DavidsonPartnersLtd

Structural Engineering
Civil Engineering
Building Design
Project Management

Practising in association with Ayson and Partners, Consulting Surveyors

Our Ref: 24100

14 October 2008

WASTEWATER MANAGEMENT REPORT

C REEKS
438 PORT UNDERWOOD ROAD
WHATAMANGO BAY

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1 INTRODUCTION

This report describes the site and details the proposed new on-site wastewater management system to replace the existing (failed) ETS system.

Davidson Partners Ltd was engaged to assess the site and confirm appropriate wastewater system details. We have carried out a site inspection and soil assessment, reviewed other Davidson Partners Ltd designs in similar conditions, and herein recommend suitable measures for the sustainable discharge of treated domestic wastewater.

The property is located on the western side of Whatamango Bay on a steep, bush clad slope.

2 DESIGN SUMMARY

• Soil Description	Silty clay loam
• Ribbon Length	40 – 50mm
• Soil Category	4
• No. of People	10
• Water Supply	Spring
• Wastewater Flow Allowance	180 l / person / day
• Daily Load	1,800 litres
• Land Application Details	
◦ Method	Drip Irrigation
◦ DIR	3.6mm / day
◦ Area (min)	500 m²
• Pump/Chamber Details	
◦ Size (min)	2,200 litres
◦ Elevation Head	45 m (to be confirmed)
• Treatment Type	Vermiculture (Biolytix BF6)

3 INVESTIGATION

An investigation was carried out in accordance with ASNZS 1547:2000 "On-Site Domestic Wastewater Management" and the Marlborough District Council "Guidelines for New On-Site Wastewater Management Systems". Refer to the site notes in the Appendix.

The steeply sloping (30°) face is stable, clear of surface water and suitable for a wastewater land application system. The exposure to the sun and wind is high and the vegetation is well established native bush species, providing good evapotranspiration assistance.

Three test pits were excavated by spade and logged. Refer to the site notes and logs in the Appendix.

The soil profile consisted of 150mm topsoil overlying a light grey, hard, dry silty clay loam.

Ribbon length tests were undertaken on samples from the silty clay loam soil horizon. The soil had a ribbon length that varied from 40mm to 50mm. The ribbon lengths smooth and silky nature and rate of drying of the soil, indicates that the soil is a Category 4 soil.

4 DESIGN

4.1 General

Any land application system should be kept shallow to make maximum benefit of evapotranspiration and biological activity in the upper soil.

4.2 Loading

The house has 5 bedrooms and has an unreliable spring fed water supply. However, in conjunction with a roof water collection system, a wastewater allowance of 180 l / p / day is considered reasonable.

For design purposes, the design wastewater loading is therefore 10 persons at 180 l / person / day i.e. 1,800 litres / day.

4.3 Land Application System

4.3.1 Assessment of Land Application Options

We have assessed a number of potential wastewater land application options for the site taking into consideration the underlying geological, hydrogeological and wider environmental conditions. The following options were reviewed:

a) Primary Treatment to Trenches

This is the most basic system and uses the pipe work and aggregate in the trench to evenly distribute effluent onto the surface of the underlying soil which then provides further treatment before being completely assimilated.

However, we consider that the length of trenches required will be excessive / not fit within the flat area available and construction on the steep slopes will be inappropriate.

b) Primary or Secondary Treatment to Bed

This system has the advantage of reducing the area requirements. However, there is no suitable flat area available.

c) Primary Treatment to Low Pressure Effluent Distribution (LPED)

The principal of Low Pressure Distribution System (LPED) is to discharge primary effluent through a small diameter pipe nestled within a larger pipe to evenly distribute into the topsoil for evapotranspiration uptake by the vegetation covering the area.

This system is considered suitable for the site but uses more land application area than a drip irrigation field.

d) Secondary Treatment to Drip Irrigation

The principle of the drip irrigation system is irrigation into the topsoil at a low application rate for evapotranspiration uptake by the dense bush covering the area. Use of drip irrigation will require secondary treatment.

Given the steep slope and reduced area requirements, we consider this the Best Practical Option.

4.3.2 Detailed Design

The Design Irrigation Rate (DIR) for a Category 4 soil is 3.6mmm / day. For a daily flow of 1,800 l, a minimum land application area of 500 m² is required.

Final design of the drip field layout shall be carried out by the treatment supplier.

4.4 Treatment

4.4.1 Assessment of Treatment Options

Secondary treatment systems include aeration, sand / textile filters, wetlands, composting type or vermiculture.

a) Aeration Systems (AWTS)

Aeration systems do not perform well with intermittent or big variations in loading and are not recommended for this site.

b) Sand / Textile Systems

Sand and / or textile systems require a septic tank and a good on-going maintenance programme and provide high quality treatment under varying conditions. Although acceptable, they are not the preferred option.

c) Wetlands

Wetlands are an attractive passive environmental treatment system. However, flat area is required and therefore is not suited to this site.

d) Composting Toilet Systems

Composting toilet systems have traditionally only treated the black water and require diligent attendance by the home owner. They do not treat the grey water.

e) Vermiculture

The Biolytix treatment system using worms and humus takes up little space, is low maintenance and is considered the Best Practicable Option in this particular case.

4.4.2 Detailed Design of Treatment System

An "all-in" black and grey water treatment system using worms and humus, manufactured by Biolytix and has infrequent maintenance requirements (usually annually by the manufacturer). It also has practically no odours, is compact and eliminates the need for a septic tank and separate pump chamber.

It is cost effective and produces very high quality effluent (better than 12 mg / l BOD5 and 9 mg / l suspended solids). The Biolytix BF6 filter can treat up to 1,600 l / day and over 2,000 l / day for short periods. A Biolytix Technical Note No. 3 is attached in the Appendix.

5 INSTALLATION, OPERATION AND MAINTENANCE

Appropriate operation and maintenance of the overall wastewater system is paramount to its performance and a service contract must be in place at the time of commissioning and remain so with the approved service agent. Records of maintenance work should be copied to Council for inclusion on property records.

Davidson Partners Ltd has carried out a site investigation and design in accordance with current codes and modern practice. However, the treatment and land application systems are biological (living) processes and modifications may have to be undertaken to the treatment and/or land application system in some circumstances, such as when there is/are;

(a) An increase in design load
(b) Disposal of inappropriate substances to the septic system
(c) Poor maintenance
(d) Poor workmanship or departure from construction drawings.

We strongly recommend that the homeowner and installer read and note the information included in the Appendix and shown on the drawings to ensure ongoing good practice and maintenance.

Note that inspections by the Designer are required at the time of setting out of the new system and at commissioning with water prior to pipework being covered.

6 REFERENCES

Crites, R and Tchobanoglous, A (1998). 'Small and Decentralized Wastewater Management Systems'.

ARC Environment, Technical Paper No. 58, Second Edition 'On-Site Wastewater Disposal from Households and Institutions'.

A.S./N.Z.S. 1546.1:1998 'On-Site Domestic Wastewater Treatment Units, Part 1: Septic Tanks.

A.S./N.Z.S. 1547:2000 'On-Site Domestic Wastewater Management'.

MDC (11 July 2005) 'Guidelines for New On-Site Wastewater Management Systems'.

Marlborough Sounds Resource Management Plan

Centre for Environment Training 'On-Site Wastewater Management Training Course', Christchurch 2001.

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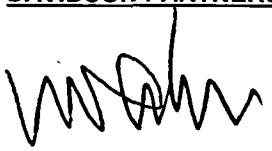

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Our Ref: 24100

APPENDIX

A1. On-Site Wastewater Management Details

- Field Assessment Report
- Test Pit Logs
- Owner & Installer Guidelines
- Biolytix Details & Operation & Maintenance Spec

A2 Drawing Numbers 24100 sheets;

C1 Location and Site Plans
C2 Drip Irrigation Field

DAVIDSON PARTNERS LTD WASTEWATER MANAGEMENT FIELD ASSESSMENT REPORT		JOB NO. 24100 SHEET NO 1 NAME lm DATE 01-Apr-08
CLIENT	C REEKS	
LOCATION	438 PORT UNDERWOOD ROAD	

REFERENCES : 1 MDC, 11.07.05 "Guidelines for new on-site wastewater management systems"
2 AS/NZS 1547:2000 "On Site Domestic Wastewater Management"

NOTE: ALL 3 TEST PITS SIMILAR

1 Site Exposure to - sun	HIGH
- wind	HIGH
2 Topsoil Depth (mm)	150
3 Soil Description (colour, moisture, firmness, type)	light grey, dry, hard silty clay loam
4 Coarse Fragments (size / abundance)	few < 10%
5 Ribbon Length (mm)	40 - 50
6 Soil Structure (Pedal Content)	medium
7 Soil Category (1 - 6)	4
8 Nearby Water Bodies ?	no
- Separation Distance ?	
9 Nearby Wells ?	no
- Separation Distance ?	
10 Runoff To Be Controlled ?	no
11 Ground Water To Be Controlled ?	no
12 Any Stability Considerations ?	no
13 Depth to Water Table	NA
14 Vegetation Cover - Existing ?	yes
- Proposed ?	regen natives
15 Gravity Head to Proposed Disposal Field	no
16 Existing Systems Nearby - type	primary to ETS
- proximity	
- perform'ce	poor
17 Reserve Area Available ?	not reqd for 2ndry
18 Intended Water Supply	spring
19 Power Available?	yes
20 Other Comments ?	

Davidson Partners Ltd CONSULTING ENGINEERS	On Site Wastewater Design Client C REEKS Location 438 PU RD FLOW ALLOWANCES	Job No 24100 Sheet No 1 Name LM Date 1.04.08

REFERENCES :1 ARC TP # 58 Third Edition
2 AS/NZS 1547:2000 "On Site Domestic Wastewater Management"
3 ON-SITE NewZ Special Report - 97/1
4 MDC,11 July 2005,"Guidelines for New On -Site Wastewater Systems"

		Appliance/Fixture per Capita Daily Flow Allowance				Total per Capita Flow (l/p/d)
		Toilet	Washing Machine	Shower	Basin (kitchen, bathroom, laundary)	
1	**Households with standard fixtures** (11 L wc, top loading washing machine)	60 *50*	25 *20*	75 *55*	20 *15*	**180** [*140*]
	Blackwater only	60 *50*				60 [*50*]
	Greywater only		25 *20*	75 *55*	20 *15*	120 [*90*]
2	**Households with standard water reduction fixtures** (11/5.5 dual flush wc, shower flow restrictors, aerator taps and water conserving automatic washing machines)	40 *35*	20 *15*	65 *50*	20 *15*	145 [*115*]
	Blackwater only	40 *35*				40 [*35*]
	Greywater only		20 *15*	65 *50*	20 *15*	105 [*80*]
3	**Households with full water reduction facilities** (6/3 dual flush wc, shower flow restrictors, aerator taps, front loading washing machine and flow/pressure control valves on all water use outlets)	20 *20*	15 *15*	55 *35*	20 *10*	110 [*80*]
	Blackwater only	20 *20*				20 [*20*]
	Greywater only		15 *15*	55 *35*	20 *10*	90 [*60*]

Design wastewater flow per person per day	180
Number of Bedrooms	5
Equivalent Occupancy	**10**
Design Daily Wastewater Allowance	1800

NOTES 1 Add 5 l/p/d for a bath
2 Figures in [*italics*] are for roof water supply. Other values are for creek, community and/or bore water supply

DavidsonPartners Ltd CONSULTING ENGINEERS	On Site Wastewater Design Client C REEKS Location 438 PU RD IRRIGATION DESIGN	Job No Sheet No Name Date	24100 2 LM 1.04.08

IRRIGATION DESIGN

1 Design Irrigation Rate (DIR)

Upper Bound DIR = 3.8
Lower Bound DIR = 3.25

DIR considered appropriate for the site = mm / day

Let DIR = 3.6 mm / day

2 Field Size

Irrigation field area = Daily Flow / (DIR) = **500 m^2**

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HOW TO GET THE BEST FROM YOUR ON-SITE WASTEWATER MANAGEMENT SYSTEM

Helpful Information for Homeowners/Occupiers

1. GOOD HOUSEHOLD PRACTICES

(a) Reduce solids disposal to treatment tanks as much as possible including food scraps, fats, grease etc. Scrape all dishes before washing and do not install a waste disposal unit unless the wastewater system has been specifically designed to carry the extra load.

(b) Do not put any of the following down sinks, drains or the toilet.

- (i) Oil/grease from e.g. a deep fryer;
- (ii) Stormwater and any drainage other than wastewater generated in the house;
- (iii) Petrol, oil and other flammable/explosive substances;
- (iv) Household, garden, garage and workshop chemicals (e.g. pesticides, paint cleaners, photographic chemicals, motor oil and trade waste);
- (v) Disposable nappies and sanitary napkins.

(c) In order to keep the bacteria working in the tank and in the land application area:

- (i) Use biodegradable soaps;
- (ii) Use a low-phosphorus detergent;
- (iii) Use a low-sodium detergent in the dispersive soil areas;
- (iv) Use detergents in the recommended quantities;
- (v) Do not use powerful bleaches, whiteners, nappy soakers, spot removers and disinfectants including cold water washing products.
- (vi) Do not put chemicals or paint down the drain.

(d) Conserve water. Less water means a lower load on the treatment system and land application area, with ensuing improved and more reliable performance. Conservation measures include:

- (i) Installation of water-conservation fittings such as low water use toilets, spray taps and water saving automatic washing machines;
- (ii) Taking showers instead of baths;

(iii) Only putting the dishwasher or washing machine on when there is a full load.

(e) Space dishwasher and washing machine use out to avoid overloading the wastewater system. Try not to do a large amount of washing in any one day and avoid running the washing machine and dishwasher at the same time.

(f) For the physical protection of treatment and land application systems:

(i) The treatment unit must be protected from vehicles;

(ii) Pedestrian traffic routes should not cross effluent field areas;

(iii) No vehicles or heavy stock should be allowed on trenches or beds;

(iv) Deep rooting trees or shrubs should not be grown over absorption trenches or pipework.

2. MAINTENANCE

(a) General

The appropriate maintenance of your treatment and land application systems will be the key to their effective and reliable performance. Please contact a drainlayer or Council if you are unsure about anything or require further advice.

(b) Septic Tanks

Any septic tank (primary wastewater treatment unit) will need to:

(i) Be cleaned out regularly i.e. every three to five years or when scum and sludge occupy two thirds of the volume of the tank (or first stage of a two-stage system). All scum, sludge and septage material must be disposed of in an approved manner. Pump chambers should be cleaned out at the same time if necessary;

(ii) Have grease traps cleaned out regularly;

(iii) Keep the vent and/or access cover of the septic tank exposed;

(iv) Have any outlet filter inspected and cleaned, normally at the same time as septic tank cleaning. Remove the cartridge and rinse off with a garden hose, being careful to rinse all septage material back into the tank. It is not necessary that the cartridge be cleaned "spotless". The biomass growing on the filter aids in the pre-treatment process and should be left on the cartridge.

(c) Secondary Treatment Systems

Improved treatment systems, such as aerated plants or sand filters, require specialist maintenance and should be looked after under a maintenance contract. Owners should ensure that they are aware of the manufacturers/suppliers recommended maintenance intervals and that a contract is in place for routine checks of mechanical components.

These systems will have a primary treatment stage which should be treated as in (b) above.

(d) **Effluent Field**

Reliable performance from your effluent field (including shallow trenches, drip irrigation field or mound) will be aided by regular attention including one or more of the following depending on the type of system:

(i) Keep the surface water diversion drains upslope of and around the land application area clear to reduce absorption of rainwater into trenches or beds;

(ii) The baffles or valves in the distribution system should be periodically (monthly or seasonally) changed to direct treated wastewater into alternative trenches or beds, as required by the design;

(iii) Evapotranspiration and irrigation areas should have their grass mowed and plants maintained to ensure that these areas take up nutrients with maximum efficiency;

(iv) Clean disc filters or filter screens on irrigation-dosing equipment periodically by rinsing back into the primary wastewater treatment unit;

(v) Irrigation systems which dispose of wastewater that has only been treated by a septic tank and filter, must be flushed through with clean water before and after any significant period of non-use.

(vi) Regular maintenance of the treatment system (as per manufacturers recommendations), especially for aerated and sand contactor type systems.

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GUIDELINES FOR INSTALLERS OF ON-SITE DOMESTIC WASTEWATER MANAGEMENT SYSTEMS

References

A.S./N.Z.S. 1546.1:1998 'On-Site Domestic Wastewater Treatment Units, Part 1:Septic Tanks'
A.S./N.Z.S. 1546.3:2001 'On-Site Domestic Wastewater Treatment Units, Part 3 AWTS'
A.S./N.Z.S. 1547:2000 'On-Site Wastewater Management'

1. GENERAL

(a) All products and construction shall be in accordance with the relevant standards and in general the best trade practices shall prevail. If there are any questions about any aspect of the work, please contact Council in the first instance.

(b) The Contractor shall act to protect the health and safety of staff and private persons at all times.

(c) The Contractor must be aware of the inspection requirements of Council and/or the Engineer and the need to provide As-Built locations of the treatment and land application systems to Council and the owner.

(d) The Contractor should also educate the owner about the functioning of their system, especially the maintenance requirements, and where appropriate put in place a maintenance contract for systems which rely on mechanical action in order to function property.

2. LOCATION OF TREATMENT AND DISTRIBUTION SYSTEMS AND LAND APPLICATION AREAS

(a) All tanks and the land application area shall be located clear of structures to avoid the undermining of foundations. In general, a minimum clearance of 2.0 metres should be adequate but if in doubt check with Council or an Engineer. Tank vents should be located 3 metres minimum from dwellings.

(b) The Contractor must be aware of the required separation distances of tanks and/or the land application area to surface water (ponds, water courses and drainage paths), wells and/or boundaries.

(c) Treatment systems should be sited with consideration for access by desludging trucks.

3. GOOD CONSTRUCTION TECHNIQUE

(a) **Treatment and Distribution Systems**

(i) When working with existing systems or carrying out maintenance tasks, measures shall be in place to ensure staff are adequately protected from contact with wastewater.

(ii) All tanks located in areas where high seasonal groundwater levels are known to occur shall be weighted down or provided with anchorage in accordance with clause 10.3.3 of A.S./N.Z.S. 1645:1998 (copy attached).

(iii) The Contractor shall allow to carry out any treated effluent testing required by Council. Samples should be taken once the system has been in operation for approximately three months. In a holiday home situation, testing should be done in January.

(iv) All pump chambers shall be vented similar to septic tanks. The commissioning of pumped distribution systems shall consist of at least the following:

- A check of pump out and emergency storage volumes (reserve capacity equivalent to the peak daily flow should be provided).
- Three drawdown tests.
- Testing of the operation of controls and alarms.
- Checking of uniform flow throughout any pressurised distribution network prior to covering over.

(b) <u>Land Application Area</u>

The following excavation techniques shall be observed so as to minimise the risk of damage to the soil.

(i) Plan to excavate only when the weather is fine. Pudding, where washed clay settles on the base of the trench to form a relatively impermeable layer, must be avoided.

(ii) Avoid excavation when the soil has a moisture content above the plastic limit. This can be tested by seeing if the soil forms a "wire" when rolled between the palms.

(iii) During wet seasons or when construction cannot be delayed until the weather becomes fine, smeared soil (smooth) surfaces should be raked to reinstate a more natural soil surface taking care to use fine tines and only at the surface.

(iv) When excavating by machine, fit the bucket with "raker teeth" if possible, and excavate in small "bites" to minimise compaction.

(v) Avoid compaction by keeping people off the finished trench or bed floor.

In particular for trenches and beds:

(vi) If rain is forecast, cover any open trenches to protect them from rain damage.

(vii) Excavate perpendicular to the line of fall or parallel to the contour levels.

(viii) Ensure that the inverts are horizontal or sloped at not more than 1 in 200.

BIOLYTIX TECHNOLOGIES *Technical Note No 3*

BIOLYTIX FILTER STP

Introduction

This technical note provides a summary of the Biolytix Sewerage Treatment Plant.

Wastewater Treatment Details

General

Wastewater and food waste is treated in Biolytix Filters using Biolytix Filtration (see Figure 1), a patented passive aerobic process. The technology is based on layered, flexible modular filter elements that are designed to also be installed into a conventional septic tank unit but are equally suitable to be used within any vertical cylindrical tank (normally a minimum depth of approximately 1.5m is required).

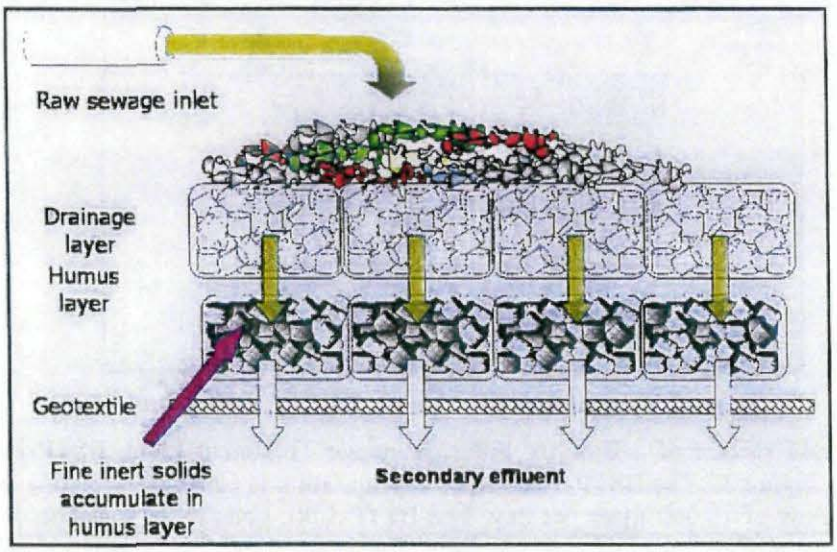

Figure 1 Biolytix Filtration Schematic

The Biolytix™ Filter unlocks nature's magic to odourlessly treat sewage, wastewater, food wastes and even scrap paper & cardboard. The filter is a robust organic soil ecosystem which is not only fed by the organic wastes that are filtered out of the wastewater but is actually structured from the fine humus produced, cleverly turning the problem into the solution. Just as humus is the key to soil fertility, it is also the key to the Biolytix™ Filters cleansing powers. Billions of microscopic organisms inhabit every gram and millions of worms beetles & other organisms structure it so that its drainage and air porosity are continually renewed and maintained indefinitely. It is normally a single pass filter where wastewater enters at the top of the bed and clear organically filtered water, is pumped out from the bottom.

STP Filter Configuration

There are two main versions of the Biolytix Filter available to treat domestic wastewater, a BF6 filter that treats domestic wastewater to produce a high secondary treated effluent and a BF2 filter that produces effluent similar to a septic tank.

A schematic of a single Biolytix Filter, BF6 is shown in Figure 2. Normally the filter is constructed within a standard 2,500 litre polymer tank (1.88m dia 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 (5 watt) air pump.

The BF2 filter is very effective at removing COD and may be used as a pretreatment module in a Biolytix Sewage Treatment Plant (Biolytix STP). When operating as a pretreatment module, an air pump is added to the standard BF2 filter to provide supplementary aeration. The modified BF2 filter is marketed as a Biogrinder Pumping Station (BGPS). In the Biolytix Filter STP option, wastewater is initially pretreated in a BGPS unit before discharging to a number of BF6 units operating in parrallel.

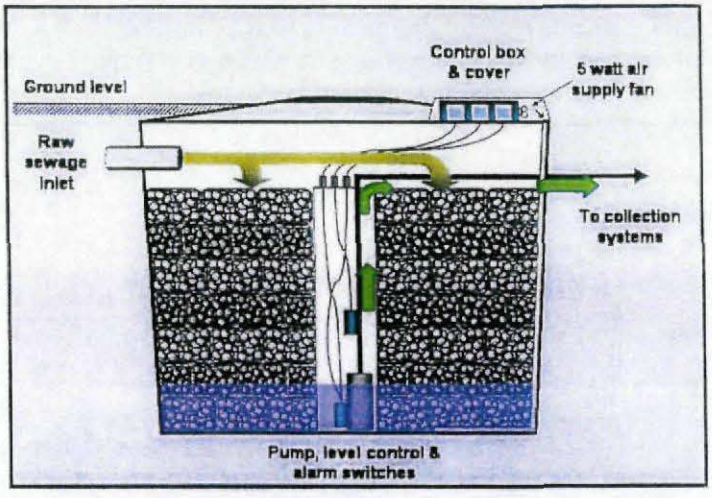

Figure 2 Typical Biolytix Filter – BF6 Cross Section

A typical cross section of a Biolytix Filter Sewerage Treatment Plant, BSTP-10kL is contained in Figure 3. The BSTP-10kL filter configuration is capable of treating a daily wastewater flow of 10,000 litres per day. The BSTP-10kL consists of 4 standard filters each, 1.88m diameter and 1.63m high and therefore requires an installation area of approximately $16m^2$. Due to the modular nature of the treatment units the BF2 and BF6 filters may be installed at different site locations and in any shape configuration (e.g. straight line, triangular shape etc).

There are also BSTP-3.3kL and BSTP-6.6kL options. The BSTP-6.6kL option has one less BF6 filter and the BSTP-3.3kL two less BF6 filters than the BSTP-10kL. Figure 4 provides a plan detail of a BSTP-6.6kL treatment plant arrangement.

The BSTP-10kL treatment system is modular and multiple treatment units may be installed to provide a treatment solution for schemes with flows greater than 10kL/day. In this instance the flows to each of the BF2 pretreatment filters would need to be configured so that flows do not exceed 10kL/day. This would need to be achieved by appropriate configuration of gravity sewers or alternatively a macerated pump flow would be required to distribute flows evenly to the BF2 pretreatment filters.

Operation

Wastewater normally gravitates to the STP, BF2 pretreatment filter. A standard BSTP treatment system is supplied with an inlet at 0.4m to pipe invert, however options are also available for 0.65 and 1.0m invert depths. The pretreated flow from the BF2 filter is pumped in parallel to up to 3 BF6 secondary treatment modules, subject to the treatment plant rating (i.e. 3.3, 6.6 or 10kL/day). The BF6 secondary treatment modules are linked at their bases to enable effluent to be pumped from the treatment facility from a single pump well.

The filter is normally supplied with a phone line telemetry alarm system or if necessary an audio visual site alarm system.

The STP units are able to cope with power outages and unlikely pump failure events. In these situations the BF2 filter is normally designed so that effluent may overflow to the BF6 filters but only after passing through the filter bed layers of the BF2 unit. Without pretreatment in the BF2 filters the BF6 filters still have capacity to treat 1,600L/day each or in excess of 2,200L/day (4 day peak) to a high secondary standard. If there is total failure of BF6 pumping system, there is in excess of 1,300 litres of storage within each BF6 bed prior to effluent overflowing to an emergency subsurface drain. Any overflow would be treated effluent or at least partially treated effluent during an extended failure event (e.g. power failure) as similar to the BF2 filter overflow, all effluent is required to pass through the BF6 bed prior to overflow.

The Biolytix Filter is a low energy treatment plant. Operational efficiency of a Biolytix STP varies subject to the discharge head of the final effluent pump and the average daily flow discharged to the filter. Typical energy usage of a BSTP may vary in the range of 0.3-1.5 kWhr/kL treated, including allowance for pumping of the treated effluent, or if discharge pumping is excluded, 0.15 to 0.6 kWhr/kL treated. Maximum efficiency occurs when the filter is loaded at its rated capacity.

Performance

SIA Global completed independent performance tests of the Biolytix Filters to Australian Standard, AS1546.3 On-site Domestic Wastewater Treatment Units Part 3: Aerated Wastewater Treatment Systems September 2003. Table 1 summarises the results from the independent testing on the BF6 filter. Essentially the independent testing showed that the Biolytix Filter (BF6) produces a high quality secondary effluent (at average flow rates they consistently produce a 5/5 BOD_5/ TSS effluent). The Biolytix filter normally achieves 3-4 log reduction in Thermotolerant Coliforms.

Table 1: Effluent Characteristics Biolytix BF6 Filter

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

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.

Legislation varies in each state regarding the approval requirements for the Biolytix Filter STP system and Biolytix Technologies should be contacted to confirm specific requirements and current status of BSTP approval applications.

Further information on the Biowater concept and Biolytix Filters can be viewed at www.biolytix.com.

Maintenance

Maintenance requirements for the BF6 filters are basic and normally limited to an annual maintenance inspection of the pump and top layer of the filter bed and check on pump and air blower.

The BGPS prefilter unit (in the BF-STP) would initially require monthly inspections over the first 12 months. Subject to the nature of the wastewater loading and results of the first annual review it is likely that inspections would be required every 3 to 6 months in following years.

Any accumulated non biodegradable material within the filter units would need to be removed manually and disposed to land fill in accordance with local regulations.

Humus build up requires sections of the top layer of the filter bed (BF6 filters) to be replaced in accordance with loading rates. Under normal operation humus (uncompacted) is created at a rate of 10L/person/annum (at full domestic loading rates) and would need to be disposed to an appropriate landfill site or preferably to re-inoculate new filter units.

The Biolytix Filters are very robust and capable of accepting variable loads normally, including possible periods of no flow. The filters are normally maintained by a plumber or semi-skilled personnel.

Biolytix offer a fully comprehensive maintenance contract that covers all maintenance, requirements, emergency callouts and replacement parts. The contract is typically offered for a 20 year period. Pricing varies with location due to the affect of travel costs.

Proven Technology

Biolytix™ has invested more that $3 million to refine its patented treatment process and engineer it to fit into a neat compact package. Many prestigious and discerning clients in New Zealand, Australia and South Africa already enjoy the benefits of the Biolytix™ Filtration for households and on a larger scale for Golf Course Estates, Eco-Resorts and Five Star Hotels.

In Australia Biolytix Technologies has concentrated mainly on small scale treatment systems that are modular and may be easily grouped or networked to treat relatively high wastewater flows. There is a Biowater scheme operating on Macleay Island, Queensland (Australia) that was completed in partnership with the water authority, Redland Water and Waste. As a group Biolytix has done some large projects. The Spier complex (South

Africa) treats over 240kl/day in two cluster plants with some smaller plants spread as appropriate to minimise the cost of collection.

A strength of the Biolytix technology is that it can be scaled to give the best economic outcome. One size does not fit all in practice and the Biolytix modular approach is designed to overcome this problem and allow scale up and even scale down if required by the usage on the site.

North

LOT 46
DP 1896

LOT 47
DP 1896

LOT 48
DP 1896

LOT 49
DP 1896

LOT 50
DP 1896

PT SEC 92
QUEEN CHARLOTTE SOUND DISTRICT
(SO 17/A)

NEW "BIOLYTIX" BF6 TREATMENT SYSTEM

NON RETURN VALVE

APPROX 90m SLOPE LENGTH AND 50° ELEVATION ABOVE BF6

DELIVERY AND RETURN LINES

TP3

TP1

TP2

DRIP IRRIGATION FIELD. (500m²) (SEE SHEET C2)

PORT UNDERWOOD ROAD

MHWS

QUEEN CHARLOTTE SOUND

WAIKAWA BAY

WHATAMANGO BAY

AHURIRI BAY

5993235mN

2599850mE

LOCALITY PLAN (NZMS 260 P27)
1:50000

SITE PLAN
1:500

0mm 100mm

NOTE:
LOCATIONS OF FEATURES ARE APPROXIMATE ONLY AND HAVE NOT BEEN PRECISELY SURVEYED.

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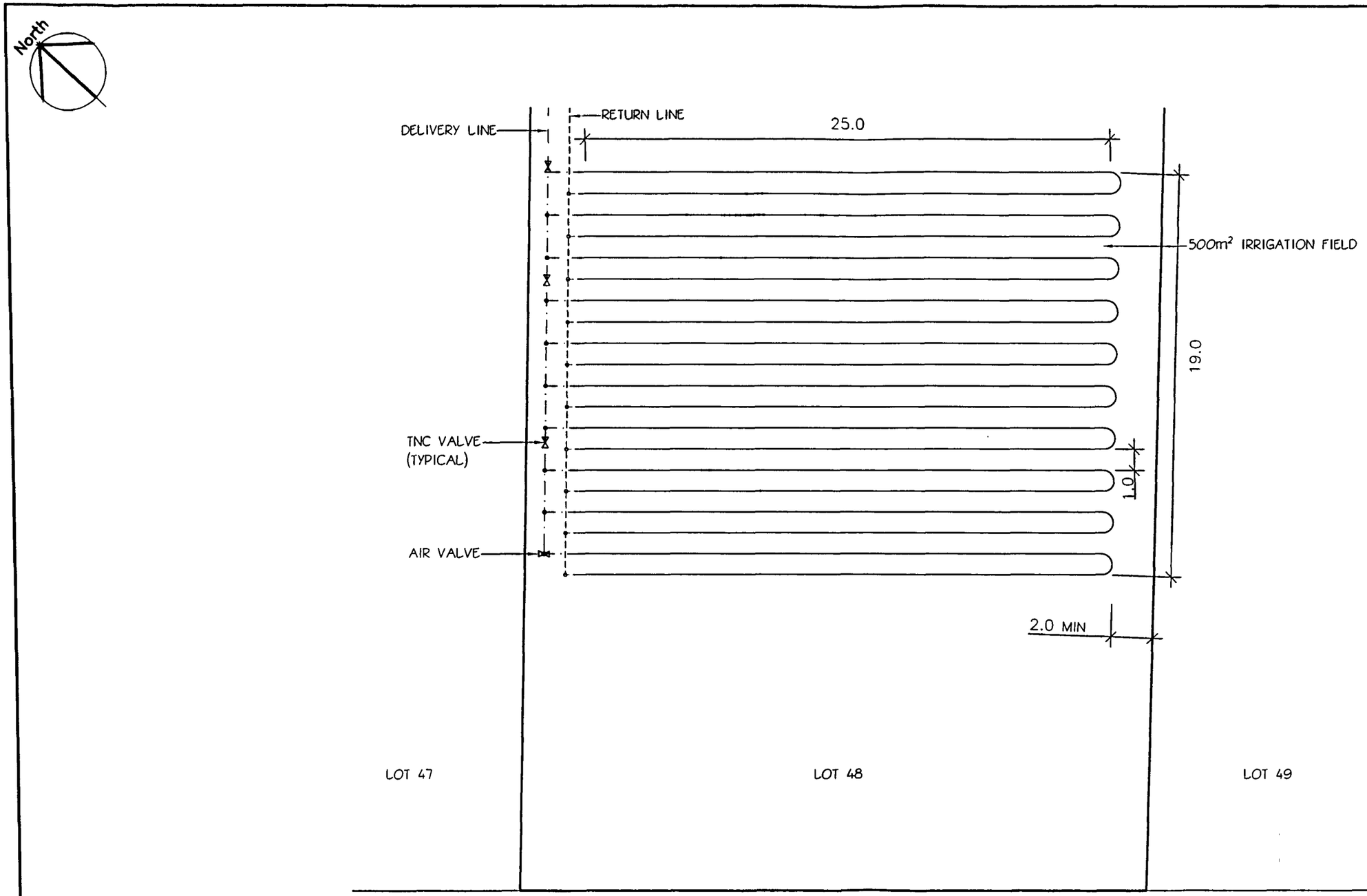
C. REEKS
438 PORT UNDERWOOD ROAD
WASTEWATER UPGRADE

locality and site plans

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
06/08	A3	24100	C1	C

DES LM DRN BT CK CAD



PLAN–IRRIGATION FIELD
1:200

NOTES:

THE DESIGN OF THE DRIP IRRIGATION FIELD SHALL BE CONFIRMED BY "BIOLYTIX" THE DETAILS SHOWN ARE INDICATIVE ONLY

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drip irrigation field

DATE	ORIGINAL SIZE	DRAWING No	SHEET	ISSUE
6/08	A3	24100	C2	

DES LM | DRN BT | CHK | CAD \\STD A3\A210.dwg

0mm 100mm