eurofins

The World's Leading Laboratory Network

Assuring Sample Integrity

Water

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"The result of any test can be no better than the sample on which it is performed".

Principles of Sampling

Sampling requires two very important processes to be completed correctly. The first is the sampling itself, and the second is the paperwork associated with each sample. We use the terms Representative and Traceable to describe the sampling process, getting both performed correctly means that our results will be as accurate as possible.

This brochure has been compiled to provide our customers with a brief overview of the techniques required for accurate sampling.

Representative

“A sample must have the same distribution of characteristics as the body from which it is drawn. Only then, can the sample be used to draw conclusions about the greater body”.

This means that if the sample is taken wrong then our results will be wrong.

Traceable

Traceability refers to the completeness of the information about every step from the time the sample is taken until we deliver your report.

If the samples you collect get mixed up at any stage in the process then the results we deliver could be wrong.

This means you need to include accurate paperwork for each sample you submit.

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Cover Photo: A red tick indicating correctness.

Introduction

Eurofins ELS is one of New Zealand's leading experts in the areas of:

- Air quality monitoring
- Boiler water
- Environmental water
- Landfills
- Meat industry services
- Potable water for councils
- Sample Integrity
- Swimming pools
- Biological fluids
- Ceramicware and metal food containers
- Food and Dairy Products
- Legionella
- Metals
- Potable water for small communities
- Sewage and effluent
- Trade waste

The company has its origin as part of the Hutt City Council Laboratory and became a private enterprise in 1994. We grew through natural growth as well as the acquisition of local laboratories until in December 2012 we were acquired by Eurofins - the largest laboratory network in the world.

Eurofins Scientific is an international life sciences company which provides a unique range of analytical testing services to clients across multiple industries. The Group is the world leader in food and pharmaceutical products testing. It is also number one in the world in the field of environmental laboratory services, and one of the global market leaders in agroscience, genomics, pharmaceutical discovery and central laboratory services.

We are based in a purpose built facility of 1450 m^2 at 85 Port Road, Lower Hutt. Eurofins ELS is comprised of four separate laboratory areas – Instrumental Chemistry, General Chemistry, Biological Fluids, and Microbiology. The latter is further split into three separate rooms with clean, cleaner and ultra clean capabilities. The ultra clean lab is used for pathogenic bacteria determinations.

In mid-2016 Eurofins-ELS opened satellite laboratories in Auckland and Christchurch. These laboratories offer full scope testing and sampling services.

Who should read this brochure?

This brochure has been prepared for everybody who collects samples for laboratory analysis. Recent changes to laboratory accreditation rules mean that we now know the uncertainty associated with each analytical test. Through this process we have determined that the factor contributing most uncertainty, is sampling.

Eurofins-ELS is dedicated to providing the most accurate result possible for our clients and this process begins with assisting our clients to collect samples. This brochure explains the bottles and preservatives used, as well as some suggested sampling procedures.

A Summary of the Sampling Process

Bottles
Before laboratories adopted the ISO17025 standard we would typically send 1 bottle type and subsample back at the lab. We got away with this by stating on our reports that the sample was analysed "as received". The new standard requires good laboratories to take more responsibility for the samples they analyse.

Eurofins-ELS takes this obligation seriously so we work with our clients to ensure the integrity of the samples from the time they are taken right through to the numbers on our reports.

Now we usually send more than one bottle type with each sampling kit – sometimes as many as 10 different bottles per sample! The bottle labels are all colour-coded to make sampling easier. Each bottle corresponds to a particular preservative type and ensures the parameters under examination remain as constant as possible.

Please have a look at pages 6 - 7 for more detail on the bottle types we provide.

Sampling
The objective of sampling is to collect a portion of material small enough in volume to be transported conveniently and handled in the laboratory while still accurately representing the material being sampled.

Sampling is an often underestimated but very crucial step in the analytical process. Many things can go wrong before the sample reaches a laboratory so we offer assistance to minimise risk associated with:

- Inappropriate sample types and locations
- Incorrect sampling technique
- Sample contamination
- Incorrect labelling
- Sample homogeneity
- Delivery timeframes

Please look at pages 8 – 13 for detailed sampling guidelines.

Delivery to the Lab
Delivery instructions are detailed on pages 14 - 15 and our delivery address can be found on the back page. Please remember to call us if you have any difficulties or need some further clarification.

Bottle Types

Eurofins-ELS delivers a range of bottle types featuring different labels to our clients based on the sampling technique and preservatives required for each analysis.

Unpreserved bottle – Purple border

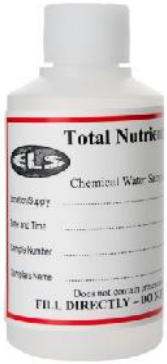
Used for all water types and effluents

This bottle is used for 'shorts', such as BOD, suspended solids, pH, conductivity, turbidity, and alkalinity species.

150mL Brown Glass Bottle - Brown border

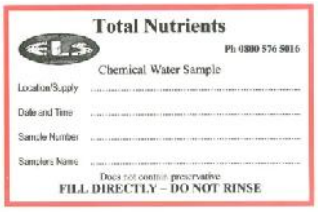
Used for all water types

Used for all forms of carbon analyses including Total Organic Carbon, Dissolved Organic Carbon, Non-Purgeable Organic Carbon, and Purgeable Organic Carbon. Please fill the bottle carefully so that air is not introduced. Refrigerate before delivery.



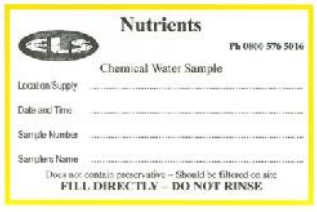
100mL Total Nutrients bottle – Red border

Used for all water types and effluents



Total Phosphorus and Total Nitrogen are sampled in this bottle. It is recommended that the bottle be filled <u>almost</u> to the top, frozen then delivered. Alternatively the sample can be delivered to ELS within one hour of sample collection.

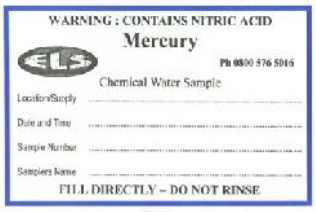
100ml Dissolved Nutrients Tube – Yellow border



Used for all water types and effluents

Use this bottle for dissolved nutrients such as DRP, Nitrate-Nitrite Nitrogen, and ammonia. It is recommended that the sample be filtered on-site, the bottle filled to the shoulder, then frozen. Alternatively the sample can be delivered within one hour of sample collection.

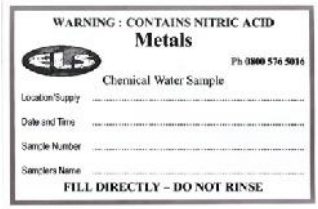
250mL Glass Mercury – Blue border



Used for all water types and effluents

This specially cleaned and preserved bottle is used specifically for the collection of mercury samples. It contains nitric acid and should be filled without overflowing. Once sampled it does not require refrigeration.

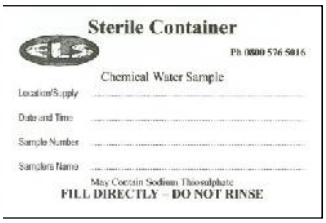
50mL Tube– Silver border



Used for all water types and effluents

This bottle is for the collection of metals samples and contains nitric acid. It should not be overfilled. It is also used to collect potable water for aggressiveness.

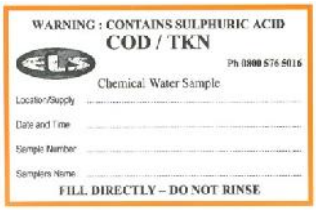
Sterile bottle – various sizes, no border



Used for all water types effluents, and solids

Can be used for all microbiological analyses such as E.coli or Enterococci. The bottle contains sodium thiosulphate for potable water samples.

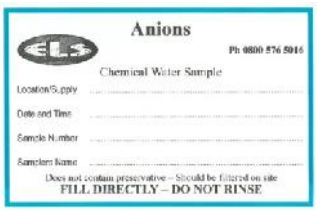
100mL COD/TKN bottle – Orange border



Used for non-potable waters effluents

This bottle contains sulphuric acid and should be filled without overflowing.

100mL Anions Tube – Aqua border



Used for all water types and effluents

Sulphate, Fluoride, Chloride, and other anions are collected in this bottle. It is recommended that the sample be filtered on-site wherever possible.

Sampling Techniques

The bottles detailed above can be used to collect any type of sample, however the collection of samples is varied. The details below are designed to assist samplers in the collection of these sample types.

It is important to take care when filling sample bottles. NEVER RINSE SAMPLE BOTTLES. Some sample bottles contain a preservative - as stated on the bottle. These bottles should not be over-filled and special care taken not to touch the opening of the bottle or the inside of the lid. Bottles containing preservative are usually smaller and are for specialist analyses. Bottles that do not contain preservative are usually larger and can be filled to overflowing.

Potable Water

Wherever possible a tap must be cleaned and then flushed for at least two minutes. This ensures that the water we are testing is from the source and not from a stagnant part of the pipe. After flushing please fill the bottles without overflowing, as many contain special preservatives that must stay in the sample.

For bacterial analysis

Select a tap that is supplying water directly from the main. Open tap fully and allow water to run to waste for 2 – 3 minutes. Reduce flow to permit filling bottle without splashing, do not overflow.

- Use a dedicated cold water tap.
- Take care when opening and closing the bottle and make sure that no contamination enters bottle. Don't touch the rim of the bottle with your fingers or any other object.
- Make a note of the time and date of sampling on the bottle label and store the bottle in the fridge until delivery to the laboratory.

The sample must be analysed by Eurofins-ELS within 24 hours of sampling to ensure accurate test results. We require that potable water samples be delivered at below 10°C so the samples may need to be in a chilly-bin along with some ice packs.

For chemistry analysis

Collect any chemistry samples after the microbiological sample to avoid contamination. Samples should be collected in the appropriate bottles for each test following the instructions on the label.

Potable Water Aggressiveness Sampling
To determine whether a water supply is aggressive under the drinking water standards two samples are collected and analysed for lead by ICP-MS. It is important to use the correct bottles and to follow this procedure closely.

The Flushed sample – usually collected in the evening

- Select a cold water tap that is made of brass, inside a building, and representative of the distribution being tested.
- Flush for 2 to 3 minutes, or long enough to flush the standing volume.
- Fill a 125mL Nalgene sample bottle that contains acid as a preservative.
- Allow the tap to stand untouched for at least 12 hours.

The Unflushed sample – usually collected the next morning

- Collect the portion of water that has been sitting inside the tap by filling a 125mL Nalgene bottle without flushing or overfilling the bottle.

It is the ratio between the lead content in the two samples that determines whether the water supply is aggressive.

Environmental and Receiving Waters
Many water bodies (rivers, streams, ditches etc) are shallow and well mixed and surface (0-1m) water sampling is all that is required. For this purpose, immersion of a sample bottle by hand to just below the surface (typically 0.25-0.5m) is satisfactory. Ideally the sampler should be wearing a plastic disposable glove and be standing downstream of where the sample is being collected. Always sample upstream of any other action in the water that may result in stirring up sediment (eg. ducks, cows crossing or drinking, other monitoring work). If the sample is being collected from a boat (eg. lakes, wetlands, ocean waters), the boat should be facing into the ongoing current and the sample collected from the front of the boat. This minimises contamination from the boat itself. To keep some distance between the sampling point and the boat it is acceptable to use a bucket attached to a rope to obtain the sample to fill the bottle. The bucket should be cleaned before use and stored appropriately between uses.

Algae Sampling
Algae are sampled into bottles containing iodine as a preservative.

- When sampling rivers or streams collect samples from flowing water upstream from where you are standing. Sample by holding a bottle facing upstream and then tipping the contents into the iodine preserved bottle. Do not spill the iodine from the sample bottle.
- When sampling ponds or still water the most algae will be found in the top 30cm of the water column. Sampling by scooping a bottle through the water and then tipping the contents into the iodine preserved bottle. Do not spill the iodine from the sample bottle.
- Put the bottles into a chilly bin containing ice for delivery to the lab.

Ground Water Samples

Groundwater occurs in aquifers at various depths below the ground. Recharge may be by direct infiltration of rainfall, by seepage from rivers or other bodies of surface water, or by transfer from one aquifer to another. The area of recharge may be at the sampling site or many hundreds of kilometres away. The water may have been in the aquifer for days or millions of years.

The quality of groundwater can vary from almost pure to extremely concentrated brines. Its quality depends on the geology of the aquifer and can be subject to contamination from substances that come into contact with the ground. Fertilisers, pesticides, petroleum products, landfills, mining, household and farm and industrial wastes all contaminate groundwaters to varying degrees, often much more than surface waters.

Monitoring of the quality of groundwaters involves techniques different from those used for surface water quality investigations because groundwater, by its very nature, cannot be sampled without some disturbance from the construction of a bore or other access hole and the effects of sampling devices and procedures.

Sampling staff must take extreme care to ensure that samples are representative of the water in the aquifer. To retrieve a representative sample the following principles should be considered:

- The sampling equipment should not change the water quality in any way and particular effort should be made to avoid cross-contamination between bores and sampling equipment.
- Sufficient water should be removed to ensure the sample is newly derived from the aquifer itself rather than from water that has sat in the bore.

The aim of sampling water from a well is to obtain a sample representative of the water in the aquifer outside the well. All wells should be purged for a period of time before sampling to flush out non-representative water from the well and any connected pumping system. Stagnant water in the well may give results unrepresentative of conditions in the aquifer, because physical parameters such as temperature and contact with well construction materials may differ from those conditions in the aquifer. These physical differences are likely to cause changes in the chemical composition of the water standing in the well. Also note that some parameters will unavoidably change through contact with air. Iron is particularly affected, and often a clear sample can turn brown within a few minutes.

A commonly used guide for determining the amount of water that should be purged from a well is that at least 3 times the volume of water sitting in the well casing must be flushed from the system. This volume is known as the ‘standing volume’ which can be calculated as: π x r2 x depth x 3 where π is equal to 3.142, r is the radius of the well head (equal to half the diameter) and depth is the total well depth minus the depth of water level (established using a dip-probe).

Trade Waste
Trade Wastes can contain particularly toxic and dangerous compounds so it is important that Health and Safety procedures are followed at all times.

Eurofins-ELS has identified the sampling technique as the major contributor to inaccuracy in expected results, so we have developed several sampling techniques that minimises the risk associated with this part of the process.

- Three grab samples of the discharge shall be taken at intervals of not less than 1 minute or more than 5 minutes. These are combined using equal volumes of all three samples to obtain an instantaneous sample.
- A four-hour average sample is prepared by taking not less than 12 grab samples over a continuous four-hour period. The intervals between the samples must not be less than 5 minutes nor more than 30 minutes. The samples shall be mixed using equal volumes of all samples to obtain the four hour average sample.
- A twenty-four hour flow proportionate sample is obtained from no less than 18 grab samples over a continuous twenty-four hour period.

We recommend a combination of manual and autosampler techniques to collect representative samples in order to meet client and council specifications. Our specialist operators are able to achieve such tasks as pre-programming the autosamplers to collect samples on a particular day on a time or flow basis.

Compliance Samples
Samples that are collected for the purpose of compliance against environmental standards usually require rigorous attention to the details contained in this brochure. Correct bottles and a chain of custody should be used at all times.

A typical compliance sample kit may consist of the following:

- Unpreserved Bottle for pH and suspended solids
- COD/TKN bottle for either or both of these tests
- Sterile bottle to check for microbial contamination
- Total Nutrients bottle to check for phosphorus and nitrogen contamination

The types of samples you will be most likely to collect will include grab samples or samples collected by automatic-sampler. If you require samples to be collected over an extended time frame please consider an on-site automatic sampler. Further details are shown in the Trade Waste section on page 10. Eurofins-ELS can advise you what tests are best to achieve the desired outcome, however if you know the tests you require please refer to the bottle type section to determine which bottle should be used for that test.

Cooling Towers and other Legionella Samples

Safety Precautions

A facemask and other protective clothing as required are to be worn when collecting water samples from cooling towers. The condition of the tower should be recorded to include the presence of biological growths and sludge.

Sample Collection from Cooling Towers

- Obtain water samples from incoming supply to tower from the header tank or the ball valve in the tower.
- Collect samples in 100mL sterile containers from pond water furthest away from the make up and from the water return line of the circulation system to the tower. If this is not practical, take samples from cooling tower pond. Sludge and biofilm material can also be analysed.
- Samples that cannot be processed immediately should be kept in a refrigerator for not more than 24 hours.

Collection of Samples from Water Services within Buildings

- Collect samples from cisterns, calorifiers, hot water cylinders, and showers in 100mL sterile containers. Samples should be collected before and after outlets are flushed and from the distal point of each service.
- The external surface and rim of the outlet being sampled should be clean and free of deposits.

Samples from Shower Heads, etc.

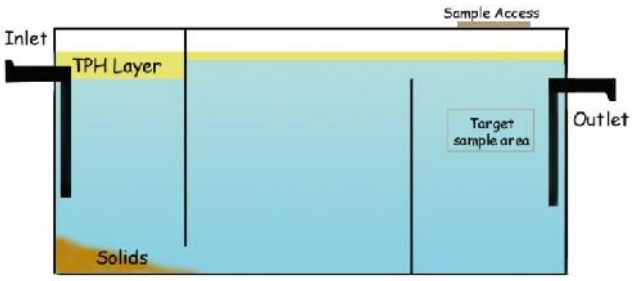
- Remove showerhead etc from the fixture and allow water to drip out.
- Moisten a sterile swab with water and thoroughly swab the inside of the pipe, showerhead etc.
- Break the swab aseptically into a 100mL sterile bottle containing not more than 10mL of water.
- If you wish to measure the effect of your treatment then collect before and after samples from each source.

Samples from chlorinated sources must be free of chlorine, achieved by adding sodium thiosulphate to the container.

Soil, Sludge, and Solid Materials

Due to its non-homogenous nature, solid material can be very difficult to sample. It is recommended that many sub-samples be collected from the sample site using a grid pattern, then combined into one sample for delivery to the laboratory. Most solid samples can be delivered to the laboratory inside a strong plastic bag.

Interceptors
The sample point for multi-stage interceptor will always be the last chamber where the outlet flows from. Samples should be collected from mid-depth to avoid collecting any sediment or floating material.



3 Chamber Interceptor Layout

Swimming Pools
Where possible, collect samples in the area of, and during the time of maximum bather density. Bather numbers are also noted to assist in subsequent interpretation of laboratory results.

Microbiology Samples
Carefully remove the bottle lid and hold bottle near its base. At a pool depth of about a metre swiftly sweep bottle through water 20cm below the surface. Make sure that the dechlorinating agent is not washed out, and leave a mixing gap.

Chemistry Samples
Please fill an unpreserved bottle by swiftly sweeping the bottle through water 20cm below the surface.

Effluent
Treated effluent requires testing to ensure compliance with Consent criteria. Many different consent conditions exist within New Zealand, and Eurofins-ELS has become proficient at working with many of them. Most require the following sampling techniques:

24-hour composite samples
A 24-hour composite sample should be collected for all chemistry analyses so that each day is analysed discreetly. Results from each day can then be used for reporting continuous monitoring criteria.

The autosampler should be set to collect samples at sensible intervals to ensure sufficient volume is collected to represent the daily flow. Planning is required so that any heavy rainfall event is sampled without overflowing the collection vessel.

Grab Samples
Grab samples are useful to record a snapshot of the effluent quality, and can be used when an unusual event occurs at the plant. All microbiological samples should be collected as grab samples because conditions in the autosampler are not appropriate for this test-type.

Sample Preservatives, Filtration, Delivery, and Storage

Sample Preservatives

Eurofins-ELS uses various preservation techniques to ensure the integrity of the test. Where acids are used the sampler must takes precautions to avoid injury to hands and eyes.

Sulphuric and Hydrochloric Acid
Acid is added in small quantities in order to stop the microbial action that could remove the analyte we are looking for. The amount is small and the acid is dilute, but can still cause injury to your hands and eyes.

Sodium Hydroxide
This is used in the cyanide bottles to make the sample alkaline so that cyanide is not released. The amount of used is small but can still cause injury to your hands and eyes.

Sodium Thiosulphate
This chemical neutralises the chlorine in potable water and swimming pool microbiology samples. This ensures that sterilising effect of the chlorine does not continue during the trip to the laboratory.

Chilling
Chilling a sample greatly reduces the microbial activity and is recommended for all samples taking longer than an hour to reach the laboratory. The recommended temperature is 10°C, and we have procedures in place to record the sample temperature for chilly bins arriving at the laboratory.

Freezing
Freezing is a very effective way of preserving low-level nutrient samples as it almost completely stops microbial activity. This is the method recommended for the preservation of bore water and clean surface water samples.

Others
Some other specialised preservatives are used for tests such as Dissolved Oxygen and sulphide. These test bottles are delivered with detailed instructions.

Filtration of samples

Where long transit times will be encountered on-site filtration is strongly recommended for all nutrient, anion, and metals samples. Eurofins-ELS recommends the use of large syringes of 50-100mL capacity and 0.45 micron cellulose filters. We regularly perform validations on our filters of choice and will recommend only those filters that pass our criteria. Eurofins-ELS is, however, happy to filter the samples when they are received as long as our client recognises the implications.

Anions and Metals

A high turbidity level in samples is not desirable for anion and metals determinations. Any sample that is turbid (>1 NTU) must be filtered through a 0.45µm cellulose filter prior to analysis, and preferably on-site during the sampling process. Samples of 1 NTU appear cloudy to the naked eye, so if a sample appears clear then it does not require filtration.

Removal of particulate by filtration is further recommended on-site so that it cannot dissolve in transit leading to elevated results.

Nutrients

All Dissolved Reactive Phosphorus, NNN, and low-level ammonia samples require filtration.

Delivery to the Lab

In order to assure the samples are delivered in the appropriate manner, Eurofins-ELS recommends the following procedure is followed wherever possible. If these procedures cannot be met, then the test may not IANZ endorsed.

All samples should be delivered to the laboratory as soon as possible and within 24 hours. Microbiological activity continues even at 10°C so the sooner we receive samples the better. We can provide temperature data-loggers to check delivery conditions if required, and use pilot samples as a delivery temperature check. Please ask us for instructions.

A chain of custody should be included with all deliveries so that we can check the sampling time and sample details. Sample receipt is acknowledged and the details included on the Chain of Custody will be used to prepare your report.

Eurofins-ELS operates 365 days a year and accepts samples from Monday to Saturday. If you send samples on a Friday you will require a Saturday delivery sticker.

Storage at Eurofins-ELS

Once samples have been analysed at Eurofins-ELS, we retain them for a period afterwards. This allows time for you to query a result and for our analysts to perform a repeat analysis if required. Sometimes a simple visual check of the sample can assist with troubleshooting an unusual result.

Eurofins-ELS has two large purpose-built walk-in fridges, and a walk-in freezer just for this purpose. Please remember however, that some tests such as BOD and pH cannot be analysed outside very tight timeframes.

Contact Details

Please feel free to contact us by any one of the methods shown below.

Main Lines

Wellington	Main Telephone	(04) 576-5016
Christchurch	Main Telephone	(03) 343-5227
Auckland	Main Telephone	(09) 579-2669

Direct Lines

	Accounts	(04) 568-1205
Rob Deacon	General Manager	(04) 568-1203
Sunita Raju	Microbiology Lab Manager	(04) 568-1206
Tracy Morrison	Chemistry Lab Manager	(04) 568-1200
Sharon van Soest	Chemistry Lab Manager	(04) 568-1200
Deb Bottrill	Sample Logistics Manager	(04) 576-5016
Dan Westlake	Christchurch Lab Manager	021-242-2742
Ralph Veneracion	Auckland Lab Manager	021-242-2711

Email can be directed to staff using "first name last name"@eurofins.com

Courier

Wellington: 85 Port Road, Seaview, Lower Hutt, New Zealand 5010

Auckland: 35 O'Rorke Road, Penrose, Auckland 1061

Christchurch: 43 Detroit Drive, Rolleston 7675

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P.O. Box 36-105, Wellington Mail Centre, Petone, New Zealand 5045.

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IANZ Accreditation Numbers:
Biological 639, Drinking Water 787,
Chemistry 414, RLP 1140