WATER SAMPLING METHODOLOGIES v.1.0 (8/8/12)

NORPLAN / DACAAR: Proposed method for sampling of water samples

Before Measuring or Sampling

1. Before sampling, wells and boreholes should be pumped (or emptied by bucket) for at least 5 minutes before any measurement or sampling commences (to ensure "fresh" water is sampled). Where wells and boreholes are in regular use, this may not be necessary.

2. Flowing springs or karezes can be measured / sampled directly

Field Measurements

3. At each site, field measurements should be made of electrical conductivity, pH and temperature. These measurements should be made as close to the source as possible and preferably in running water.

    - for flowing springs and karezes, the measurements can be made directly in the flowing water.
    - In the case of a handpump, one person can pump the borehole slowly into a clean overflowing bucket, while the second person takes the field measurements in the overflowing bucket.
    - Otherwise, water can be collected in a clean bucket and measurements can be made without delay in the bucket.

4. The calibration of the pH meter should have been checked at least every three days against standard buffer solutions (as the pH of most natural groundwaters is in the range 7-9, the calibration should be made between buffer solutions of pH 7 and pH 10.

Samples

5. Samples should be taken directly from the source or, if this proves impossible, from a clean, rinsed, plastic bucket filled with water from the source.

6. Before sampling, all sample flasks, caps and syringes should be rinsed with the water which is to be sampled.

7. All samples should be marked with the following information (markings should preferably be in indelible pen on a self-adhesive, waterproof label):

    - Sample number (the sampler should keep a register of all the sample numbers)
    - The suffix "U" (unfiltered), "F" (filtered), "FIs" (filtered for isotope analysis), "UIs" (unfiltered for isotope analysis).
    - The date
    - The location

8. When samples have been taken, make sure that all the labels are legible and that all data / sample numbers have been carefully and legibly recorded in a field book.

9. Store samples in the dark in a cool place (e.g. a refrigerator but *not* a freezer). Transport samples in a dark cool place (e.g. a cool box). Do not freeze the samples. Send to laboratory and analyse as quickly as possible.

Protocol 1: Standard water samples for analysis at DACAAR

10. Label the 500 mL bottle with a waterproof marker showing time and date and the sample number with a suffix "U" (meaning that the sample is unfiltered).

11. The 500 mL analytical grade PE flask should be rinsed with the water to be sampled three times. Contact should be avoided between the sampler's fingers and the inside or rim of the bottle or cap.

12. The flask should be filled to the top, either by submerging the flask in the source or by letting water run into the flask.

13. The cap should be screwed firmly on the flask, avoiding contact between the samplers' fingers and the inside of the cap.

Protocol 2: Water samples for chemical analysis in Norway

14. Label the 100/125 mL bottle with a waterproof marker showing time and date and the sample number with a suffix "F" (meaning that the sample is filtered).

15. The 100 or 125 mL analytical grade PE flask should be rinsed with the water to be sampled three times. Contact should be avoided between the sampler's fingers and the inside or rim of the bottle or cap.

16. The polypropylene syringe should be filled with water from the source and then ejected. This should be repeated three times to clean the syringe.

17. The polypropylene syringe should be filled with water from the source and a 0.45 µm filter fitted to the nose of the syringe.

18. The syringe should be slowly depressed to force a small amount of filtered water into the flask. The cap should be placed on the flask and the flask shaken to rinse the flask with filtered water. The water in the flask should then be discarded. This step should be repeated.

19. We are now ready to take the sample !

20. The polypropylene syringe should be filled with water from the source and the same 0.45 µm filter fitted to the nose of the syringe.

21. The syringe should be slowly depressed to force sufficient filtered water to fill the flask (the filter can be carefully removed when the syringe is to be refilled, and then replaced).

22. When full, the cap should be screwed firmly on the flask.

23. When the water contains a lot of particles, it may be necessary to use 2 or more filters to collect a sample, as the filter becomes clogged. For each new filter, allow the first few drops of filtrate to run to waste, before continuing to fill the sample flask.

24. With very turbid water, it may not be realistic to fill the entire flask. This is OK.....but we typically need a *minimum* of 30-40 mL for analysis.

25. Throughout entire procedure, avoid contact between fingers and the interior of the flask and cap, the rim of the flask and cap, the nozzle of the syringe and the two ends of the filter. Also avoid contact between the ground (or any other dirty surface) and these points.

Protocol 3: Water samples for isotopic analysis in Norway

26. Examine the water. If it is clean and clear (most groundwaters), you do not need to filter. Proceed to step 27. ***If the water contains a lot of particles or is visibly turbid (e.g. river water)***, you should collect **two** samples for isotope analysis:
    (i) a filtered sample, marked "FIs" (filtered for isotopic analysis) using Protocol 2, steps 14 to 23. You should try to fill the entire flask (minimal air space) if possible (* see **NOTE** below).
    (ii) **and** an unfiltered sample, marked "UIs" (unfiltered for isotopic analysis) by continuing to steps 27-30.

27. Label a 100-125 mL bottle with a waterproof marker showing time and date and the sample number with a suffix "UIs" (meaning that the sample is unfiltered, for Isotopes).

28. The 100 / 125 mL analytical grade PE flask should be rinsed with the water to be sampled three times. Contact should be avoided between the sampler's fingers and the inside or rim of the bottle or cap.

29. The flask should be filled to the top, either by submerging the flask in the source or by letting water run into the flask.

30. The cap should be screwed firmly on the flask, avoiding contact between the samplers' fingers and the inside of the cap. There should be a minimal air space in the flask.

Duplicate samples

At around 10% of sites, duplicate sample sets should be taken and submitted to the laboratory. This in order to verify the analytical reproducibility of the results.

NOTE

* If you have difficulty collecting a full filtered flask (100-125 mL) for isotopic analysis, because the water has too many particles, *then* you can collect an additional 500 mL flask of unfiltered water. When you return to base or to the lab, let this flask stand still for 1-2 days. Allow the particles to settle. Then use the syringe to take particle-free water from the top of the flask - use a disposable filter capsule to filter the water into a 100/125 mL flask, which can then be labelled "FIs" (meaning that the sample is filtered for isotopic analysis).