Manual collection of surface water samples (including field filtration)

1 Purpose and scope

This document describes the method for manually collecting water quality samples.

2 Associated documents

Physical and chemical assessment:

- *Water quality sampling using in situ water quality instruments*
- *In situ water quality sampling using a Secchi disc*

Sampling design and preparation:

- *Quality control for water and sediment sampling*
- *Preparation for sampling*
- *Permits and approvals*
- *Record keeping including the taking of field photographs and videos*

3 Health and safety

Before following the methods contained in this document, a detailed risk management process (identification, assessment, control and review of the hazards and risks) must be undertaken. All work carried out must comply with the Queensland Work Health and Safety legislative obligations.

4 Permits and approvals

Permits and approvals may be required to conduct activities involving animals, plants and/or in protected areas (for example National Park/Regional Park, State Forest or State Marine Park). See *Permits and approvals* document for more information on requirements.

5 Skills, training and experience

Skills, training and or experience required to understand and or undertake this method include experience in using the equipment described in the method.

6 Equipment

See Appendix 1 for example equipment checklist.

7 Procedure

7.1 Overview

Samples should be collected directly into the laboratory supplied containers when sampling waters where possible, as this will reduce the risk of contamination. Direct sample collection is the preferred procedure if the environment is safe (e.g. during low flow conditions), and sample bottles do not contain preservative.

Where there is no flow (e.g. in dams and isolated pools) samples may be collected using an extendable sampling pole (Figure 1), rather than wading in, so as not to disturb the substrate. However, this may not represent the bulk of the waterbody as it is an edge sample. An alternative method is to move slowly into the middle of the water body (if safe) and collect the sample away from any plume caused by movement into the water body. The choice of method will depend on the objectives of the sampling.

During high flow conditions or where entry into the water is not possible (due to the presence of crocodiles or chemical contamination), the use of an extendable sampling pole or water sampler (such as a Niskin bottle or Van Dorn sampler (Figure 2)) are recommended. Water samplers can be used to collect samples at discrete depths. The choice of water sampler will depend on the sampling program. For example, if water samples are being collected for ultra-trace metal analysis, it may be appropriate to obtain a water sampler that has a Teflon-coated internal mechanism. Contact your scientific supply company for more information.

Figure 1: An extendable sampling pole

Figure 2: Van Dorn sampler

7.2 Preparation for sampling

1. Prior to leaving for the field, inspect all equipment and ensure it is in good working order and has been cleaned appropriately. Make sure if you are using an intermediate container that is appropriate for the analytes/s being sampled for.
2. On reaching the sampling site, prepare a clean work area and ensure all equipment that you will require is unpacked and easily accessible.
3. Pre-label all sample containers if possible.
4. Confirm the order that sample containers will be filled. When preparing for sampling note whether:
    - the sample container requires rinsing
    - the sample container contains preservative
    - the sample requires 'no head space'.

Note:

- If the sample container contains preservative, it will not be possible to collect water directly into the sample bottle. It is recommended that a clean laboratory supplied bottle (made of the same material, washed appropriately and without the preservative present) be used to collect the sample, with subsequent transfer to the bottle with preservative. This clean collection bottle should not be used at more than one site.
- Check with your laboratory on how much sample is needed for analysis. This is particularly the case for field filtered samples in turbid waters, where it may be difficult to filter. .
- If undertaking ultra-trace sampling, double bag samples to protect them from cross contamination from leakages and melted ice.

7.3 Collecting samples directly from a stream or river

1. Label sample containers.
2. Identify a representative area to collect the water sample and determine an appropriate and safe access route that will minimise the risk of disturbance of the substrate.
3. Collect *in situ* water quality measurements before collecting water samples for chemical analysis. Measurement of temperature, dissolved oxygen and conductivity can indicate the presence of stratification

in the water, and may determine where in the water column samples should be collected. See *Water quality sampling using in situ water quality instruments* document.

4. Put on powder free gloves immediately prior to collection of the water sample. Gloves must be stored in a clean environment (e.g. in a plastic bag).
5. To collect the sample, wade into the mid-point of the stream or river, and face into the direction of the flow. This is so any potential contamination from substrate disturbance will flow away from where the sample is being collected.
6. Remove the lid of the bottle, ensuring your fingers do not come into contact with the internal surfaces of the sample container or lid.
7. Invert the sample container fully and submerge to a depth of 0.3m below the water surface—avoid surface scums and debris in the water including macrophytes. If the water is less than 0.6m deep, the sample should be collected at mid-water column.
8. Rotate the sample container into the direction of flow.
9. If rinsing the bottle, allow the sample container to fill at least one third of the container volume. Remove from the water and recap.
10. Shake the sample container gently and pour the water downstream of the sample collection point.
11. Complete the rinse procedure three times.
12. To fill the sample container, repeat steps 6 to 8 and then allow the sample container to fill completely.
13. Recap the sample container.
14. Return to the shore and check that the details on the sample container are correct.
15. Place the sample container in a cooler box (with ice or ice bricks) or refrigerator and chill. Double bag samples if ice is to be used.
16. Fill out the chain of custody form.

Note:

- If sample is to be collected from a boat, collect the sample as close to the front of the boat as practicable, as it is moving slowly forward into the current. Be aware of any potential contamination from the boat.
- If undertaking analysis for ultra-trace metals it is recommended that USEPA *Method 1669 Sampling ambient water for trace metals at EPA water quality criteria levels* (USEPA 1996) be consulted.

7.4 Sample collection with an extendable sampling pole

Extendable sampling poles (see Figure 1) should ideally have an attached adjustable bottle holder that allows laboratory supplied bottles to be fitted directly to the pole. This eliminates the need for an intermediate sample container and reduces the risk of sample contamination. The bracket should angle the mouth of the bottle away from the pole, thereby reducing the potential for water to drip off the pole into the sample container. The use of rope to hold clasping brackets to the pole should also be avoided to minimise the potential for water to drip off the rope and bracket into the sample container.

The procedure for collection using an extendable sampling pole is:

1. Collect *in situ* water quality measurements before collecting water samples for chemical analysis. Measurement of temperature, dissolved oxygen and conductivity can indicate the presence of stratification in the water, and may dictate where in the water column samples should be collected. See *Water quality sampling using in situ water quality instruments* document.
2. Clean extendable pole and adjustable bottle holder thoroughly prior to the collection of samples. Equipment should be cleaned with phosphate-free laboratory grade detergent and rinsed with clean water.
3. Extend the sampling pole to the required length and check that all surfaces have been cleaned.
4. Place the sample container into the adjustable bottle holder.
5. Remove the lid of the sample container ensuring your fingers do not come into contact with the internal surfaces of the sample container or lid. Do not place the sample lid on the ground.
6. Move to the edge of the water and invert the sample container and submerge to a depth of 0.3m below the water surface. Avoid surface scums and debris in the water. Avoid sampling over macrophyte beds.
7. Rotate the sample container into the direction of flow and fill the sample container.
8. If rinsing the bottle, allow the sample container to fill at least one third of the container volume. Remove from the water and recap.
9. Shake the sample container gently and pour the water downstream of the sample collection point.
10. Complete the rinse procedure three times.

11. To fill the sample container, repeat steps 4 to 7 and then allow bottle to fill completely, turn the bottle upright and remove it from the water.
12. Replace the lid on the bottle.
13. Check that details on the sample container are correct.
14. Place the sample container in a cooler box (with ice or ice bricks) or refrigerator and chill. Double bag samples if ice is to be used.
15. Fill out the chain of custody form.

7.5 Manual sampling using water samplers

1. Label sample containers.
2. Collect *in situ* water quality measurements before collecting water samples for chemical analysis. Measurement of temperature, dissolved oxygen and conductivity can indicate the presence of stratification in the water, and may dictate where in the water column samples should be collected. See *Water quality sampling using in situ water quality instruments* document.
3. Inspect the internal surfaces of the water sampler, ensuring it is clean. If sampler has been washed prior to use, further rinsing of the water sampler is not necessary because this will occur as the device moves through the water body.
4. Cock the water sampler and lower into a representative area of water and to the required depth.
5. Trigger the water sampler as per the manufacture's instruction to fill, and remove the device from the water.
6. To rinse the labelled sample container, pour water from the sampler into the labelled container until one third full. Replace the lid on the labelled sample container and shake gently. Remove the lid from the labelled sample container and pour the rinsate out downstream of the sample collection point.
7. Rinse the sample container three times (if appropriate).
8. Once the final rinse of the labelled sample container is complete, discard any remaining water from the water sampler away from the sample collection point.
9. Refill by cocking the water sampler, lowering the sampler to the required depth and triggering the sampler.
10. Remove the sampler from the water and fill the labelled sampler containers. Do this quickly to avoid sediment particles from settling to the bottom of the water sampler. Recap the sample containers.
11. Complete a final check that details on the sample container are correct.
12. Place the sample container in a cooler box (with ice or ice bricks) or refrigerator and chill. Double bag samples if using ice.
13. Thoroughly rinse discrete depth sampler three times with high quality deionised water, allow to dry and store in a clean location prior to reuse at further sampling sites.
14. Fill out the chain of custody form.

7.6 Filtering the sample

When filtering a sample there are a number of aspects to consider:

- Various types of filter membranes are available, and the choice of membrane depends upon the parameters being analysed. A cellulose acetate filter is commonly used to filter water samples that are being tested for metals, and polyethersulfone filters for nutrients. Contact the filter manufacturer for recommendations. Glass fibre pre-filters are not recommended for use when testing for trace or ultra-trace metals because of the contamination risk. The two most important aspects of filtration to consider are:
    - The working definition of a 'dissolved' sample (e.g. dissolved metals or dissolved organic carbon) is a sample that has been filtered through a 0.45µm membrane.
    - The filter is a common source of contamination. Make sure blanks are taken to test the quality of the filter. Further information is provided in *Quality control for water and sediment sampling* document.
    - Filtration cannot be undertaken on a sample that has preservative in it.
- If collecting a 'total' and a 'dissolved' sample it is recommended that the 'dissolved' sample be sub-sampled from the 'total' sample container, if preservative is not present in the container. This allows a cross check for the total and dissolved results. Further information is provided in the Quality control for water and sediment sampling document.

- If speciation studies are being undertaken, samples must be filtered immediately after collection. Nutrient samples should always be filtered immediately after collection if possible.
- Generally, samples should be filtered in the field. However, if trace or ultra-trace analysis is required, it may be more appropriate to filter samples in the evening (after return from the field) in a clean environment. The filtration area can be any room that is clean and dust free.

The procedure for filtering samples is:

1. Prepare a clean work area and ensure all equipment that you will require is unpacked and easily accessible in order to minimise the risk of contamination.
2. Label all sample containers.
3. Put on a new set of gloves immediately prior to the commencement of filtering.
4. To rinse the syringe, pull out the plunger and fill about a third full with sample water. Replace the plunger and gently shake to rinse the internal surfaces of the syringe and plunger. Repeat 3 times.
5. Remove the filter from the packaging and attach filter to syringe (see Figure 3).
6. If subsampling from a 'total' sample container:
    6.1. Shake the 'total' water sample gently to resuspend particulate matter.
    6.2. Place filter on the syringe and fill the syringe with sample water.
    6.3. Push a couple of millilitres of sample through the filter to rinse, and discard the rinsate away from the sample processing area.
    6.4. Push approximately 5mL of sample through the syringe and filter into the 'filtered' sample container.
    6.5. Replace the lid on the labelled sample container and shake gently to rinse all internal surfaces including the lid.
    6.6. Remove the lid and discard the rinsate away from the sample processing area.
    6.7. Repeat the rinse of the 'filtered' sample container three times.
    6.8. Shake the 'total' water sample gently and fill the syringe with sample water.
    6.9. Remove the lid of the 'filtered' sample container and filter the required sample volume into the sample container.
7. If collecting directly from a waterway:
    7.1. Rinse the syringe three times in sample water.
    7.2. Fill the syringe with sample water and place filter on end of syringe.
    7.3. Push a couple of millilitres of sample through the filter to rinse.
    7.4. Push approximately 5mL of sample through the syringe and filter into the 'filtered' sample container.
    7.5. Replace the lid on the labelled sample container and shake gently to rinse all internal surfaces including the lid.
    7.6. Remove the lid and discard the rinsate away from the sample processing area.
    7.7. Repeat the rinse of the 'filtered' sample container three times.
    7.8. Fill the 'filtered' sample container with water pushed through the syringe and filter.
8. Recap the sample container.
9. Place the sample container in a cooler box (with ice or ice bricks) or refrigerator and chill.

The filtering process is illustrated in Figure 3.

Note: If water is turbid, filtering can take a long time.

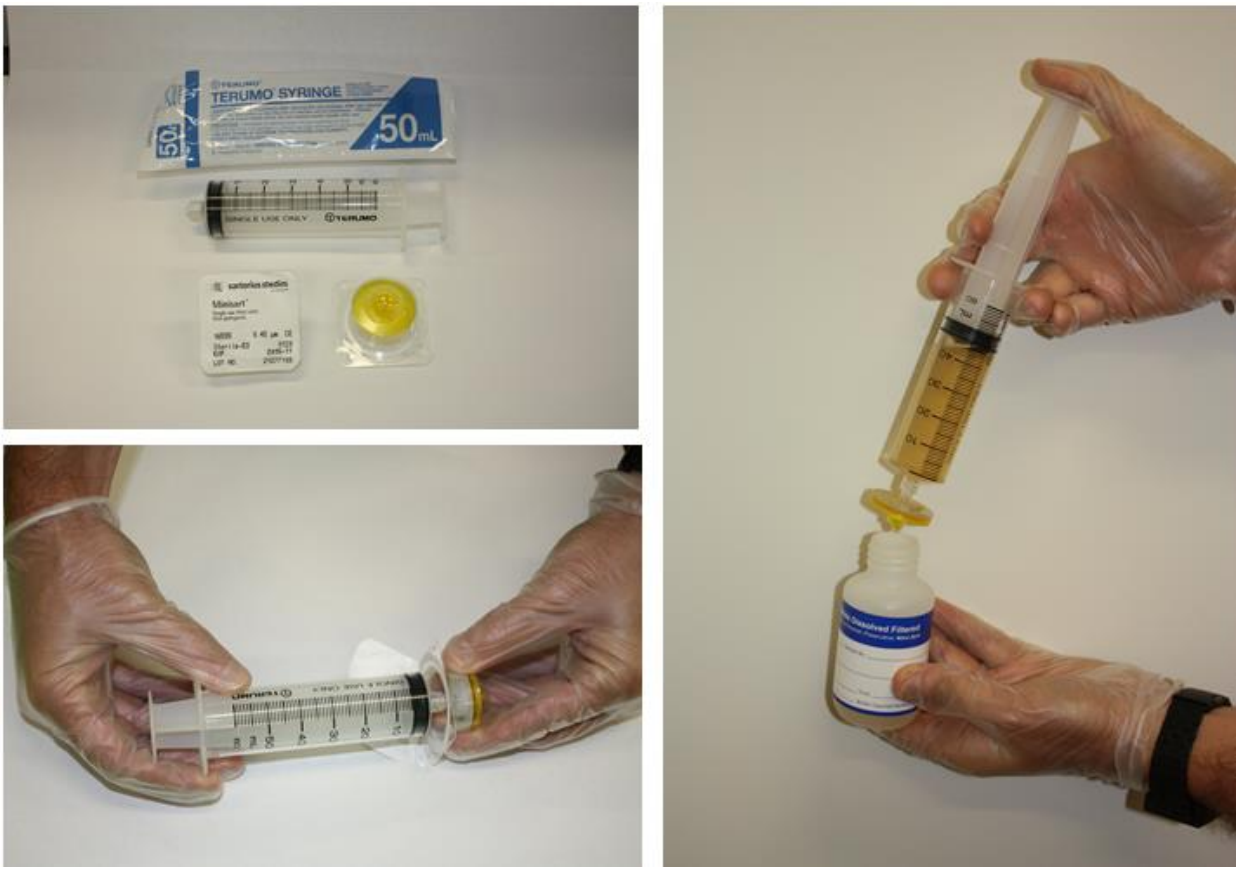

Figure 3: Filtering a water sample into a sample container

8 References and further reading

USEPA 1996, *Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels*, United States Environmental Protection Agency, Washington, viewed 30 August 2016, www3.epa.gov/caddis/pdf/Metals_Sampling_EPA_method_1669.pdf.

Appendix 1

Table 1: Equipment checklist

Equipment	✓
Sample containers prepared by an accredited laboratory	
Non-powdered gloves	
Chain of custody forms, data sheets, notebook or field computer	
Water proof markers and pens	
Sampling pole with attachment to hold sample container	
Water sampler and associated equipment if appropriate	
Waders, gumboots or similar personal protective equipment (shore based sampling)	
Filters and syringes	