



Environmental Laboratory Services

Testing the Waters



Sewage and Effluent

## Table of Contents

Introduction	Page 4
Who should read this brochure?	Page 3
How effluent treatment plants work	Page 4
Effluent Treatment Plants	Page 4
Influent Characterisation	Page 5
Air Quality	Page 5
Process Control	Page 6
Biofilters	Page 6
Sludge	Page 7
Landfill Disposal	Page 7
Final Effluent	Page 8
Land Disposal	Page 8
CBOD or BOD?	Page 8
Data reporting	Page 9
Receiving Waters	Page 10
Marine and River Water	Page 10
Shellfish	Page 10
How to Arrange Everything	Page 7
Cost of Analysis	Page 7
Contact Us	Page 8

## Introduction

Environmental Laboratory Services 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. In 1998 the laboratory acquired the Wellington City Council Laboratory. In September 2001, ELS further expanded with the purchase of the Inorganic Chemistry section of AgriQuality New Zealand. This section was previously part of ESR, which before that was the DSIR.

We are based in a purpose built facility of 1450 m<sup>2</sup> at 85 Port Road, Lower Hutt. 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.

ELS is privately owned by scientific people committed to the science industry in New Zealand. We continue to be one of the few major laboratories in the country with such a broad microbiological and chemical analysis capability. We provide high quality, fast turnaround analyses at competitive prices.

## Who should read this brochure?

This brochure has been prepared for all effluent treatment plant operators and owners, and is designed to provide information on the testing capability that ELS possesses.

Because all consents are different, we have developed a wide range of test types to cover them. This ranges from the characterisation of influent, through your process to the final effluent quality, and also includes sludge and air quality tests.

## How effluent treatment plants work

Sewage treatment processes are essentially the same all around the world. The system relies heavily on bacteria to process the solids and liquid portions of the waste. The process outlined below shows all areas where ELS can perform analyses to assist your operation.



## Effluent Treatment Plants

### Influent Characterisation

Part of the testing service offered is our influent characterisation analyses. These analyses are performed on a regular basis to gauge the overall strength of the effluent throughout the catchment.

Any long term effluent quality changes through industry or population increase can dramatically affect the operation of the treatment plant servicing the council. Comprehensive monitoring programs should be in place to allow for council planning.

There are three recognised sources of effluent within a typical council catchment

#### Domestic Waste

The majority of domestic waste is potable water and can be described as a high volume / low load. It is important to note however, that while each test value may be low; the annual loading may be high due to the volume of potable water received at the plant.

#### Trade Waste

By far the largest unknown in the catchment area, a Trade Waste network conveys effluent of low volume / high load. Most local councils sample the premises of each trade waste customer.

The trade waste network is open to abuse from many sources, either knowingly or not. ELS has a specific Trade Waste brochure detailing the tests we perform. Please ask us for a copy.

#### Stormwater Infiltration

Under heavy rainfall conditions an effluent treatment plant receives large volumes of very dilute effluent.

### Air Quality

ELS offers a microbiological air quality service and can also analyse for specific gasses in the environment around the plant. We operate sampling equipment for both indoor and outdoor air quality monitoring and have dedicated sampling systems, which can be placed at your site if required.

These tests we routinely monitor include:

- Sulphur based discharges such as SO<sub>2</sub> and Total Reduced Sulphur
- Faecal coliforms

Please ask for a copy of our air-monitoring brochure

### Process control

ELS offers assistance to treatment plant operators by analysing process samples for a range of different parameters. This may be

- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Dissolved Oxygen
- Metals
- Nitrate
- Nutrients to check the efficiency of a nutrient removal plant
- Oil and Grease to check for saponification
- Sludge Volume Index
- Suspended solids
- Volatile Solids

Most of the larger plants have on-site laboratories capable of determining a small range of necessary tests. Recent developments in rapid chemistry tests allow the operator to accurately determine a range of tests using portable units.

It is still important however for the operator to check the performance of these kits against other labs so that ongoing accuracy is ensured. The process of achieving this is through Interlaboratory Comparison Programs (ILCP), which are offered by several companies in New Zealand.

On-line meters should also be carefully checked, carefully maintained, and where possible, routinely calibrated against known controls.

### Biofilters

Biofilters are organic odour reduction beds, but require maintenance to perform at their best. This usually requires regular addition of water and nutrients.

The modern biofilter will operate for extended periods with minimal monitoring. However to maintain maximum efficiency, moisture levels must be maintained at higher than 60% and temperature in the 20 - 35°C range. Control of pH is less critical but should be within the range 4 - 8. The filter bed should be maintained in an aerobic condition.

ELS understands the needs of biofilters and regularly tests the various parameters required for their successful operation.

Due to the strong odours that often accompany biofilter samples, ELS has constructed a separate area ventilated by a fume cabinet fan, just for drying and digesting such samples. When we built this, we made sure it was well away from the laboratories and lunchroom!

## Sludge

The Ministry for the Environment has stated that by *"December 2007, more than 95 percent of sewage sludge currently disposed to landfill will be composted, beneficially used or appropriately treated to minimise the production of methane and leachate"*

This places a great deal of pressure on New Zealand government, industry, and council to find alternative uses for effluent sludge. Most opinions lie in the direction of compost, however this option conflicts with Iwi custom.

One thing is certain – there will need to be a lot of analytical tests performed to assure the end user that the sludge is safe. These are tests that ELS can either perform directly, or arrange, and they include:

- Arsenic
- Chromium
- Cryptosporidium
- Faecal coliforms
- Helminth ova
- Lead
- Nickel
- Organo-Chlorine Pesticides
- Phosphorus
- Salmonella
- Cadmium
- Copper
- Enteric viruses
- Giardia
- Iron
- Mercury
- Nitrogen
- pH
- Potassium
- Zinc

Of the tests listed, we have already identified that zinc may become a major issue, as it regularly appears in high levels. Its source is not fully known.

## Landfill Disposal

Until the MfE requirements are met, landfill disposal will remain a reality in New Zealand. As a country we are still not ready to recycle all the sludge produced.

Until this time, the landfill operators will require sludge to be monitored for parameters to ensure the effect on the landfill environment is minimised.

A common test procedure to achieve this is by performing metals analyses after a Toxicity Characteristic Leaching Procedure (TCLP) extraction.

This technique reports metal levels that are likely to wash out of the sludge into the landfill under normal environmental conditions.

We detail this procedure further in our metals brochure. Please ask us for a copy.

## Final Effluent

Final effluent quality is thoroughly tested to ensure compliance with consent criteria. Many different consent conditions exist within New Zealand, and ELS has become proficient at working with many of them.

Our service includes all the many tests required for complete compliance to all the consents we have worked with. This includes a thorough knowledge of aspects not immediately obvious to inexperienced laboratory personnel.

This includes sampling which we have learned plays a major role in affecting the results we report. Our experience allows us to offer advice on how to minimise the impact of sampling changes on your results.

Final Effluent discharge consents require the collection of data over long timeframes, so it is very important to understand the sampling needs in order to minimise variation in reporting.

Please ask us for a copy of our Sample Integrity brochure, which further details the process.

## Land Disposal

In some areas of New Zealand, land disposal remains the only alternative to effluent discharge.

This is achieved by spraying effluent over pasture, or more recently by trickling the effluent through underground pipes beneath the root zone.

ELS offers a nutrients analyses service to monitor the effect of the discharge on ground and surface waterways.

## CBOD or Total BOD?

Some confusion still exists around New Zealand about the difference between a Carbonaceous BOD, a Total BOD (also known as BOD<sub>5</sub>), and the appropriate use of each test.

Total BOD consists of the oxygen demand attributed to both nitrogen and carbon based nutrients in a given sample of effluent. The official BOD method that ELS follows (APHA Method 5210 B), states that where the effluent contains a lot of ammonia, this may be removed from the test by the addition of a nitrification inhibitor. When the laboratory follows this procedure it must be stated on their report, so that there is no confusion as to what test was performed.

Meat works and non-nitrogen removing effluent plants should be monitored using the Carbonaceous BOD test (C-BOD). The reason for this is because

ammonia takes a lot of oxygen to break down and therefore Total BOD results can be much higher than expected.

Most resource consents will stipulate that a BOD<sub>5</sub> is performed and under this requirement it is quite usual to perform a C-BOD on effluent with high ammonia content. However, if the consent details a maximum allowable value for BOD<sub>5</sub> then this will not be an appropriate value for the carbonaceous portion.

In these circumstances the Resource Consent criteria for C-BOD should be established independently of the Total BOD results. It is usual for a C-BOD consent limit to be lower than one set for Total BOD.

### Data Reporting

Often our work requires us to present our data in very specific formats. This includes spreadsheet or csv formats designed to integrate with our customers own systems. Automation of this process allows for simplification and minimisation of transcription errors.

Running Effluent Geomean													
SampleDate	Suspended Solids q/m3	BOD5 - Total q/m3	Geomean SS		Geomean BOD		SS & BOD Count	SS that exceed 75 g/m3	Compliance %	BOD that exceed 75 g/m3	Compliance %		
Consent Criteria	<b>30</b>	<b>30</b>											
7-Apr-03	12	10	13.3	Complies	5.3	Complies	90	3	97	Complies	1	99	Complies
8-Apr-03	10	3	13.2	Complies	5.2	Complies	90	3	97	Complies	1	99	Complies
9-Apr-03	6	2	13.2	Complies	5.2	Complies	90	3	97	Complies	1	99	Complies
10-Apr-03	6	2	13.2	Complies	5.2	Complies	90	3	97	Complies	1	99	Complies
11-Apr-03	2	1	13.1	Complies	5.1	Complies	90	3	97	Complies	1	99	Complies
12-Apr-03	5	1	13.0	Complies	5.0	Complies	90	3	97	Complies	1	99	Complies
13-Apr-03	1	1	12.6	Complies	4.9	Complies	90	3	97	Complies	1	99	Complies
14-Apr-03	3	1	12.5	Complies	4.9	Complies	90	3	97	Complies	1	99	Complies
15-Apr-03	4	1	12.4	Complies	4.8	Complies	90	3	97	Complies	1	99	Complies
16-Apr-03	5	2	12.4	Complies	4.7	Complies	90	3	97	Complies	1	99	Complies
17-Apr-03	1	1	12.2	Complies	4.7	Complies	90	3	97	Complies	1	99	Complies
18-Apr-03	17	2	12.5	Complies	4.7	Complies	90	3	97	Complies	1	99	Complies
19-Apr-03	4	1	12.4	Complies	4.7	Complies	90	3	97	Complies	1	99	Complies
20-Apr-03	7	2	12.4	Complies	4.6	Complies	90	3	97	Complies	1	99	Complies

Spreadsheets such as the one shown, are used on a daily basis to ensure compliance to a range of consent conditions including:

- Geometric mean of 90 consecutive values
- Compliance against rolling month values
- Individual maximum allowable values

## Receiving Waters

Did you know that 1.5 Billion litres of sewage are treated and discharged into the New Zealand environment every day!

And yet, the perception many of us have that our coasts and freshwaters are some of the cleanest in the world is still well founded. New Zealand doesn't have the severity of problems facing nations such as the United Kingdom or the US, even with this volume of discharge occurring each day.

But we do have some problems.

- Some of our stormwater and sewerage systems are approaching 100 years old. Combined sewerage and stormwater pipes can sometimes pump untreated human effluent into lakes, rivers, and the sea, especially in urban areas.
- Stormwater collects waste from streets, lawns, and parks and deposits it in waterways. This run-off often contains animal waste. Run-off from farmland collects waste from farm animals, which also ends up in rivers and finally in the sea or lakes.
- Effluent treatment plants pump varying degrees of treated wastewater into our environment in large volumes.

### Marine and River Water

There are a number of disease-causing pathogens that once discharged into the marine and freshwater ecosystems can survive for some time. Every time we come into contact with waters that have been contaminated with human and animal faeces, we expose ourselves to these bugs and risk getting sick.

Environmental Laboratory Services has extensive experience with sampling and analyses of receiving waters. We personally sample these waters around Wellington's regional coastline, and receive samples from around New Zealand.

Testing from both a freshwater and marine environment is performed as part of a regular monitoring program designed to minimise the risk associated with recreational and fishing activities.

### Shellfish

Mussels are filter feeders and are known to concentrate contaminants such as metals and viruses. Even though virus infection is specific to the species it came from, they can live long enough inside a mussel to return back to a human host.

ELS can provide a testing service to monitor the health of a receiving water environment.

## How to arrange everything

After you have read this brochure, please give us a ring to discuss your sampling needs and to arrange the delivery of bottles to you.

You will receive the bottles within a few days. Please fill them up following the instructions and then send back to ELS.

We will then analyse and send you the results.

### How to collect the samples

We will provide you with colour-coded bottles and clear instructions to make sampling easier. Each bottle corresponds to a particular preservative type and ensures the parameters under examination remain as constant as possible. Alternatively, we can collect the samples if you are nearby.

Please ask for a copy of our "Assuring Sample Integrity" brochure.

### How to return the samples to ELS

All samples should be delivered to the laboratory as soon as possible but within 24 hours. Microbiological activity continues even at 4°C so the sooner we receive samples the better. Please follow the instructions we include.

ELS operates 365 days a year and accepts samples from Monday to Saturday. Please remember that if you send samples on a Friday your courier may require a Saturday delivery ticket.

## Cost of Analysis

ELS offers competitive prices for all microbiological and chemistry analysis required.

Please contact us for a quote.

## Contact Details

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

### TELEPHONE

Main lines to Central Services

Main Telephone	(04) 576-5016
Facsimile	(04) 576-5017
Free Phone	(0800) 576-5016

Direct Lines

Joanne	Accounts	(04) 568-1205
Rob Deacon	General Manager	(04) 568-1203
Sue Meiklen	Occupation Health	(04) 568-1207
Sunita Raju	Microbiology	(04) 568-1206
Terry Manning	Managing Director	(04) 568-1204
Tracy Morrison	Instrumental Chemistry	(04) 568-1200
Jacinta Hira	General Chemistry	(04) 568-1209

Email can be directed to staff using "first initial last name"@els.co.nz

### COURIER

85 Port Road, Seaview, Lower Hutt, New Zealand.

### MAIL

P.O. Box 36-105, Moera, Lower Hutt, New Zealand.

### EMAIL

General Information: [solutions@els.co.nz](mailto:solutions@els.co.nz)

### WEB

[www.els.co.nz](http://www.els.co.nz)



NZFSA Laboratory Approval Scheme  
Accreditation Number 905

IANZ Accreditation Numbers:  
Biological 639, Drinking Water 787,  
Chemistry 414, Dairy L1921