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# Engineering Report

## Proposed Wastewater System

**Lot 1 DP4235**
**Bay of Many Coves**
**Queen Charlotte Sound**

**for**

**John Docherty**



**Jan Dimmendaal**
Chartered Engineer
Smart Associates Ltd
15 February 2007

Project D07-2032

## Table of Contents



### *Appendices*

## 1. Introduction

1.1 John Docherty is proposing to upgrade the onsite wastewater system on his property in Bay of Many Coves, Queen Charlotte Sound.

1.2 A four-bedroom holiday home is situated not far from the eastern boundary (foreshore) of the property. The house has an east-north east aspect with relatively flat land in front and behind the building (0-5°). To the south the property slopes at 20° – 25° towards the crest of a small secondary ridge.

1.3 There is a moderately flowing stream which deviates from directly behind the house to run down 16m north of the house on a SW/NE orientation.

1.3 The existing wastewater system on the property is a primary treatment system (septic tank). Details of the land application system are not known, however the location is likely to be within 15m of the stream.

1.3 Apart from the lawn area to the north and east of the house the property is covered in regenerating native bush.

1.4 The property legal description is Lot 1 DP4235 and the land area is 0.4155ha.

## 2. Design - Wastewater Treatment and Disposal

2.1 The site investigation identified that a suitable wastewater disposal area exists on proximal slopes to the southwest and upslope of the house. Based on the soil assessment carried out, an average drainage category of 4 has been adopted.

2.2 Three test pits were dug at the site in the proposed effluent disposal area and their locations are shown on the site plan. The representative soil properties are:

**W 1**

| (m) | Horizon or Layer and boundary | Genesis | Description | | | | | | | Drainage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Colour | Field Texture | % + 2mm Fragments | Compactness | Consistency | Structure | Moisture condition | |
| 0.10 | Ah | Topsoil | Dark brown | Loamy humus | None | Very Loose | V Soft | V.Strong | Dry | 2 |
| 0.60 | B | Alluvial | Pale brown | Sandy clay | 20% | Loose | Soft | Moderate | Moist | 3 |

**W 2**

| (m) | Horizon or Layer and boundary | Genesis | Description | | | | | | | Drainage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Colour | Field Texture | % + 2mm Fragments | Compactness | Consistency | Structure | Moisture condition | |
| 0.05 | Ah | Topsoil | Dark brown | Loamy humus | None | Very Loose | V Soft | V.Strong | Dry | 2 |
| 0.20 | B | Colluvial | Med brown | Silty clay loam | 10% | Loose | Soft | Strong | Dry | 3 |
| 0.50 | C | Colluvial | Pale brown | Clay loam | 20% | Med Dense | Firm | Moderate | Moist | 4 |

**W 3**

| (m) | Horizon or Layer and boundary | Genesis | Description | | | | | | | Drainage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Colour | Field Texture | % + 2mm Fragments | Compactness | Consistency | Structure | Moisture condition | |
| 0.05 | Ah | Topsoil | Dark brown | Loamy humus | None | Very Loose | V Soft | V.Strong | Dry | 2 |
| 0.30 | B | Colluvial | Med brown | Silty clay loam | 5% | Loose | Soft | Strong | Dry | 3 |
| 0.60 | C | Colluvial | Pale brown | Clay loam | 10% | Med Dense | Firm | Moderate | Moist | 4 |

2.3 The proposed land application area is on westerly aspect slopes of 20° to 25°. The landform element is linear planar.

2.4 At the closest point the proposed land application area is approximately 20m from the stream and less than 50m from the neighbouring dwelling to the south (refer Site Plan Appendix A). An Assessment of Environmental Effects follows in section 3.

2.5 Secondary treatment and drip irrigation effluent disposal are considered the most suitable options for this property when the average slope and soil drainage characteristics are taken into account.

2.6 A secondary treatment system involves aerobic biological processing and settling or filtering of effluent received from a primary unit. The following system is considered suitable:

**Biolytix BF6 3000 PAT** treatment system coupled with a drip irrigation system. System performance details are:

BOD after 5 days (average) < 8.8 g/m$^3$
Suspended solids (average) < 5.4 g/m$^3$

A Biolytix system specification is attached (Appendix C).

Based on information provided by the system supplier the Biolytix system is the most suitable for a holiday home situation where the house is unoccupied for extended periods and as a consequence there is no flow of effluent going into the system.

The design irrigation rate for Category 4 soil is 25mm/week (i.e. 3.6mm/day).

2.7 The recommended location of the proposed irrigation disposal field is indicated on the site plan (Appendix A).

2.8 The design of the system has been based on a four bedroom dwelling with a permanent occupancy of 8 people (as per MDC Guidelines for new on-site wastewater management systems) to calculate a design flow of 1440 litres/day for the new dwelling. A minimum wastewater storage capacity of 4500 litres is required. The wastewater flow design allowance of180 litres/person/day has been used in the design of the system. This allowance is in accordance with Appendix 4.2D of AS/NZS 1547:2000 and is based on a stream water supply source for the dwelling.

2.9 The length of dripline required is 420m (refer wastewater design sheets Appendix B). The irrigation system design requires 1.6 l/hr emitters with lines laid at 1.0m spacing and following contours (when possible), at 100mm below ground level. The installation of the irrigation system is to be in accordance with the product installer guide supplied by the manufacturer.

2.10 Prior to the proposed system becoming operational the system designer must inspect and certify that the system has been installed according to the design. This certification must then be forwarded to Council.

2.11 The Marlborough District Council requires that the owner of any advanced wastewater treatment system enters into and retains a maintenance contract with the supplier of the system, or with a recognised maintenance contractor, for maintenance to be carried out at yearly intervals. Records of the maintenance should be forwarded to the Council as soon as practicable following the completion of the inspection or, in the case of remedial works being required, on completion of those remedial works.

2.12 Access from the foreshore for system maintenance is available via an existing track, which provides access to the house or over the lawn area leading up to the house from the foreshore.

## 3. Assessment of Environmental Effects: Activity - Install Effluent Disposal Field Within 30 Metres of a Stream and less than 50m from another Land Application Area

3.1 Effects

It is proposed to install a Biolytix BF6 3000 PAT secondary treatment system and drip irrigation effluent disposal system with the effluent disposal system being less than 30 metres from a stream and less than 50m from another land application system.

A possible environmental effect resulting from this proposed activity is the contamination of the stream, and ultimately the Bay of Many Coves foreshore through the vertical movement of secondary-treated effluent, that is not treated or consumed in the soil.

exponential decay rate should guard against this happening

The proposed irrigation system will be located amongst established native bush.

3.2 Mitigation Measures

*Treatment*

The treatment system proposed is a Biolytix BF6 3000 PAT secondary treatment system, both which produce a high quality effluent (refer 2.6 above), and therefore have a minimum impact on the environment.

Established vegetation on the property will assist with the breakdown of the effluent entering the soil.

Coliform numbers, the indicators used to measure the various pathogens present in sewage effluent, are initially very low in the secondary-treated effluent. These will not be a concern for it is well established that bacterial, (and viral etc), numbers are reduced exponentially with passage of effluent, whether primary-treated or secondary-treated, through mid-range textured soils.

This is evidenced by Note 1 in Table 4.2B1 of NZS 1547:2000 where it is noted that a "path length of 0.3 – 0.4 metres would be sufficient to reduce (bacterial) numbers to insignificant levels in normal soils i.e. soils that are of a mid-range texture, not too sandy or too clayey, and not saturated all the time".

We are of the opinion that the soil on the property (refer 2.2 above) falls into this mid-range soil category.

## 4. Recommendation

A Biolytix BF6 3000 PAT Secondary Treatment System combined with drip irrigation effluent land application is recommended for this site. Installation is to be in accordance with requirements and recommendations of NZS1547:2000.

## 5. Limitations

This report is valid for two years from the date of issue and covers the design of a wastewater treatment and land application system for John Docherty at Lot 1 DP4235, Bay of Many Coves, Queen Charlotte Sound. Any other areas are outside the scope of this report.

The reliance by other parties on the information or opinions in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

## 6. References

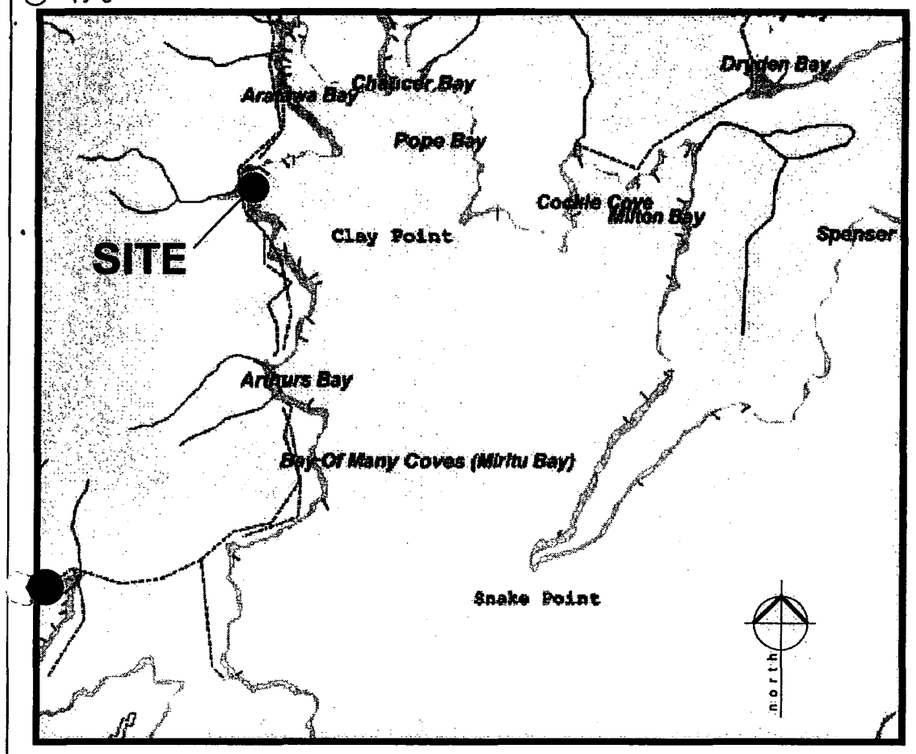
1. NZS 1547:2000 On-site Domestic Wastewater Management
2. Marlborough District Council Guidelines for New On-site Wastewater Management Systems.

**Jan Dimmendaal,** Chartered Engineer
15 February 2007

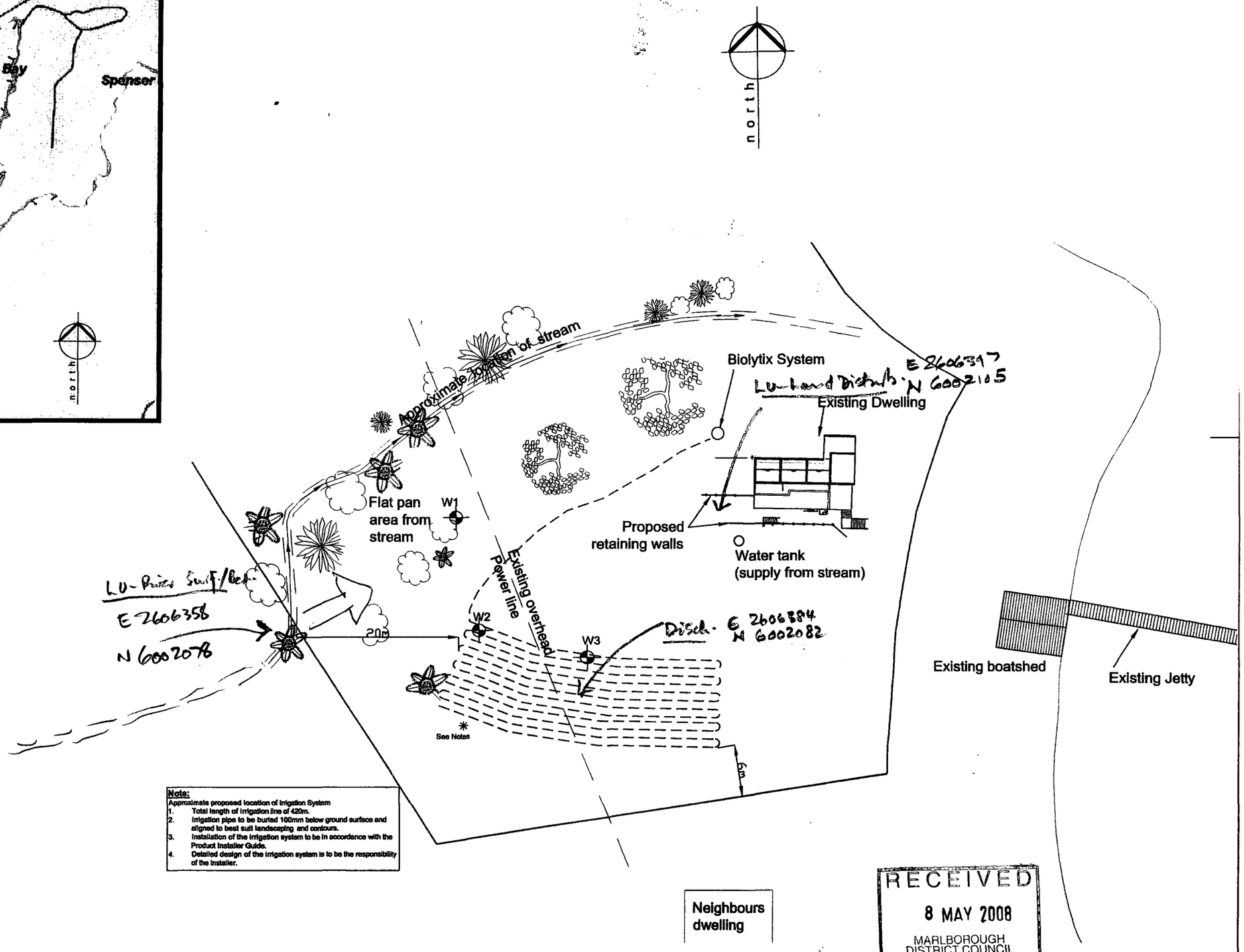
## *Appendix A*

Drawings
Site Plan; Retaining Wall Layout;
Retaining Wall Details

REVISIONS




1 LOCALITY MAP
nts




**Note:**
Approximate proposed location of Irrigation System
1. Total length of irrigation line of 420m.
2. Irrigation pipe to be buried 100mm below ground surface and aligned to best suit landscaping and contours.
3. Installation of the irrigation system to be in accordance with the Product Installer Guide.
4. Detailed design of the irrigation system is to be the responsibility of the installer.

RECEIVED
8 MAY 2008
MARLBOROUGH DISTRICT COUNCIL

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ACENZ

PROPOSED ON-SITE WASTEWATER SYSTEM
BAY OF MANY COVES, Q.C SOUND
for JOHN DOCHERTY

PROJECT No. **D07-2032**

NOTES
Do not scale from this drawing. Only figured dimensions are to be taken from this drawing. The contractor must verify all dimensions on site before commencing any ordering of materials, work or shop drawings. The contractor must report any discrepancies to the Engineer before commencing work. If this drawing exceeds the quantities taken in any way, the Engineer is to be informed before the work is started. This drawing is Copyright and must not be reproduced without the consent of Smart Associates Ltd. The Engineer is to be given at least 2 weeks notice of the beginning of construction works, and at least 48 hours notice of critical items (eg concrete pours, prefining etc). The Engineer reserves the right to alter the design in light of site circumstances including previously unforeseen design issues.

| | | | |
|---|---|---|---|
| SITE PLAN 080458 | | | DRAWING No. 001 |
| DRAWN jd | CHECKED mp | SCALE (A3) As Shown | DATE 9/02/07 |
| COMPUTER FILE: drawings\ | | | REVISION / |

# *Appendix B*

Wastewater Design Sheets

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# WASTEWATER SYSTEM DESIGN SHEET

To AS/NZS 1547:2000

**John Docherty** **File No: D07-2032**

Intended water Supply:

~~*Public Supply Rain water (roof collection)*~~ *Bore/Well/Dam*

Local experience with existing on-site systems:

Septic Tank or similar (Primary treatment):

*OK when installed properly with a correctly sized level drainage area and maintained.*

Secondary treatment:

*Produce high quality effluent suitable for irrigation. Increased loading rate can be used if trench disposal is used - less disposal area required*

Recommendation for this site: *Biolytix Secondary treatment system utilising drip irigation land application*

DRAINAGE CONTROLS:

Need for surface water collector / cut-off drains?

AVAILABILITY OR RESERVE / SETBACK AREAS

Reserve area available for extensions, % of design area: *100%*

Setback distance? (between development and disposal system): *Min. as required by Resource Management Act*

Ksat, (m/day): ESTIMATED SOIL CATEGORY: *Category 4 - Imperfectly drained loam*

## Design

RECOMMENDED D.I.R. *25* mm/week

(NOTE: Where DIR is 10mm/week or less, ETA/ETS trenches to Fig 4.5A7 NZS1547:2000 should be specified to enable the utilisation of such soils)

8 Permanent People At 180L/person/day: *1440* L/day from Appendix 4.2D AS/NZS 1547:2000

DESIGN WEEKLY FLOW: *10080* L/week

$\frac{1440}{3.6} = 400$

Septic tank size (min): *4500* (Table 4.3A1)

AREA REQUIRED: *403.2* m²

LENGTH REQUIRED: *420.3* m . **(Refer Irrigation System Calculation sheet)**

RESERVE AREA REQUIRED: *100%* of specified drainage area

**RECOMMENDATION :**

*Biolytix Secondary treatment with dripper line irrigation. Min 4500 litre capacity treatment and irrigation lines to be a minimum total length of 420m using 1.6 l/hr emitters Lines to be laid at 1.0m spacing to follow contours (when possible), at 100mm below ground level . Installation of the irrigation system to be in accordance with the product Installer Guide. Detailed design of the irrigation system is to be responsibility of the installer.*

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**Irrigation System Calculation**

Project Title: John Docherty
File Ref: D07-2032

Date: Tuesday, 13 February 2007
Operator:

| | |
|---|---|
| Acceptable daily loading rate (mm/day) | 3.6 |
| Daily influent (l/day) | 1440 |
| Emitter type | Raam 17 |
| Emitter flow rate (l/h) | 1.6 |
| Emitter Spacing (m) | 1 |
| Dripline Spacing (m) | 1 |
| Distance from Treatment system to Irrigation Field (m) | 5 |
| Field Size ($m^2$) | 400 |
| Field length assuming square area | 20 |
| Number of lines | 21 |
| Total Dripline Length (m) | 420 |
| Total flow Rate Required (l/h) | 672 |

**Pump Duty**

| | |
|---|---|
| Flow (l/h) | 672 |
| Head (m) | 12 |

| Head-Loss Table | | |
|---|---|---|
| **Item** | **Head loss (m)** | **Comments** |
| Emitter | 5 | Minimum pressure required |
| Lateral | 0 | Head loss insignificant |
| Submain | 1 | Using Netafim Raam 17 as a submain |
| Main | 0.06 | Using 25mm LDPE x main length |
| Water meter | 0 | For a 15mm Multijet Turbine Water Meter |
| Filter | 3 | For a Semi blocked filter |
| Tank Depth | 2 | |
| Elevation | 0 | |
| Sub Total | 11.06 | |
| Total | 12 | including 10% |

**NOTE:**
**This design is indicative only and detailed design is the responsibility of the installer.**

# *Appendix C*

Biolytix System Specification

## A Strong Track Record

Biolytix has spent more than $3 million to refine its patented treatment process. Many discerning clients in Australia, New Zealand, and South Africa already enjoy its benefits for households and on a larger scale for Golf Course Estates, Eco-lodges, National Parks, Five Star Hotels and housing developments.

*The Biolytix filter is the smallest system, making it easier to transport, install and hide in your garden.*

## 20-Year Performance Guarantee

## Receive A Free Report

Visit www.biolytix.com for "The 17 Vital Points You Need To Know Before Investing In A Waste Treatment System"

## A "New Inventors" Winner

Winner Winner

## Why Ian Kiernan ("Clean Up Australia") Chose Biolytix

"In 2001, when the task of selecting the sewage treatment plant for the new Lord Howe Island Museum fell to me, I looked at many options.

I chose a Biolytix™ Filter because our museum is a long way from spare parts and specialist servicing.

Its simple but smart design and promise of consistent, reliable performance, together with a guarantee of no odour, were very appealing. The system delivered... just as we were promised."

**For more information or to get a free quote:**

www.biolytix.com

**or call our Head Office:**

**1300 881 472**

## The International Award-Winning

# BIOLYTIX

# Waste Treatment Systems

***Recycle sewage, greywater, sanitary items and food scraps into a lush garden.***

By the time the waste filters through the first layer, it is cleaner than septic output. By the second layer it is cleaner than an aerated system. By the third layer, it's winning awards ....

***Global Winner of an Environmental Technology Award at the World Expo, Japan 2005.***

## How Biolytix Shines

Most of our competitors make a lot of money from frequent servicing (usually 4 times per year!), and from replacing expensive parts, such as blowers. Below are just some of the many ways Biolytix™ protects your quality of life, and your wallet....

## Global Environmental Leaders

Biolytix has the lowest greenhouse gas emissions of any waste treatment system in the world.

## COMPETITOR COMPARISON

| Biolytix Systems | Most Other Systems |
|---|---|
| ✓ Guarantee performance and parts for 20 years | ✗ Guarantee parts only for 2 yrs |
| ✓ Only need 1 service per year | ✗ 4 services per year essential |
| ✓ Power costs less than $12 p/yr | ✗ Power costs are more than $130 p/yr |
| ✓ Silent operation | ✗ Noisy and annoying blowers hum 12-20 hrs/day |
| ✓ Natural process that needs no chemicals | ✗ Rely on chlorine – so can't remove all pathogens |
| ✓ Safe for people, pets and your soil | ✗ Pathogens potentially sprayed around |
| ✓ No odour guaranteed! | ✗ Often stink after a high loading |
| ✓ Smallest tank on market | ✗ Are large and can disrupt the garden |
| ✓ Continue to treat during power failure | ✗ Stop working after power failure |
| ✓ Alarm notifies Head Office if problems | ✗ You inform service personnel of problems |
| ✓ Handles peaks and troughs in loading | ✗ Can fail after holidays or during a party |
| ✓ Loves organic loads, such as milk down sink | ✗ Food down the sink can lead to failure |
| ✓ Handles a large range of household cleaners | ✗ Must use a strict list of cleaners |
| ✓ You can shower and wash when you want | ✗ Must spread out water usage |
| ✓ Recycles kitchen waste through a sink grinder | ✗ Can't handle the extra load of sink grinder |

## HOW BIOLYTIX™ SOLVED THE WASTE TREATMENT RIDDLE

It was a humble beginning. In 1987 Dean Cameron couldn't find a waste treatment system that didn't have problems. When it comes to managing sewage he thought people shouldn't have to put up with foul smells, breakdowns and having to continually add chemicals. So he set out to invent the world's best system.

Convinced that nature had the answer, he studied such things as the decomposition of forest litter in rivers and on river edges. He discovered that the fastest decomposition was not occurring in the water, but rather on river edges.

"Historically, nearly all treatment systems leave the waste to fester in the water and expensively blow air into it",he said, "yet this is not how nature works". So Dean separated the waste from the water immediately and used selected organisms and smart engineering to convert it into structured humus. Before long he received fantastic results.

Investors, researchers and engineers quickly saw the benefits and created a dynamic team, including groups such as GHD Engineers, A Co-operative Research Centre (CRC), Spier Holdings, Queensland Uni and Murdoch Uni.

Dean's hunch turned out to be right

## Our Patent

**"To use the waste material and the structured humus it produces as a filter for cleansing wastewater."**

This cleverly turns the problem (the waste) into the solution (the humus to filter and clean the wastewater).

ecoEng LIMITED

# *Biolytix™ Filters*

www.biolytix.com

Prepared by Andrew Dakers
ecoEng Ltd
Dakers@paradise.net.nz
13 Sept 2005

## 1 Background.

The Biolytix™ filters were developed and are manufactured by the Australian company Biolytix Technologies.

The Managing Director of Biolytix Technologies is **Dean Cameron** Managing Director, based in, Maleny, Queensland

The Project Engineer is **Gary Ingram**, based in Sandy Bay, Tasmania.

Christchurch contact: Antony Willemse, ph 942 8901. Email: willemse@paradise.net.nz

The standard domestic filter is specifiedas BF6 2500 PAT. (i.e. a 2500 litre tank fitted with an effluent pump, air pump and telemetry phone alarm system. The process used in the Biolytix™ filters are similar to the biological process use in the wastewater treatment system, formerly known as **Dowmus.** The Dowmus filters that have been installed in New Zealand are essentially the "BF1" filter. Dean Cameron advises that;

> *There are about 60 Dowmus systems in the Auckland region and all are working well as primary systems - although there have been some issues with the sand filters used to bring the effluent quality up to secondary standard but the Dowmus process has proven very robust. Biolytix™ is servicing most of these units and upgrading them as required to newer bed configurations. High secondary effluent is being achieved from some prototype Biolytix™ Filters Model 5 installed in 2002*

The performance of the BF6 unit has been dramatically improved (over the BF1) *by using a deeper bed with much more retention time coupled with a fine barrier filter. To achieve this a new bed configuration was developed and internal bed support in the form of structural plastic media was developed to support the humus filter elements so that they do not compact and so reduce LTAR of the bed. Ecologically you can see that the process is very similar to the Dowmus.* (Dean Cameron, pers comm., 2005).

Gary Ingram reports (pers comm., 2005) that the new Biolyix BF6 system is different from the Dowmus unit (BF1) in that the *BF6 system has an enhanced bed design that provides strength to the filter bed (i.e. prevents bed compaction and reduction in natural aeration capacity of bed).* He notes that the BF6 system is equipped with completely re-engineered filter bed layers, pumping system, and electrics. Telemetry phone line alarm has also been added as standard components. Biolytix Technologies subjected their filters to a formal risk analysis to assist in engineering design of system and this resulted in *very low failure risks.*

Gary Ingram reports that the BF6 filter version has now been operating commercially in Australia for nearly 2 years and has been performing extremely well.

## 2 The Biolytix™ process

The BF6 unit uses an Everhard polymer tank fitted with a patented layered filter structure. The primary filtering layer consist of biologically active humus layer along with other layered media including peat. The manufacturer's describe the process as follows:

> *It cleverly turns the organic matter, which is the main problem in the first place, into the solution. The fine humus produced is then structured by soil invertebrates into a sponge-like porous filter medium. Like a rich organic top soil, earthworms and beetles continually burrow through it and keep it open, free draining and aerobic. Because it emulates the highly efficient breakdown that occurs in the surface layers of moist organic soils, our patented process generates no odour. Just as a forest floor can cope with a massive short term organic loading and break it down over time, so Biolytix Filtration can easily handle party peaks and long absences. These often cause competing processes to fail.*

For a more detailed explanation of the filter process refer to **Section 6**

## 3 Guarantee and Accreditation

The Biolytix™ units are new to New Zealand but well proven in Australia. A 20 year guarantee for the filters are available provided the system is maintained by accredited Biolytix™ service personnel.

The Biolytix Company report that:

> ***The Biolytix™ Filter, BF6 has been accredited in all Australian states (interim accreditation in Tasmania). To obtain accreditation the Biolytix Filter was independently tested to AS1546 and was proven to treat domestic wastewater up to 1,600 litres per day with 4 day peaks of 2,150 litres per day.***

Biolytix Award

Biolytix™ has been chosen in Top Five Australian Eco-Tech Companies: Biolytix™ was recently selected as one of the top five Australian Companies to be nominated by the Australian Government for the Global Eco-Tech Awards in Japan . The world winners are selected in September 2005.

## 4 Treatment Performance

The quality of the treated effluent is of a very high standard in terms of $BOD_5$ and suspended solids as presented in Table 1. Bacterial levels (F.Coliform) are not usually an issue if dispersal is by subsurface irrigation. However with respect to nutrients and coliform, the manufacturer reports:

- *Typically we were getting nutrient levels at around 8mg/L total phosphorus and 28mg/L total nitrogen*
- *Typically a 3-4 log reduction of coliforms is achieved through the Biolytix Filter bed..*

**Table 1. BF6 effluent quality**

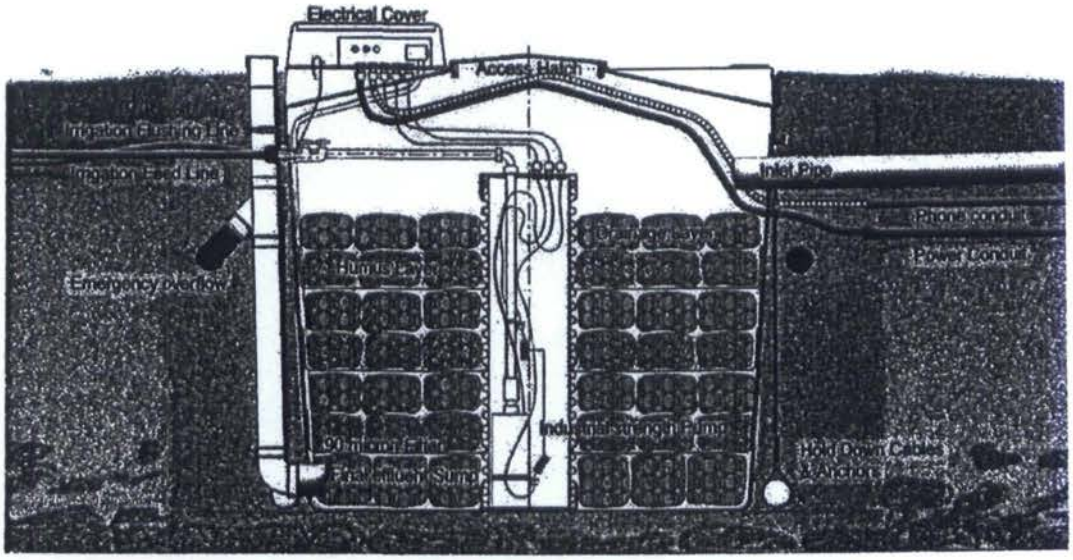
| Characteristic | Results | Maximum | Average |
|---|---|---|---|
| $BOD_5$ | 100%<20 mg/L<br>90%<11.6 mg/L | 14 mg/L | 8.8 mg/L |
| Suspended solids | All < 30 mg/L<br>90%<8.9 mg/L | 14 mg/L | 5.4 mg/L |
| Dissolved Oxygen | 100%>2.0 | Minimum 2.2 mg/L | 4.26 mg/L |

# 5 A rationale for Choosing the Biolytix™ Treatment System.

- The system is simple, easy to install and easy to manage.
- The Biolytix™ filters achieve a very high and consistent standard of treatment of the wastewater, reducing the risk of clogging of the soil infiltration zone.
- The Biolytix™ filter process has high resilience to fluctuating loads and influent quality.
- The Biolytix™ filter tanks are totally sealed units preventing inflow from stormwater. The treated wastewater is pumped directly to the subsurface irrigation area through small bore pressure pipe so there are no manholes and therefore stormwater leakage.
- A servicing contract for ongoing operation and maintenance of the system will be in place with trained and competent agents.

# 6 How The Biolytix™ Waste Treatment System Works

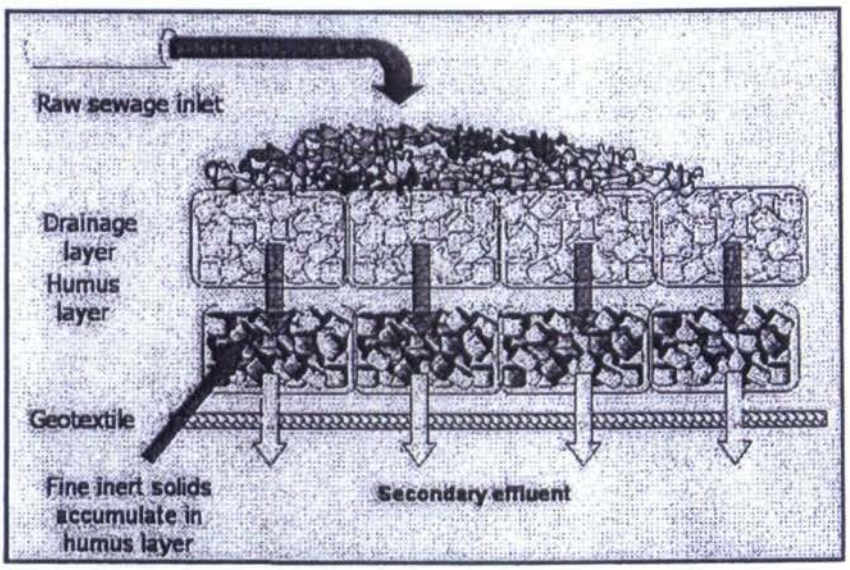
The following have been provided by Dean Cameron, Managing Director, Biolytix Technologies, Maleny, Queensland



*Cross Section of a typical Biolytix Filter – BF6*

The Biolytix™ Filter is a robust, organic soil ecosystem that converts sewage, wastewater, sanitary items and food wastes into irrigation water. All the wastes are simply fed onto the Biolytix™ Filter bed using standard plumbing. The top layer is made up of coarse mesh bags with plastic media in them. This houses the wet soil ecosystem. It accommodates worms, beetles and billions of microscopic organisms. These soil creatures are vital "macerator" organisms, breaking up the organic material, converting the waste into humus and structuring it so that its drainage and air porosity are continually renewed and maintained indefinitely. The organic matter particles then wash through and accumulate on the surface of a finely structured humus and coco-peat layer. Here it is reprocessed again and again and structured into a sponge-like filter by the soil organisms that live in it.

The fine structured compost has remarkable properties. It is 90% water by weight, yet has a high cation and anion exchange capacity. This means it adsorbs and holds back nutrients, chemical compounds and toxins for the trillions of living organisms to digest over time. (Competing treatment processes don't have this ability.) It also has powerful odour-absorbing capacity, which is why we can guarantee no odours.




*Sewage entering the top section of the Biolytix™ Filter*

After the last layer, the effluent has been well treated and a geofabric filter, about the diameter of the tank, filters out all particles larger than 90 micron. This three dimensional filter is biologically cleaned and does not need any maintenance. It protects the irrigation system from clogging up.

The water component of the wastewater finally accumulates in the sump where some more of the very fine sediment is settled out in a quiescent zone before the clear, reclaimed water can be pumped or drained to irrigation or reuse.

Each filter has an emergency storage of 1300Litres

## The Smart Biolytix Patent

**Biolytix™ has the patent to use the structured humus as the filter to cleanse the wastewater.** This cleverly turns the problem (the waste) into the solution (the filter to cleanse the wastewater).

As the technology is fully aerobic it does not require an energy-intensive aquatic or odourous septic stage. The layered, flexible modular filter elements are designed to also be installed into a conventional septic tank unit, but are equally suited to be used within any vertical cylindrical tank (normally a minimum depth of approximately 1.5m is required).

Normally the filter is constructed within a standard 2500 litre polymer tank (1.88m diameter by 1.63m high). The only mechanical components in the standard treatment unit (BF6 filter) are a single-phase industrial strength pump and a tiny but robust (5 watt) air pump.

The Biolytix™ Filter can be scaled according to the wastewater loading.