sample container caps on the ground, as this will increase the risk of contamination.

Avoiding contamination

Do not touch the inside of sample collection vessels (e.g. grab pole sampler), sample containers, sample bottles or caps with hands or other sampling equipment.

Pre-rinse the sample collection vessel and final container three times with sample (a minimum of 3 x 20 mL water sample) before collecting the final sample. This is a preventative measure to ensure that there are no contaminants in the bottle. Avoid touching the inside of sample collection vessel and final container during sample transfer.

Do not rinse laboratory-supplied containers that contain preservatives or are specifically pre-washed.

If there is reason to believe that a sample has become contaminated during sampling, take a new sample using a new container. Attach a new label and hand write all details from the original label onto the blank label. Discard the used container. When discarding bottles that contain hazardous or corrosive chemicals (either the sample or preservative) take caution and dispose of appropriately.

Always take a spare set of sample containers and labels out with you on the day of sample collection, in case of sample contamination.

Filling containers

Fill sample containers slowly and down the side edge of the container to the specified level, usually to the shoulder of the container. In some cases, the container must be filled to the top, as the existence of an air space may affect the sample. Slow filling is essential to prevent dangerous splashing of corrosive and toxic chemicals, and to prevent the loss of preservatives.

Storage and transport

Store and transport the samples as specified. Most samples require storage at

1–4℃ by cooling bricks (refrigeration), but this m ay depend on transport times to the laboratory.

The laboratory must receive samples before exceeding the maximum holding time for the parameter to be analysed, allowing enough time within the holding time for the laboratory to process the sample. Analysis of samples received by the laboratory outside the maximum holding time will be of no value.

Overall equipment list for collecting water samples

Below is a list of what is normally taken into the field to conduct water sampling.

- Bottles as required for your sampling.
- Calibrated probe for measurement of *in situ* parameters (whatever you need or have available to you, e.g. Minisonde, Hydrolab, Quanta or WTW instruments), probe cover, protection cap, surveyor.
- Field filtering gear (e.g. hand pump, filter tower, filter papers and tweezers) if required.
- Laboratory deionised (DI) water for field blanks (and quality control samples) if required.
- Deionised water in a spray bottle for cleaning filter tower (and spare deionised water for refills).
- Tap water for filling the probe protection cap and drinking water – in separate bottles.
- Bucket for measurement probes/surveyor.
- A copy of the sampling and analysis plan (SAP).
- A copy of the safety plan (includes emergency numbers and routes to nearest hospitals).
- Chain of custody (COC) forms.
- Field observation forms (FOF).
- Plastic lunch bag for COC/FOF to go into in eskies.
- Courier (or laboratory) information (where do you drop the samples off? e.g. road or air freight couriers; the office address; information to attach to esky with samples to ensure that they are couriered correctly and arrive at the laboratory).
- Eskies with ice bricks – make sure you have enough!
- Extendable grab pole sampler.
- Masking tape (always useful).
- Nitrile gloves, gumboots, waders, coveralls, safety glasses, sunscreen, hat, and any other personal protective equipment (PPE) you might think you need (for very dirty sites it may be more appropriate to use thicker sturdier nitrile gloves which are chemically resistant – and cover up arms to a longer length).
- Map of sites.
- A GPS, if sampling at a new site.
- Permanent marker and pens.
- Extra labels.

- Extra sample containers.
- Spare bucket to carry bottles to and from vehicle.