

# Water sampling for microbiology, minerals, flow rate and water temperature

## Standard Operating Procedure (SOP)



Figure 1. Water sampling from outside tap as nearest point of entry

**Read the entire SOP thoroughly before commencing any water sampling.**

Good-quality, hygienic water is a key component of pig health, welfare and productivity. Sampling non-mains water at point of entry (see Figure 1) to determine bacterial contamination may also be a farm assurance scheme requirement (eg Red Tractor Assurance). If this is all that is required, use the standard operating procedure (SOP) for water sampling for microbiology only.

However, you may also wish to test for mineral content, flow rate and temperature to assess water quality and quantity of a new supply, such as a borehole, or as part of problem-solving activity to investigate issues, such as poor water intake or pipes and filters getting blocked.

It is recommended that three samples are taken at each point, as variation is common when testing for bacterial organisms. Three samples will allow a mean to be established and reduces the risk of an abnormal reading distorting the conclusions and inappropriate action being taken as a result.

Consult your veterinary surgeon/adviser before sampling to ensure the most effective and efficient approach is taken.

A full farm analysis of water may cost in the region of £500, excluding time for collecting samples. If samples are collected incorrectly or accompanying forms are not completed accurately, this money is wasted.

## It is essential that the following steps are undertaken prior to sampling:

- Before handling or using any chemicals, make sure you are familiar with the Material Safety Data Sheet (MSDS). Take necessary safety precautions and ensure chemicals are kept out of reach from children. Consider who is going to interpret the results – often this is your veterinary surgeon/adviser
- Agree with your veterinary surgeon/adviser what you will test for and the numbers of triplicate samples needed. The AHDB standard panel comprises:
  - Microbiology: *E. Coli*, coliforms, Total Viable Count (TVC) two days at 37.5°C and three days at 22°C
  - Mineral: Mn, Mg, Ca, Cu, Na, Fe, hardness, pH, nitrates and nitrites and Total Dissolved Solids (TDS)
- Produce a full map/plan of the water system or ask for one to be supplied
- Use the system map/plan to identify where to take samples from, establish the most effective sampling regime and for interpretation of results. This will determine the number of samples, sample bottles and bottle type required
- Contact the testing laboratory to arrange pre-payment, order bottles and clarify analyses to be undertaken; also confirm with the laboratory where the results are to be sent
- All water sample analyses are time-critical and must reach the laboratories within 24 hours of sampling. Decide if you wish to transport samples to the laboratory or a convenient drop-off location, or if you wish to have the samples collected, in which case the laboratory will arrange for a courier. If you are arranging transportation, check when the facility closes and allow plenty of time to get there. **If the samples fall out of the 24-hour period, they will have to be re-taken**
- Establish who knows where the water enters the farm and go through the questions with them on page one of the form at the end of this document
- Ask whether anyone is available to help you – it is important for your own safety to understand the pen setup and whether it is possible to shut the pigs away while taking water samples
- **Only farm staff should dismantle farm equipment and water systems so that uncontaminated samples can be taken.**

## Equipment list



Figure 2. Equipment for water sampling

- Sterile sample bottles; these will be provided free by the testing laboratory – standard boxes hold 12 bottles
- **Note: Trace element/mineral testing bottles have white/clear lids; microbiological testing bottles have blue lids**
- A one-litre jug (graduated and marked clearly at 500ml)
- Stopwatch or phone with timer function
- Disposable gloves (three pairs)
- Permanent marker pen
- Clean scoop or small bucket
- Labels (completed in advance but not attached to bottles until filled)
- Kitchen roll
- Thermometer
- Camera/mobile phone to take photos of pen and infrastructure
- Container(s) for carrying bottles upright once filled (eg cardboard wine carrier, not the box they were delivered in for biosecurity reasons)
- Submission form from the laboratory and clipboard
- Container for transporting bottles upright to the testing laboratory (this could be the box the bottles were delivered in for biosecurity reasons) to the testing laboratory
- Surgical spirit or sodium hypochlorite solution in a spray or wash bottle. Sodium hypochlorite is corrosive, read the MSDS for chemicals and ensure necessary safety precautions are taken before handling
- The following may be supplied by the farm:
- Tools to dismantle pipe, drinkers, etc as necessary
- Something (eg brush) to clean around the surface of the pipe or drinker fitting to be dismantled, to remove surface contamination such as rust and debris
- Spare parts, PTFE tape and/or pipe sealant in case emergency repairs are necessary

- Anticipate or set the expectation that the sampling could take one to one and a half hours; the process is far easier and quicker with two people
- Check that acid is not being used to treat the water and that medication is not being used at any of the sample points as this will temporarily distort the results. Details of any treatments such as water softeners or acid should be recorded on the data collection form at the back of this document

### Key things to remember

- Check that the sterility seal on the bottle cap is unbroken
- Keep the sample bottle unopened until just before it is filled. All blue-capped bottles must be opened by turning the cap to split the seal, rather than attempting to peel it off. If the seal is broken prior to sampling, discard the bottle and do not use
- Take care not to spill or tip out the fluid from the micro (blue-lidded) bottles as this is a preservative
- Do not touch the mouth of the bottle, the cap or inside the bottle at any point
- Any gloves that are heavily contaminated must be discarded before filling subsequent bottles; gloves should be changed between sample points
- Do not rinse bottles out before taking a sample
- Fill the bottles to 2cm below the lip, being careful not to overfill them and lose the preservative; if you do overfill a bottle, discard it
- After sampling, ensure the blue lid is screwed on tightly and invert the bottle gently three times to mix the preservative through the sample – do not shake.



Figure 3. Sodium hypochlorite wash bottle

The white/clear-lidded bottles should be screwed tight; depending on the type of bottle being used, you may be able to tighten until an audible click is heard; this is the seal closing

### Sampling points

Typically, each farm will have at least three sampling points, as detailed below. This is in order to establish what is happening with water quality in lines past the point of entry. **All samples should be taken in triplicate with three blue-lidded bottles and three clear/white-lidded bottles being filled from each point, ie 18 bottles in total.**

Photos must be taken to illustrate where samples have been collected from and, wherever possible, the water infrastructure leading to this point. Photos must be named in the same format as samples (ie Farm name P, W or E and dates, in the format of year/month/day, where P = point of entry, W = weaner/grower building, E = end of line).

#### Point of entry (P)

This is the point at which the water comes onto the farm, as close to the mains boundary/borehole/tee-off as possible. This is likely to be an inlet into the first bulk tank/header tank or bleed tap on a pressurised system, physically close to the boundary. It is essential to establish that your point of contact on the farm knows where this is prior to visiting the unit.

#### Weaner/grower accommodation (W)

If there is no specific issue to investigate, such as poor fertility, finisher growth rates or tail biting, etc the next logical place to sample from is the 8–12-week-old pig accommodation due to increased pipe dwell times and elevated temperatures. This sample is likely to give an example of where water quality is failing on a unit with no clear issue and where pigs are most at risk.

#### Far end of the waterline (E)

This is the furthest point, of the furthest spur from where the water enters the farm. If this is the same as sample point two, the next nearest point should be sampled; this must be noted on the accompanying form.

#### Label format

Sample point	Label format	Bottles
Point of entry (where water comes onto farm)	Farm name P1 Farm name P2 Farm name P3	Blue lid and white lid for each numbered sample
Accommodation for 8–12-week-old pigs or specific area for investigation	Farm name W1 Farm name W2 Farm name W3	Blue lid and white lid for each numbered sample
Far end of waterline	Farm name E1 Farm name E2 Farm name E3	Blue lid and white lid for each numbered sample

Note: Labels should also include the client number – see confirmation from laboratory.

If it is not possible to sample easily at point of entry onto the unit (this is the point at which the water comes onto the farm, as close to the mains boundary/borehole/tee-off as possible), take the sample from a suitable point further in the system. It is important that the point chosen is as near the point of entry as possible so that a true interpretation of incoming water is achieved. A clean tap, drain point, or specifically installed sampling point should be considered first.

If you have a point where water is taken off, such as a tank where contamination may be able to enter the supply, it is essential to establish a true reading for supplied water; therefore, take a sample from the float valve outlet, not by dipping the tank.

Drinkers and troughs in occupied pens will be contaminated by the mouths of pigs and with other debris. If sampling from nipple or other drinkers, the surfaces should be cleaned first, **but not disinfected**. The risk of surface contamination can be reduced by sampling from a drop pipe or line end.

If a pipe or drinker has to be dismantled, clean the area of pipe either side of where you intend to make the break to prevent any dirt or other contamination mixing with the sample as it is taken or falling into the bottle.

#### Sampling procedure for nipple drinkers, tank float valves, taps or sample points

If you need to break the line, turn off the water first.

Take photos of sampling point and infrastructure and mark on the farm plan where sample was taken.

1. Complete labels for each bottle but do not affix until the sample has been taken and the bottle has been dried. Also mark the bottle lids with the sampling point and number (P1, P2, P3, etc)
2. Put on a pair of disposable gloves



Figure 4. Measuring water flow rate

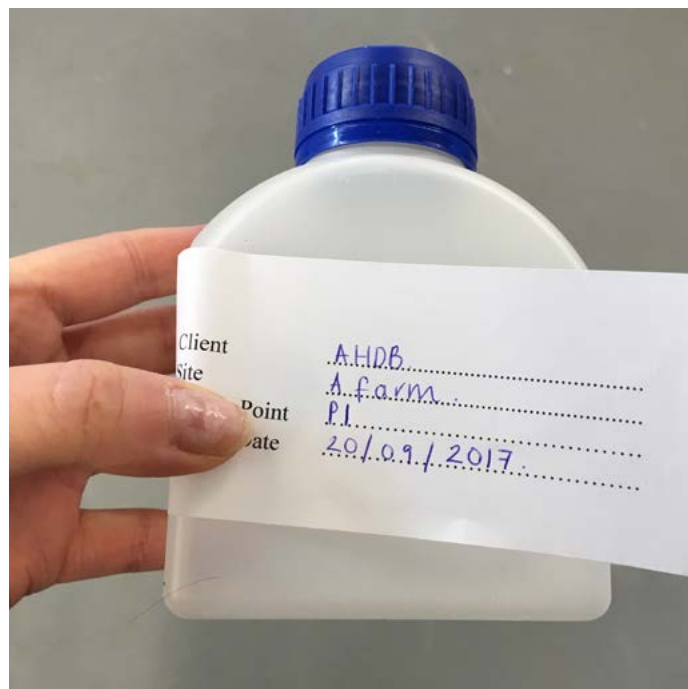


Figure 5. Labelling sample bottle

3. Remove any obvious contamination/grease/slime, etc from the nipple or around the area where the sample is to be taken. If dismantling pipework, clean the adjacent pipe first to reduce the risk of dirt and debris contaminating the sample
4. Wearing appropriate personal protective equipment (PPE), spray surgical spirit or sodium hypochlorite solution (or apply using a wash bottle – Figure 3) to sterilise surfaces
5. Put on fresh, disposable gloves before handling the sample bottles
6. Take measuring jug and stopwatch, then time and record on the form how long it takes to collect 500ml of water in the jug when manually pressing the nipple or valve (Figure 4). This should be done while pigs are drinking. Record result on the form at the end of this document
7. Take a temperature reading of the water in the jug and record it on the form at the end of this document, then discard this water
8. Keep the sample bottles unopened until just before they are filled. Take care not to spill or tip out the fluid from the microbiology (blue-lidded) bottles as this is a preservative. Do not touch inside the mouth of the bottle at any point
9. If sampling from a header tank or trough fill valve, firstly scoop some water out of the tank/trough using a clean scoop or small bucket so that there is sufficient space to take the sample without risk of contamination from standing water
10. Open the sampling point, then unscrew the bottle and place the cap clean side up on the cleanest convenient surface but do not touch inside it. **Do not empty any preservative from the bottle**

11. Fill the bottle from a gentle stream of water, which should come directly from the sampling point. The water and bottle must not come into contact with pipework or surfaces and bottles should not be overfilled (fill to 2cm below the bottle lip)
 

**Do not let the water flow over your fingers into the bottle. If you overfill the bottle, it should be discarded and a new bottle used to re-take the sample.**
12. Screw the cap on tightly
13. Gently invert the bottle three times to mix the contents
14. Once all bottles are filled from a sampling point, dry them and affix labels (Figure 5)
15. Reassemble waterline/drinker components, turn water back on and check water delivery at drinkers
16. While samples are awaiting transport/collection, chill in a fridge (3–5°C) where possible. **Do not freeze and do not put in a fridge that contains food for human consumption.** If this is not possible, store out of direct sunlight. Ideally, send/transport the samples to the laboratory in an insulated box/bag to maintain temperature
17. Complete the form from the laboratory if one has been supplied
18. Send the plan of where you took the samples, photos and results to your veterinary surgeon/adviser if agreed

#### Sampling procedure for bowl or nudge bar drinkers

For these types of drinker, it may not be possible to get the sample bottle directly into the water flow. The preferred process is to take a sample directly from the waterline before the drinker. However, this may not be practicable and in such cases an improvised, indirect method has to be used.

Avoid using a jug or other vessel to transfer water as this may result in contamination, which raises the recorded levels, producing an incorrect reading. Food-grade polythene bags, clean and unused, make a good improvised tube or funnel to fill the bottle.

1. Complete labels for each bottle but do not affix until the sample has been taken and the bottle has been dried. Also mark the bottle lids with the sampling point and number (P1, P2, P3, etc)
2. Put on a clean pair of disposable gloves
3. Remove any obvious contamination/grease/slime, etc from the nipple or around the area where the sample is to be taken. If dismantling pipework, clean the adjacent pipe first to reduce the risk of dirt and debris contaminating the sample
4. Wearing appropriate personal protective equipment (PPE), spray surgical spirit or sodium hypochlorite solution (or apply using a wash bottle – Figure 3) to sterilise surfaces

5. Put on a fresh pair of disposable gloves before handling the sample bottles
6. Keep the sample bottles unopened until just before they are filled. Take care not to spill or tip out the fluid from the microbiology (blue-lidded) bottles as this is a preservative. Do not touch inside the mouth of the bottle at any point
7. If sampling from a header tank or trough fill valve, firstly scoop some water out of the tank/trough using a clean scoop or small bucket so that there is sufficient space to take the sample without risk of contamination from standing water
8. Open the sampling point and let water flow for 30 seconds; this cleans out debris, washes out the cleaning solution and ensures the sample is from within the line
9. Open the bottle and place the cap clean side up on the cleanest convenient surface but do not touch inside it. **Do not empty any preservative from the bottle**
10. Clean around the point where water will be sampled from
11. Take a clean, unused polythene food bag and use a clean knife or scissors to cut a corner off the bottom
12. Place the bag over the cleaned surface and allow water to run through the bag and out of the cut corner for 30 seconds



Figure 6. Sampling using clean food bag

13. Fill the bottle from a gentle stream of water directly from the corner of the bag (Figure 6), without touching the bottle onto any pipe or surface and without overfilling (fill to 2cm of the bottle lip)

**Do not let the water flow over your fingers into the bottle. If you overfill the bottle, it should be discarded and a new bottle used to re-take the sample**

14. Screw the cap on tightly
15. Gently invert the bottle three times to mix the contents
16. Once all bottles are filled from a sampling point, dry bottles and affix labels (Figure 5)
17. Reassemble waterline/drinker components, turn water back on and check water delivery at drinkers
18. While samples are awaiting transport/collection, chill in a fridge (3–5°C) where possible. **Do not freeze and do not put in a fridge that contains food for human consumption.** If this is not possible, store out of direct sunlight. Ideally, send/transport the samples to the laboratory in an insulated box/bag to maintain temperature
19. Complete the form from the laboratory if one has been supplied
20. Send the plan of where you took the samples and results to your veterinary surgeon/adviser if agreed
21. Remember to take away the polythene bag and dispose of it safely

Photos must be taken to illustrate where samples have been collected from and, wherever possible, the water infrastructure leading to this point. Photos must be named in the same format as samples (ie Farm name P, W or E and dates in the format of year/month/day).

#### Preparing samples for transport to laboratory

- Double-check sample transport/collection arrangements, including making sure the courier knows how to find the farm and any biosecurity arrangements agreed with the laboratory; provide your mobile telephone number in case of any issues
- If you are transporting to a drop-off point or laboratory, check when the laboratory needs to receive the samples by and what time they close. **Remember, samples have to be analysed within 24 hours, so allow plenty of time to get there**
- Samples should already be labelled appropriately, but check whether any additional forms need to be completed for the laboratory
- Place samples upright in a suitable container, in which they can't fall over
- While samples are awaiting transport/collection, chill in a fridge (3–5°C) where possible. **Do not freeze and do not put in a fridge that contains food for human consumption.** If this is not possible, store out of direct sunlight. Ideally, send/transport the samples to the laboratory in an insulated box/bag to maintain temperature

#### Results

When results come back from the laboratory, discuss with relevant staff and/or your veterinary surgeon. Have a copy of the site plan to hand to help with interpretation and understanding.

A separate SOP has been developed for communicating results to third parties.

#### Further information

- A basic SOP is available from AHDB Pork which covers sampling for microbiology only. Visit [pork.ahdb.org.uk/environment-buildings/water-soil-and-air/water-quality-and-quantity](http://pork.ahdb.org.uk/environment-buildings/water-soil-and-air/water-quality-and-quantity) for SOP and other information on water quality and quantity.

#### Health and safety statement

Before carrying out any water sampling, conduct a health and safety risk assessment; this will cover, for example, working with water under pressure, chemicals and proximity to electrical equipment and supplies. A Control of Substances Hazardous to Health (COSHH) assessment will be needed where any chemicals are involved.

#### Want to know more?

If you want more information about AHDB you can contact us in the following ways:

AHDB, Stoneleigh Park, Kenilworth, Warwickshire CV8 2TL  
T: 024 7647 8793  
E: [pork.kt@ahdb.org.uk](mailto:pork.kt@ahdb.org.uk)  
Twitter: @AHDB\_Pork

[ahdb.org.uk](http://ahdb.org.uk)

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**AHDB**

# WATER SAMPLE DATA COLLECTION FORM

PLEASE FILL IN ALL INFORMATION/BOXES. WITHOUT ALL THE DATA ON THIS FORM IT WILL NOT BE POSSIBLE TO INTERPRET THE RESULTS CORRECTLY.

Farm name: \_\_\_\_\_

Postcode: \_\_\_\_\_ Telephone: \_\_\_\_\_

Contact name: \_\_\_\_\_

Contact email: \_\_\_\_\_

<b>INDOOR</b>	<b>OUTDOOR</b>
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<b>BOREHOLE</b>	<b>MAINS</b>
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How clean and palatable do you think the water is? (scale 1 to 10, 1 being the best 10 being the worst):

In your view are there any problems with the water supply? 

<b>YES</b>	<b>NO</b>
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If yes please outline: \_\_\_\_\_

\_\_\_\_\_

Do you think your flow rate is adequate? 

<b>YES</b>	<b>NO</b>
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If no please explain: \_\_\_\_\_

\_\_\_\_\_

What condition do you feel your water system (pipework, header tanks, holding tanks, pressure vessels, etc) is in?

\_\_\_\_\_

\_\_\_\_\_

Have you used any medications recently? If so, please give details of what and when

\_\_\_\_\_

\_\_\_\_\_

Please attach a copy of the diagram/Google earth image/map of the farm with the sample point clearly marked (using an X and either P, W or E dependant on the sample type).

\_\_\_\_\_

Note: Copy as many of these sheets as required ie if you have more than one sampling point

### Point of entry (FARM NAME P1, P2 AND P3)

On farm housing name/address/designation: eg <i>borehole</i>			
Age of pigs		Approx. weight of pigs	
Majority pipework material	PLASTIC	METAL	Majority Pipework diameter
Water treatment name			Water treatment dose rate
Approx. distance from point of entry to farm		Seconds per 500ml (for flow rate)	
Type of drinker		Number of pigs per drinker	
Water temperature (°C)		Ambient temperature (°C)	

### Accommodation for 8-12 w/o pigs (FARM NAME W1, W2 AND W3)

On farm housing name/address/designation: eg <i>Weaner 1</i>			
Age of pigs		Approx. weight of pigs	
Majority pipework material	PLASTIC	METAL	Majority Pipework diameter
Water treatment name			Water treatment dose rate
Approx. distance from point of entry to farm		Seconds per 500ml (for flow rate)	
Type of drinker		Number of pigs per drinker	
Water temperature (°C)		Ambient temperature (°C)	

### Far end of waterline (FARM NAME E1, E2 AND E3)

On farm housing name/address/designation: eg <i>Finisher 1</i>			
Age of pigs		Approx. weight of pigs	
Majority pipework material	PLASTIC	METAL	Majority Pipework diameter
Water treatment name			Water treatment dose rate
Approx. distance from point of entry to farm		Seconds per 500ml (for flow rate)	
Type of drinker		Number of pigs per drinker	
Water temperature (°C)		Ambient temperature (°C)	

If you are providing the information above to AHDB you are agreeing to be contacted via these methods – the information will only be used for the purpose of water sampling survey. All personal data will be secured and protected in accordance with the relevant legislation for further information please refer to our privacy statement at [ahdb.org.uk](http://ahdb.org.uk)