ENSURV™
survey & engineering solutions

181 High Street
PO Box 189
Blenheim 7240
New Zealand

Phone: +64 3 578 3500
Fax: +64 3 578 3525
Email: info@ensurv.co.nz

www.ensurv.co.nz

Engineering Report

Proposed On-site Wastewater Management System Upgrade

Section 16, Blk VIII, Linkwater Survey District
2781 Queen Charlotte Drive
Picton

For Matthew Bond

Jan Dimmendaal
Chartered Engineer
ENSURV
11 August 2007

Job No 20081408

Table of Contents

1. Introduction

1.1 Matthew Bond proposes to upgrade the existing wastewater management system at his holiday home located at 2781 Queen Charlotte Drive, Picton so that it meets current Marlborough District Council standards, while at the same time allowing for future planned extensions to the dwelling on the site.

1.2 The legal description of the land covered by this development is Section 16, Blk VIII, Linkwater Survey District. The land area is 2.5242ha. That part of the property where the dwelling is located is zoned as 'Sounds Residential' and is shown to be encompassed by the 'unstable' hazard overlay according to the Marlborough District Council Sounds Resource Management Plan.

1.3 The purpose of this report is to present the results of site investigations carried out in relation to onsite wastewater treatment and effluent land application. The site investigation was carried out on 1 August 2008.

2. Description

2.1 The subject property is accessed of Queen Charlotte Drive via a walking track or by boat from the foreshore.

2.2 The existing dwelling on the property was constructed approximately 80 years ago and provides for a total of three bedrooms. The dwelling is positioned fronting onto the Sounds Foreshore Reserve boundary. An out building is positioned to the immediate south of the dwelling.

2.3 A stream is located to the east of the dwelling, and is at the closest point approximately 7m distant. The land immediately around the dwelling is in lawn and gardens with the balance of the property being vegetated native bush. The land proximal to the dwelling is largely level with then slopes up at 30° - 35° to the south and west.

2.4 The dwelling is currently serviced by a septic tank and drainage field located to the east of the dwelling. The tank is less than 10m from the stream and the existing soakage field is likely to be largely within the Sounds Foreshore Reserve.

2.5 Water supply for the property is from a stream source.

2.6 Extensions to the dwelling/development of the site are proposed in the future and this has been taken into account in the design of the proposed system.

3. Site Evaluation

3.1 In accordance with Plan Change 7 Rule 27.2.4.5.5 an assessment of the best practical option has determined that utilising the existing septic tank (primary treatment) and constructing a dose pumped trench land application system is not suitable for the property as there is insufficient suitable level area available with a minimum offset of 30m from the foreshore and the stream running through the property. It is considered that the most suitable alternative for this property is to use Secondary treatment and drip irrigation land application.

3.2 The proposed land application area is located on the slopes to the southwest of the dwelling. The land application area has a north - northeast aspect and has filtered exposure to sunlight and wind. The ground slopes at 30° - 35° and is vegetated in regenerating native bush with limited ground cover. At the closest point the land application area separation from the stream is 20m and from the foreshore is

Site Plan Appendix A). An assessment of effects on the environment follows in section 4. The landform element is linear planar.

3.3 Three test pits were dug at the site in the proposed effluent land application area and their locations are shown on the site plan (Appendix A). Soils consist of sandy clay loam overlain by a silty clay loam. Based on the soil assessment carried out, an average drainage category of 4 has been adopted. 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	
0.05	Ah	Topsoil	Dark Brown	Humus	None	V.Loose	V.Soft	V. Strong	Moist	2
0.30	A	Residual	Med Brown	Silt clay loam	0	Loose	Soft	Strong	Moist	4
0.50	B	Residual	Pale yellow brown	Sandy clay loam	5%	Firm	soft	Weak	Dry	4
0.60	C	Residual	Pale brown mottled cream	Sandy clay loam	0	Firm	Stiff	Weak	Dry	4

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	Humus	None	V.Loose	V.Soft	V. Strong	Moist	2
0.60	A	Colluvial	Med Brown	Silt clay loam	0	Loose	Soft	Strong	Moist	4
0.70	B	Residual	Pale yellow brown	Sandy clay loam	0	Firm	soft	Weak	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	Humus	None	V.Loose	V.Soft	V. Strong	Moist	2
0.30	A	Residual	Med Brown	Silt clay loam	0	Loose	Soft	Strong	Moist	4
0.60	B	Residual	Pale yellow brown	Sandy clay loam	0	Firm	soft	Weak	Dry	4

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

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 very 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. 3.6 mm/day).

3.5 The system design has been based on a 3 bedroom dwelling with a permanent occupancy of 6 people (as per MDC Guidelines for new on-site wastewater management systems and Plan Change 7 Rule 28.1.21) plus the equivalent of an additional 2.5 bedrooms (future extensions) to calculate a design flow of 1,980 litres/day. The wastewater flow design allowance of 180 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 source supply for the dwelling.

3.6 The length of drip line required is 574m (refer wastewater design sheets Appendix B). The irrigation system design requires 1.6 litre/hr emitters with lines laid at 1.0m spacing and at 150mm below ground level or on the ground surface secured by stainless steel staples and covered with 150mm of inert material such as leaf mulch. As per Council guidelines, irrigation lines should be set back a minimum distance of 2m from the property boundaries. The installation of the irrigation system is to be in accordance with the product installer guide supplied by the manufacturer.

3.7 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.

3.8 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.

3.9 Access to the system for maintenance will be available via the walking track from Queen Charlotte Drive or from the foreshore.

4. Assessment of Effects on the Environment – On-site Wastewater

Activity - Install Effluent Land Application Field within 30 metres of a Watercourse and within the Hazard Overlay of the MSRMP

4.1 Effects

It is proposed to install a Biolytix secondary treatment system and drip irrigation effluent land application system at the site, with part of the effluent field being located within 30m of an existing watercourse and the whole property being with the Hazard Overlay of the Marlborough Sounds Resource Management Plan.

A possible environmental effect resulting from the proposed activities is a decrease in the stability of the land and contamination of the existing watercourse through the vertical movement of secondary-treated effluent that is not treated or consumed in the soil.

4.2 Mitigation Measures

Treatment

The treatment system proposed is a Biolytix secondary treatment system, which produces high quality effluent (refer 3.4 above), and therefore has a minimum impact on the environment.

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 soils on the property (refer 3.3 above) fall into this mid-range soil category.

Land Stability

The low rate of effluent application (3.6mm/day) spread over a large area (550m²) is unlikely to have a detrimental effect on the stability of the property, and may improve stability by encouraging the growth of ground cover plant species.

An Opinion as to Land Stability is attached in Appendix D.

7. Recommendations

7.1 It is recommended that a Biolytix BF6 3000 PAT treatment system treatment system coupled with drip irrigation land application be installed to service the dwelling and proposed future extension on Section 16 Block VIII, Linkwater SD. Installation is to be in accordance with requirements and recommendations of NZS1547:2000.

8. Limitations

This report has been prepared for Matthew Bond and is valid for two years from the date of issue. It covers the design of a wastewater treatment and land application system for Section 16 Blk VIII, Linkwater Survey District. 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.

9. References

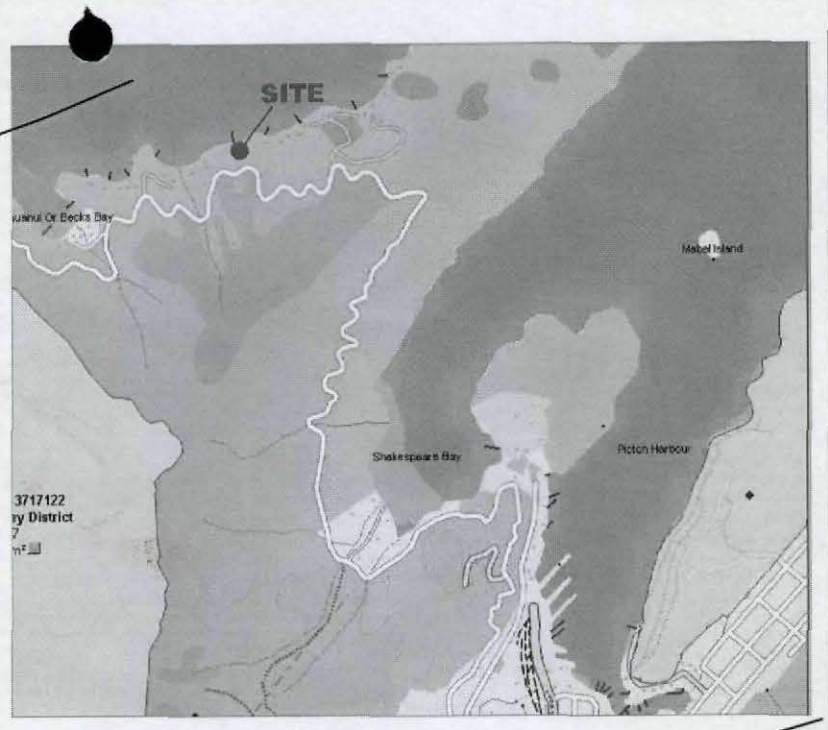
1. NZS 1547:2000 On-site Domestic Wastewater Management
2. Marlborough District Council Guidelines for new on-site wastewater management systems.

Report prepared by:

Jan Dimmendaal, Chartered Engineer
11 August 2008

Appendix A

Site Plan



north

Queen Charlotte Sound

30m

Proposed Biolytix System

Existing Dwelling

Existing Septic Tank

Stream

20m

W1

W2

W3

30°

30°

30°

Section 16
Blk VIII
Linkwater SD

LEGEND
- Wastewater test sites (W1)
- Wastewater land application area (LAA)

Land Application Area
(Drip Irrigation)

RECEIVED
14 AUG 2008
MARLBOROUGH
DISTRICT COUNCIL

ENSURV™
survey & engineering solutions

181 High Street
P.O.Box 189
Blenheim, N.Z.
Tel: ++64 3 578 3500
Fax: ++64 3 578 3525
info@ensurv.co.nz
ACENZ

PROPOSED DEVELOPMENT
SECTION 16 Blk VIII,LINKWATER SD
2781 QUEEN CHARLOTTE DRIVE

PROJECT No. **20081408**

SITE PLAN
ONSITE WASTEWATER SYSTEM

DRAWING No. .001

DRAWN JD | CHECKED JD | SCALE (A3) 1:250 | DATE AUG 08

COMPUTER FILE: COMP_FILE | REVISION /

Appendix B

Wastewater Design Sheets

ENSURV™
survey & engineering solutions

WASTEWATER SYSTEM DESIGN SHEET

To AS/NZS 1547:2000

Bond: Queen Charlotte Drive **File No: 20081408**

Intended water Supply:

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

Local experience with existing on-site systems:

Septic Tank or similar (Primary treatment):

Secondary treatment:

Produce high quality effluent suitable for irrigation.

Recommendation for this site: *Biolytix Secondary Treatment and drip irrigation 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:

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

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

Design

RECOMMENDED D.I.R. *3.6* mm/day

(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)

11 Permanent People at 180L/person/day and *1980* L/day from Appendix 4.2D AS/NZS 1547:2000

DESIGN FLOW: *1980* L/day

Storage size (min): (Table 4.3A1)

AREA REQUIRED: *550.0* m^2

IRRIGATION LENGTH : *573.5* m .

RECOMMENDATION :

Biolytix Secondary treatment with dripper line irrigation. Irrigation lines to be a minimum total length of 574m using 1.6 l/hr emitters Lines to be laid at 1.0m spacing at 150mm below ground level or stappled to the surface and covered with 150mm of inert material (bark or leaf mulch). 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.

ENSURV™
survey & engineering solutions

Irrigation System Calculation

Project Title:Bond
File Ref: 20081408

Date: Friday, 8 August 2008
Operator:

Acceptable daily loading rate (mm/day)	3.6
Daily influent (l/day)	1980
Emitter type	Raam 17
Emitter flow rate (l/h)	1.6
Emitter Spacing (m)	0.6
Dripline Spacing (m)	1
Distance from Treatment system to Irrigation Field (m)	15
Field Size (m^2)	550
Field length assuming square area	23
Number of lines	24
Total Dripline Length (m)	573
Total flow Rate Required (l/h)	1529

Pump Duty

Flow (l/h)	1529
Head (m)	29

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	15	
Sub Total	26.06	
Total	29	including 10%

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

Appendix C

Biolytix BF6 3000 PAT 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

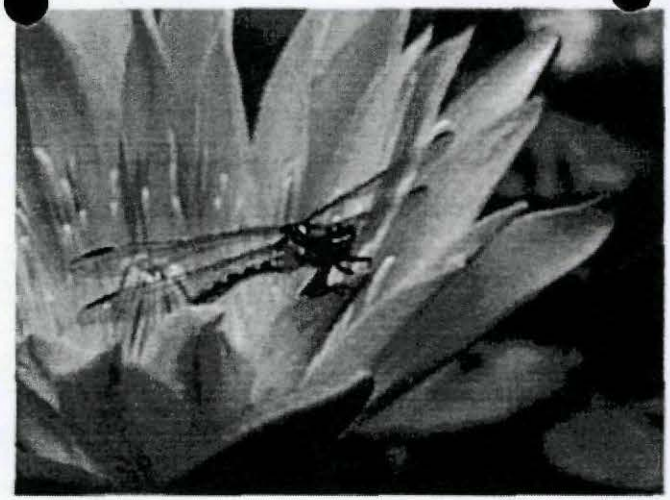
Recycle sewage, greywater, sanitary items and food scraps into a lush garden.

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).

BIOLYTIX

Biolytix® New Zealand Extended Performance Warranty & Service Contract

This agreement is between:

Name/s (the owner): _____

Site Address: _____ P/Code _____

Postal Address: _____ P/Code_____

Equipment Phone Line Number: ( ) _____ (see Clause 6)

Contact # ( ) _____ **Facsimile #** ( ) _____ **Mobile #** _____

Email: _____

And: Biolytix® Technologies Pty Ltd ("Biolytix") **ACN 097 798 966** PO Box 591, Maleny QLD 4552

Purpose of the agreement: The professional maintenance and servicing of the Biolytix® Wastewater Treatment Filter.

Product/Filter type: _____ Serial Number: _____("the Equipment") (To be completed by Biolytix®)

Installation Date/Start Date: _____ (To be completed by Biolytix®)

Annual Service Fee: The Extended Performance Warranty is available after the first year, as indicated below for clients who have not held a contract with Biolytix® consecutively from the installation date and wish to start or renew a contract. The contract start date will be determined by Biolytix® and does not include the complimentary free year. A complimentary warranty for the first year is valid from the Installation date for newly purchased equipment only.

Optional Extended Performance Warranty: Please circle one of the following if you would like to extend your warranty after the first complimentary year. If no option is circled, 20 years will be the default.

Terms: ***5 Years 10 Years 20 Years***

Payment options:

For Second and subsequent years choose one payment option only:

- **Payment option (1):** per Annum (ONE PAYMENT ANNUALLY IN ADVANCE)
- **Payment option (2):** per Quarter (4 PAYMENTS QUARTERLY IN ADVANCE)
- **Your preferred payment method: Cash Cheque Direct Debit** (please circle one choice)

Additional travel costs and Travel allowance: See Clause 7 of Terms and Conditions

Terms of Agreement: See Terms and Conditions attached hereto.

BIOLYTIX® RESERVES THE RIGHT TO INCREASE ITS SERVICE FEE IN ACCORDANCE WITH CLAUSE 7 HERETO

WORK TO BE DONE BY BIOLYTIX®:

A. At the end of each 12 month period from the Installation date/start date-carry out a comprehensive service on the Equipment including:

1. Assess effectiveness of treatment;
2. Check dispersal and flush irrigation;
3. Check irrigation filters;
4. Check pumping equipment;
5. Check equipment alarm system;
6. Visually check final effluent quality;
7. Replace all worn parts;
8. Re-inoculate if necessary
9. Advise Owner of care and maintenance of Equipment;
10. Prepare and submit maintenance report to Owner and Local Authority.

B. Carry out any emergency repairs as required due to faulty components/parts.

OBLIGATIONS OF THE OWNER: See Clause 4 of the Terms and Conditions.

Signed by the Owner/s: _____ Date: _____

Signed by Biolytix® CEO as authorised representative: _____ Date: _____

Appendix D

Opinion as to Land Stability

Date 11 August 2008

Opinion as to Land Stability

Description: Section 16 Blk VIII, Linkwater SD

For: Matthew Bond

I, Jan Dimmendaal of ENSURV, PO Box 189, Blenheim,

hereby confirm that:

1. I am experienced in the field of soils engineering and more particularly land and foundation stability and am formally recognised by the Marlborough District Council. I am familiar with and understand the purpose of the Marlborough District Council's geotechnical reporting standards. This professional opinion is furnished to the Marlborough District Council alone, on the express condition that it will not be communicated to or be relied upon by any other person. It is based on conditions presently found on site and is consistent with standards currently being applied.

2. Site investigations have been carried out by myself and are described in the site investigation report dated 11 August 2008, attached. The following professional opinion is based on the assumption that the data obtained from the investigations is representative of the whole area under consideration. In my professional opinion it is reasonable for Council to assume that the data referred to above is representative of the whole area under consideration.

3. In my professional opinion, not to be construed as a guarantee, and having regard to the specifics of the site which has been investigated to the extent that acceptable engineering practices require, giving due regard to acceptable engineering principles and practices for land and foundation stability, then the area shown on the site plan is suitable for the land application of secondary treated wastewater effluent, providing that the following recommendation described in my accompanying report is adhered to:

    1. It is recommended that the site is suitable for land application of secondary treated effluent using drip irrigation land application with installation to be in accordance with requirements and recommendations of NZS1547:2000. This professional opinion shall remain current for a maximum of two years.

Jan Dimmendaal, ENSURV
BE(Hons), CP Eng, MIPENZ

Appendix E

Photos

Proposed On-Site Wastewater Syste
Sec 16 Blk VIII, Linkwater SD
2781 Queen Charlotte Drive
11August 2008

20081408

Looking north.Biolytix system to be sited in lawn extreme left of picture

Looking west. Proposed land application area

Looking south