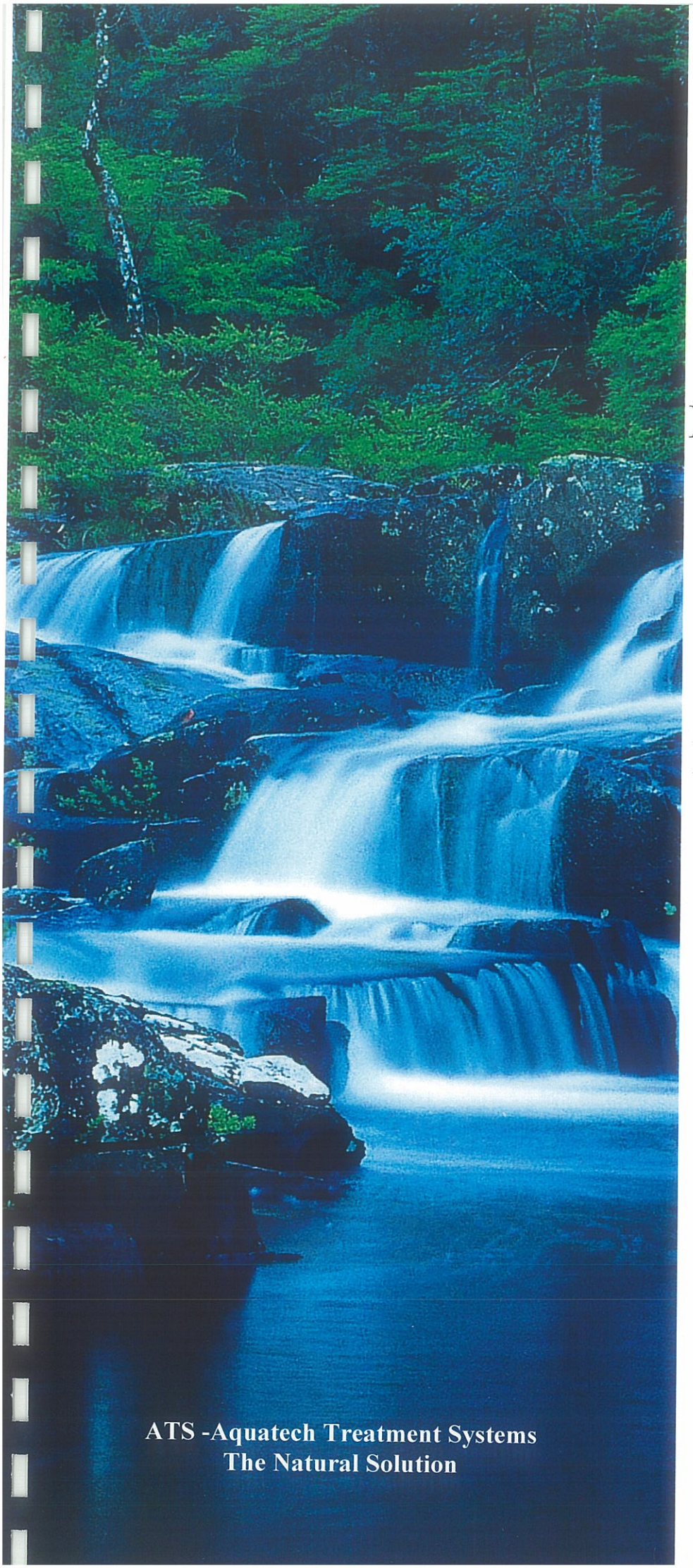


On-site Effluent Disposal Investigation Report

At

Lot 1 DP 34356, 40 Dogwood Road, Bungwhal, NSW

For

Mr. J Gowing.

February 2010.

12th February 2010
ATS Ref: 120210

Mr J Gowing
Suite 21 Jones Bay Wharf
26-32 Pirrama Road
Pyrmont NSW 2009.

Attention: Mr John Gowing

On-Site Effluent Disposal Investigation Report.
(Lot 1) DP34356, 40 Dogwood Road, Bungwhal.

1. INTRODUCTION

An on-site effluent disposal geotechnical investigation has been undertaken on the above property in accordance with AS 1547-2000 *On-site Domestic Wastewater Management* (AS 1547) and the Environment and Health Protection Guideline *On-site Sewage Management for Single Households*.

This report provides details of the investigation and recommendations for on-site disposal of treated sewage effluent. A Site and Soil Evaluation, Disposal Area Calculation Sheet and Soil Profile Sheet addressing specific matters required by AS 1547, are attached.

2. SITE DESCRIPTION.

The site is located on the eastern side of Dogwood Road, Bungwhal and is 12 hectares in area.

There are 6 proposed sites for onsite disposal on the property and are situated as per the marked plan.

Surface run-off will be controlled by means of upslope drains being installed to divert all surface and subsurface water that may be present in wet periods during the year.

The site does not contain any visible fill.

The site has no dwellings or any form of construction on it at the time of the field investigations.

3. PROPOSAL.

It is proposed that the site will accommodate the following in stages:

1st Stage

- Construction of 3 x Long Houses with an occupancy of 16 per house = 48EP
- 1 x Dining Pavilion to accommodate the 48EP in the Long Houses,

2nd Stage

- Construction of 6 Ensuited Cabins which can accommodate up to 30EP and 5 staff
- Construction of the Reception / 30 seat Cafe including 5 Staff.

The location of the proposed development is shown on the plan provided as an attachment.

4. SUMMARY.

The wastewater treatment system will treat the wastewater to a high tertiary level. This treatment, coupled with 3000m^2 Pressure Dosed Subsurface Irrigation will be the means of disposal, this will allow for efficient disposal of the effluent that is generated from the proposed development.

It is expected to have no adverse environmental effects on surrounding habitats.

5. METHODOLOGY

5.1. Investigation and Subsurface Conditions

The fieldwork investigation was undertaken on 2 separate occasions 1st being 14th August 2009 and the 25th November 2009. The fieldwork comprised on these days a visual assessment of the proposed disposal areas and surrounds. On both of the days the logging of the subsoil profile was undertaken at 4 locations, as shown in drawing (attached). The logging of the soil profile involved excavation of 3 test holes on the 14th August 2009, and 1 test hole on the 25th November 2009 was carried out in accordance with the methodology outlined in AS 1547 and *On-site Sewage Management for Single Households.*

A previous report was put together in September 2003, by Engineering Geology Specialist, this report has also been used to cross reference the soil logs.

Two site meetings were conducted with Malcolm Hunter from Great Lakes Council in relation to the report and the site, consultation has also occurred with Mr Ben Asquith from BMT WBM for a peer review.

5.2. Disposal Area Calculations

The method used to calculate the required disposal area is.

- Australian Standard - AS 1547 Recommended Design Irrigation Rate (DIR) For Irrigation Systems Table 4.2A4
- The associated spread sheet is Nominated Area Method. (as attached)

6. RESULTS

6.1. Site Investigation

Site investigations revealed at the 1st investigation:

Topsoil of a Black Silty Clay Loam to 200mm, with a Grey / Black Clay Loam to 350mm, then a Brown / Grey Clay to 500mm, then underlain Sandy Clay to 1100mm with soil depth being 1200mm in bore holes 1, 2 & 3.

The 2nd site investigation revealed a Topsoil of Black Organic layer to 300mm followed by a Fine Sandy Loam to a depth of 700mm. The underlying material was a puggy medium clay with no refusal @ 1200mm.
The borehole had no signs of ground water but it was excavated in a dry period

Logs of the subsurface profile can be seen in the attached Soil Profile Sheet.

Neither surface water nor groundwater was encountered during the investigation.

6.2. Disposal Area Calculations

The on-site effluent disposal area calculated by the method described above, for the proposed development is summarised below in Table 3.

TABLE 3: Recommended Design Irrigation Rate for Irrigation Systems.

	Required Area (m^2)
AS 1547 Method (effluent produced =6000L/day/ with a LTAR 25ltrs/m^2/week)	3000

Section 6 describes the above results in relation to the treatment and disposal systems recommended for the site.

7. LIMITATIONS TO ON-SITE EFFLUENT DISPOSAL

Table 6 of The Environment and Health Protection Guideline *On-site Sewage Management for Single Households* provides a soil assessment rating system for on-site effluent disposal systems. When the results from the site investigations and soil analysis are compared with this table, a number of minor, moderate or major limitations to the on-site diposal of treated effluent on the subject site can be identified. These limitations are given in Table 4 below.

TABLE 4: Minor, Moderate and Major Limitations to the On-site Irrigation of Treated Effluent.

Soil Feature	Limitation
Depth to bedrock	Minor
Permeability	Minor

8. CONCLUSIONS - TREATMENT AND DISPOSAL OPTIONS

Based on our evaluation of the site and the identified soil profile, the lot is suitable for the on-site disposal of effluent from:

A split bed recirculating media filtration system treats effluent from a primary septic tank to high standard of a waste water treatment, as set out in AS 1547 and *On-site Sewage Management for Single Households*. Aquatech Treatment System's have sized the required system to meet the requirement for the proposed development; the sizing of the Split Bed Recirculating System is attached.

The system described above incorporates a flow balancing / dosing tank which allows effluent to be stored if it is surge loaded. This liquid can be removed if needed from the Balance/Dosing Tank.

The soil results show the soil is a poor quality and therefore requires the treated wastewater to be of the highest quality, disposal will need to be at a low rate to help with the take up into the soil, the area of disposal is lower than the 1st test area, but is predominately the same soil characteristic's as test # 2 BH1.

The system has been designed for 65% of the treated daily flow to be applied to the disposal area, the balance will be balanced out in the time dosed irrigation/ wet weather storage tank with a capacity of 100,000Ltr. This allows for the disposal area to be keep to a minimum.

To enable the disposal area to be sized at 3000 m^2 the balance of the daily flow can be collated in the peak periods such as Christmas and then applied to the disposal area.

The required disposal area will be 3000m^2 in size. This will be installed inconjuction with a 100,000Ltr Irrigation / Wet Weather Storage Tank.

The liquid will be dispersed by pressure dosing 8 x Zones of 250m^2, with 2ltr/hr sub surface irrigation emitters.

This to allow for a high evapotranspiration to occur. Pressure dosing also allows for an even distribution of treated effluent into the zone. With each dose, the system automatically disperses the treated effluent into a rotating valve; this valve will alternate the doses to the 8 zones. This allows each zone to have a periodic rest period.

Upon installation the disposal area will require an application of Gypsum and be top dressed with a layer of organic material approximately 50mm thick.

The main area of the Long Houses and Dinning Pavilion will be able to be serviced by a gravity fall sewer main to the WWTS.

The area that the Ensuited Cabins are located in, will need to serviced by a pressure sewer system to be able collate the waste from each Cabin and convey through to the WWTS.

We have recently installed a system as such at the Eco Point Tourist Resort Bombah Point Bulahdelah. This has proven to be successful for a flat area, with very little ground fall. A brochure is attached of the product used.

A reserve effluent disposal area is recommended by AS 1547 and is equivalent to 100% of the area of the primary disposal area. The purpose of the reserve disposal area is to rest the primary disposal area, or for duplication of the disposal area if unforeseen circumstances require this at some time in the future. The reserve disposal area is to be protected from any development that would prevent its use in the future.

The site has adequate area to support a reserve disposal area may the need arise in the future.

9. ON-SITE DISPOSAL REQUIREMENTS AND RECOMMENDATIONS

The installation and operation of the on-site sewage disposal system should be undertaken in accordance with the following guidelines.

9.1. Buffer Setbacks

Recommended Buffer Distances for On-site Systems are as per Environment & Health Protection Guidelines: Table 5.

9.2. Drainage

The surface of the disposal area should be graded to prevent surface water ponding on the disposal area.

An uphill diversion drain must be constructed to protect the disposal area from surface run off from surrounding areas. Upslope subsurface seepage should be intercepted and diverted away from the disposal area by a subsoil drain.

9.3. Installation

The installation of the proposed treatment system is to be performed by the designer Aquatech Treatment Systems.

9.4. Vegetation

The effluent disposal site must be vegetated before effluent is applied. The vegetation can include grasses, shrubs and trees.
Vegetation should be regularly mowed and pruned to maintain the rate of evapotranspiration. Clippings and weeds removed from the disposal area should be disposed of away from the area to avoid increased nutrient loads on the irrigation area. Likewise, clippings and other vegetation should not be disposed of on the area.

Buffer zones (Section 7.1) adjacent to the irrigation area should also be planted with suitable vegetation.

9.5. Effluent Quality

Effluent from the selected waste water treatment system is to be disposed in the disposal area in accordance with the requirements of AS 1547 and Table 14 of *On-Site Sewage Management for Single Households.*

Please find attached a copy of the resent MidCoast Water Laboratory Analytical Report.

Methods to reduce effluent strength include:

i. Using the minimum recommended amounts of low phosphate, biodegradable liquid detergents and cleaning agents;
ii. Avoiding large quantities of bleaches, disinfectants and whiteners;
iii. Minimising the amount of solid waste entering the septic system, especially non-biodegradable items such as plastics.

It is important that the occupant makes a consistent effort to reduce the strength of the treated effluent.

9.6. Maintenance

The Wastewater Treatment System will need to be serviced quarterly to carry out checks on the system or as set in the condition of approval by the authority.

The disposal system should be regularly checked to ensure that it is operating correctly, the disposal area will need to have an annual top dressing of gypsum . Signs of failure include surface ponding, effluent run off, erosion, leaching of the soil, poor vegetation growth including burnt vegetation, odours or the formation of surface crusts.

Yours Faithfully
Aquatech Treatment Systems

Lloyd Aquilina

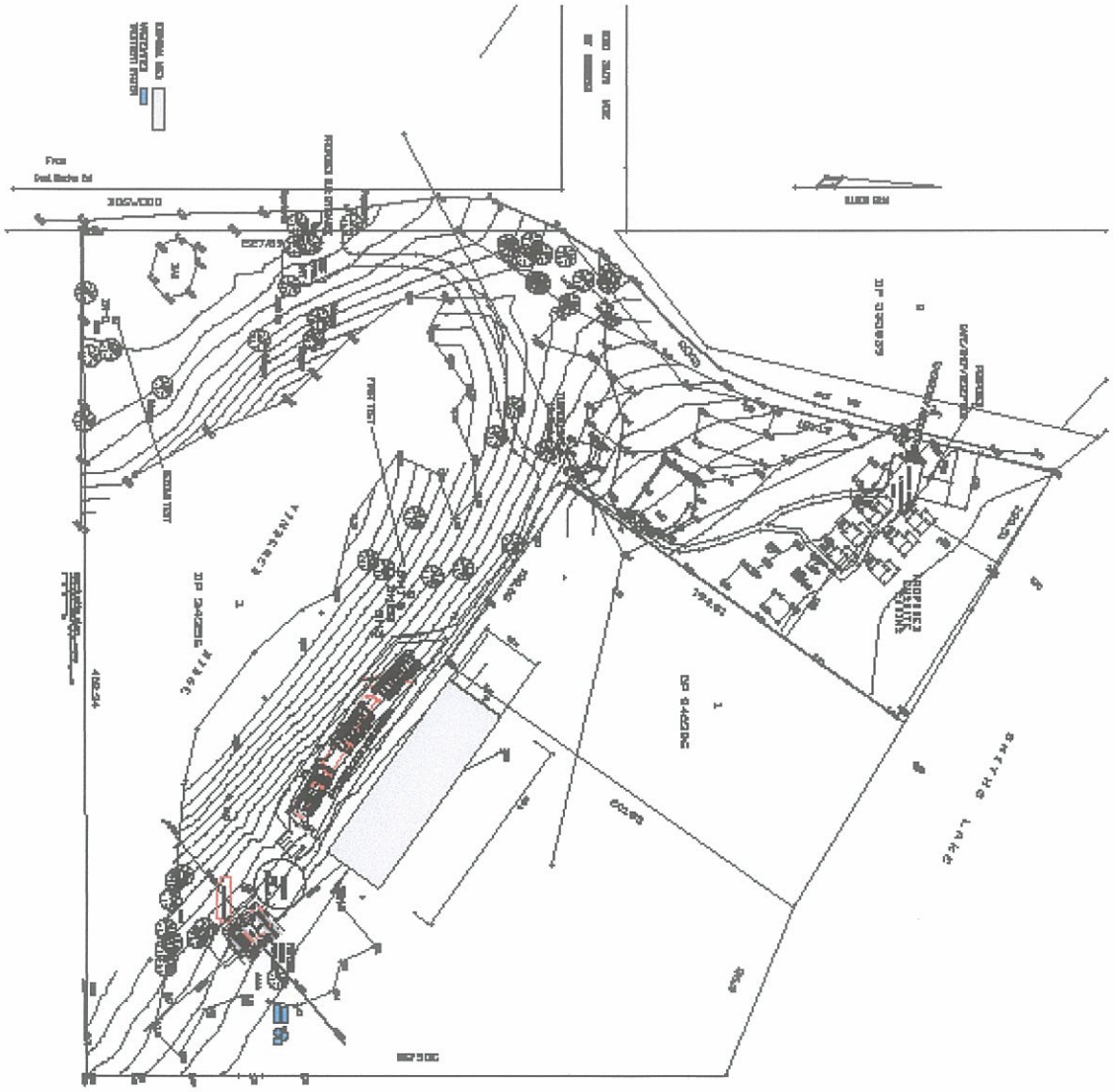
Reference

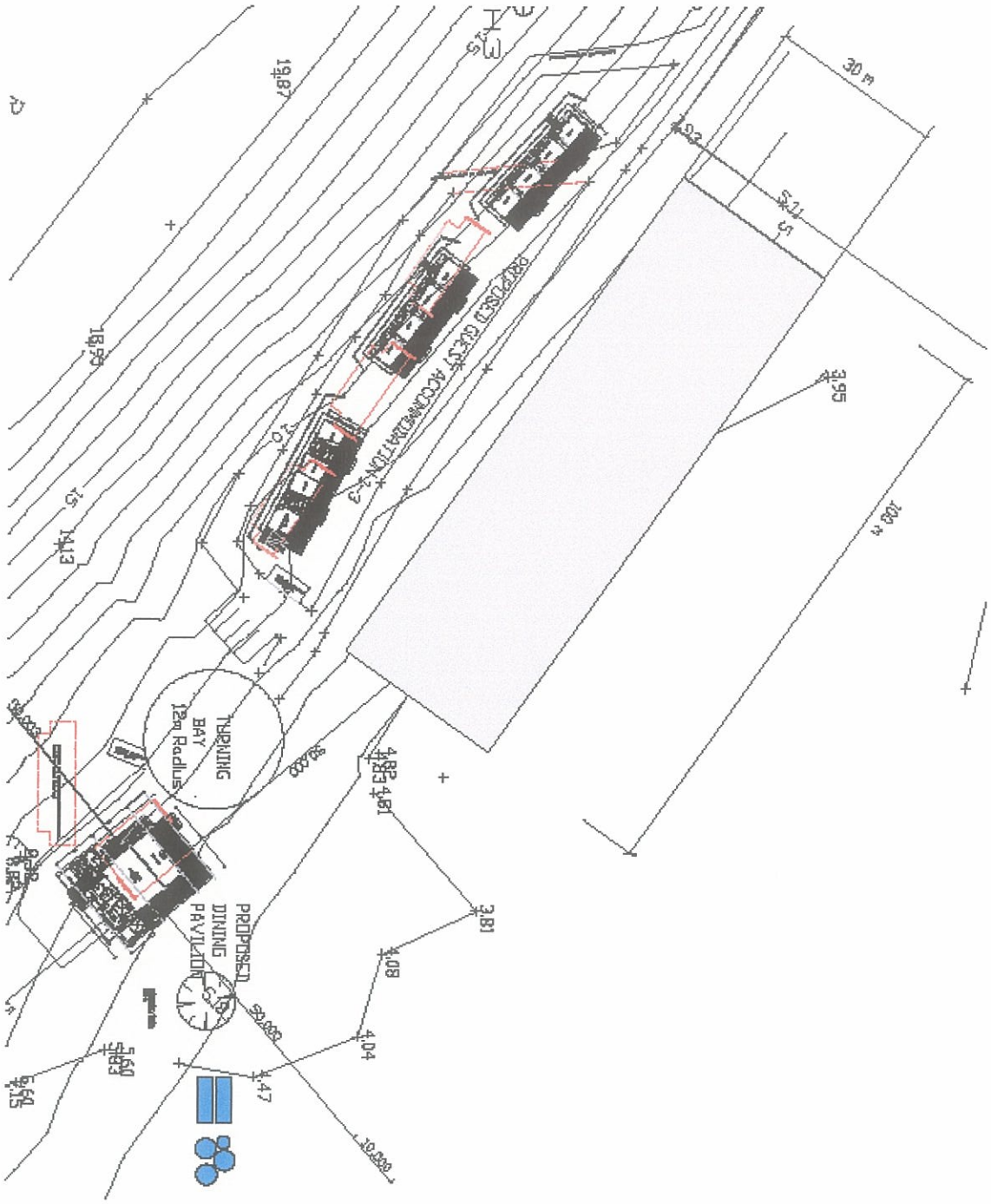
AS/NZS 1547:2000Australian /New Zealand Standard 1547:2000 *On-site Domestic-wastewater management.*

Attachments:

1. Site Plans.
2. Soil Profile.
3. Soil Conservation Service Reports.
4. Water Balance.
5. Digital Shots.
6. System Components.
7. Sewerage Management System Design.
8. Split Bed Sizing Calculations.
9. Hydraulic Calculations.
10. MidCoast Water Laboratory Analytical Report

1. Site Plans




30 m
108 m
PROPOSED GUEST ACCOMMODATION
PROPOSED DINING PAVILION
TURNING BAY 12m Radius
19.87
18.93
3.95
4.82
4.81
3.81
4.08
4.04
4.47
4.60
4.69

2. Soil Profile

SOIL PROFILE
1st Site Investigation.

LAYER	LOWER DEPTH mm	MOISTURE	COLOUR & MOTTLES	COURSE FRAGMENTS & TYPE	STRUCTURE	SOIL CATEGORY	SAMPLE TAKEN
1	0 - 200mm	5%	Black		Highly	3	14/8/09
2	200mm - 350mm	3%	Grey / Black		Highly	4	14/8/09
3	350mm - 500mm		Grey / Brown		Moderate	4	14/8/09
4	500mm - 1100mm		Sandy Clay		Moderate	4	14/8/09
5	1200mm Refusal						

SOIL PROFILE
2nd Site Investigation.

LAYER	LOWER DEPTH mm	MOISTURE	COLOUR & MOTTLES	COURSE FRAGMENTS & TYPE	STRUCTURE	SOIL CATEGORY	SAMPLE TAKEN
1	0 - 300mm	3%	Black		Highly	2	25/11/09
2	300mm - 700mm	3%	Grey / Black		Highly	2	25/11/09
3	700mm - 1200mm	5%	Grey / Orange		Moderate	3	25/11/09
4							
5							

3. Soil Conservation Reports

Soil Conservation Service
Experienced people managing your resources

Land and Property Management Authority

Scone Research Centre
PO Box283
SCONE NSW 2337
P: 02 6545 1666
F: 02 6545 2520
M: 0408 446 132

Lloyd Aquilina
Aquatech Treatment Systems
8 Barry's Lane
MARKWELL NSW 2423

14 August 2009 SCO09/238R1

Dear Lloyd Aquilina

Analysis of one soil sample – Thiess John Gowing

The analysis of one soil sample for Thiess John Gowing (26/08/09) has been completed and the results are reported as Soil test report SCO09/198R1. This sample was analysed for: electrical conductivity (EC) and pH (1:5 soil to water suspension); cation exchange capacity (CEC) and exchangeable sodium (Na), potassium (K), calcium (Ca), magnesium (Mg) and aluminium (Al); phosphorus sorption capacity (P sorp); Emerson aggregate test (EAT); and texture.

The results of the soil analysis have been discussed below.

Thiess John Gowing

The Thiess John Gowing sample was moderately acidic (pH 6.0) clay loam and was classified as Soil Category 4 (AS/NZS 1547:2000). The electrical conductivity (EC) indicates that this sample had low salinity.

The cation exchange capacity (CEC) and concentration of potassium (K) and calcium (Ca) were all low or moderate. In contrast, the concentration of exchangeable sodium (Na) and magnesium (Mg) were both high. The low level of exchangeable aluminium (Al) may adversely affect the growth of some sensitive plants.

The Thiess John Gowing sample had a high phosphorus sorption capacity (P sorp) and hence a high capacity to adsorb phosphate.

The Emerson aggregate test (EAT) indicates that the Thiess John Gowing sample had high to moderate dispersion and was prone to spontaneous dispersion. Amelioration with

gypsum (eg. 1 kilogram per square metre) may help to treat the dispersion (as well as balance the low calcium and high sodium and magnesium levels). This sample was also prone to slake which is indicative of lower than optimum organic matter content and thus addition of composted organic matter may help to improve the soil condition.

This interpretation was based on the sample supplied being representative, and literature guidelines. If you have any queries, please contact me on (02) 6545 1666.

Yours sincerely

SR Young

SR Young
Laboratory Manager
Scone Research Centre

Department of Lands
Land Administration & Management
Property & Spatial Information

Soil Conservation Service

SOIL TEST REPORT

Scone Research Centre

REPORT NO:	SCO09/238R1
REPORT TO:	L Aquilina Aquatech Treatment Systems 8 Barry's Lane Markwell NSW 2423
REPORT ON:	One soil sample Thiess John Gowing 26/08/09
PRELIMINARY RESULTS ISSUED:	Not issued
REPORT STATUS:	Final
DATE REPORTED:	11 September 2009
METHODS:	Information on test procedures can be obtained from Scone Research Centre

TESTING CARRIED OUT ON SAMPLE AS RECEIVED

G Holman
(Technical Officer)

Scone Research Centre, PO Box 283 Scone 2337, 709 Gundy Road Scone 2337
Ph: 02 6545 1666 Fax: 02 6545 2520

SOIL AND WATER TESTING LABORATORY
Scone Research Centre

Report No: SCO09/238R1
Client Reference: L Aquilina
Aquatech Treatment Systems
8 Barry's Lane
Markwell NSW 2423

Lab No	Method	C1A/4	C2A/3	C5A/3 CEC & exchangeable cations (me/100g)						C8B/1		P9B/2	
	Sample Id	EC (dS/m)	pH	CEC	Na	K	Ca	Mg	Al	P sorp (mg/kg)	P sorp index	EAT	Texture
1	Thiess John Gowing	0.02	6.0	12.1	1.3	0.1	0.9	5.9	1.5	416	3.0	2(1)	clay loam

END OF TEST REPORT

Soil Conservation Service
Experienced people protecting your resources

Land and Property
Management Authority

Lloyd Aquilina
Aquatech Treatment Systems
8 Barry's Lane
MARKWELL NSW 2423

SCO09/323

27 November 2009

Dear Lloyd Aquilina

Analysis of one soil sample – John Gowing #2

The Soil Conservation Service Laboratory has completed the analysis of one soil sample (Soil test report SCO09/323R1). This sample was analysed for: electrical conductivity (EC) and pH (1:5 soil to water suspension); cation exchange capacity (CEC) and exchangeable sodium (Na), potassium (K), calcium (Ca), magnesium (Mg) and aluminium (Al); phosphorus sorption capacity (P sorp); Emerson aggregate test (EAT); and texture.

Interpretation

The John Gowing #2 sample was a moderately acidic (pH 5.8) fine sandy loam with a soil category (AS1547) of 2. The salinity of this sample, measured as the electrical conductivity (EC), was low and should not affect plant growth.

The cation exchange capacity (CEC), an estimate of the soils ability to hold exchangeable cations, was determined to be low for the John Gowing #2 sample. While exchangeable potassium (K) and exchangeable calcium (Ca) were low, exchangeable magnesium (Mg) was moderate-high and exchangeable sodium (Na) was high. A low level of exchangeable aluminium (Al) was detected in the John Gowing #2 sample. The level of exchangeable aluminium was considered to be consistent with the acidic pH, but may only adversely affect sensitive plants. Agricultural lime treatment may be used to treat soil acidity.

The high level of exchangeable sodium was reflected in the moderate to high dispersion. The Emerson aggregate test (EAT) also indicates that the John Gowing #2 sample was prone to spontaneous dispersion. Soil dispersion may be treated with gypsum and agricultural lime. This sample was also prone to slake which is indicative of less than optimal organic matter content.

The phosphorus sorption capacity (P sorp) was moderate indicating the John Gowing #2 sample has moderate capacity to take-up phosphates applied to the soil in the effluent.

This interpretation was based on the sample supplied being representative, and literature guidelines.

If you have any queries, please contact me on (02) 6545 1666.

Yours sincerely

SR Young
Laboratory Manager
Scone Research Centre

Department of Lands
Land Administration & Management
Property & Spatial Information

Soil Conservation Service

SOIL TEST REPORT

Scone Research Centre

REPORT NO:	SCO09/323R1
REPORT TO:	Lloyd Aquilina Aquatech Treatment Systems 8 Barrys Lane Markwell NSW 2423
REPORT ON:	One soil sample John Gowing #2
PRELIMINARY RESULTS ISSUED:	Not issued
REPORT STATUS:	Final
DATE REPORTED:	25 November 2009
METHODS:	Information on test procedures can be obtained from Scone Research Centre

TESTING CARRIED OUT ON SAMPLE AS RECEIVED

G Holman
(Technical Officer)

Scone Research Centre, PO Box 283 Scone 2337, 709 Gundy Road Scone 2337
Ph: 02 6545 1666 Fax: 02 6545 2520

SOIL AND WATER TESTING LABORATORY
Scone Research Centre

Report No: SCO09/323R1
Client Reference: Lloyd Aquilina
Aquatech Treatment Systems
8 Barrys Lane
Markwell NSW 2423

Lab No	Method	C1A/4	C2A/3	C5A/3 CEC & exchangeable cations (me/100g)						C8B/1		P9B/2	
	Sample Id	EC (dS/m)	pH	CEC	Na	K	Ca	Mg	Al	P sorp (mg/kg)	P sorp index	EAT	Texture
1	John Gowing #2	0.05	5.8	8.7	0.8	0.2	1.0	2.9	0.8	317	2.6	2(1)	fine sandy loam

END OF TEST REPORT

4. Water Balance

Nominated Area Method.

A monthly water balance used to determine Wet Weather Storage for
with a nominated Irrigation Area in accordance to "Onsite Sewage Management for SIngle Households".

JOB NO.: **Dogwood Road**
LOCATION: **Bungwhal**
CLIENT: **John Gowing**
DATE: **19th January 2010**
RAIN DATA FROM: **Forster**
EVAPORATION DATA FROM: **Taree**
OPERATOR: **L Aquilina**

Design Wastewater Flow	Q	l/day	6000
Design Percolation Rate	R	mm/wk	25
Land Area	L	m^2	3000.0

Approx 54.8m square

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in Month	D	-	days	31	28	31	30	31	30	31	31	30	31	30	31	365
Precipitation	P	-	mm/month	107.3	119.8	149.3	128.7	118.5	117	87.4	72.4	67.6	78.4	80.7	92.4	1219.5
Evaporation	E	-	mm/month	176.7	145.6	133.3	99	65.1	54	62	83.7	114	145.7	159	189.1	1427.2
Crop Factor	C	-	-	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
Inputs																
Precipitation	P	-	mm/month	85.84	95.84	119.44	102.96	94.8	93.6	69.92	57.92	54.08	62.72	64.56	73.92	975.6
Effluent Irrigation	W	(Q x D)/L	mm/month	62.0	56.0	62.0	60.0	62.0	60.0	62.0	62.0	60.0	62.0	60.0	62.0	730
Inputs		(P + W)	mm/month	147.8	151.8	181.4	163.0	156.8	153.6	131.9	119.9	114.1	124.7	124.6	135.9	1705.6
Outputs																
Evapotranspiration	ET	E x C	mm/month	132.525	109.2	99.975	74.25	48.825	40.5	46.5	62.775	85.5	109.275	119.25	141.825	1070.4
Percolation	B	(R/7) x D	mm/month	110.7	100.0	110.7	107.1	110.7	107.1	110.7	110.7	107.1	110.7	107.1	110.7	1303.6
Outputs		(ET + B)	mm/month	243.2	209.2	210.7	181.4	159.5	147.6	157.2	173.5	192.6	220.0	226.4	252.5	2374.0
Storage	S	(P + W) - (ET + B)	mm/month	-95.4	-57.4	-29.2	-18.4	-2.7	6.0	-25.3	-53.6	-78.6	-95.3	-101.8	-116.6	-668.4
Cumulative Storage	M	-	mm	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
Storage per Day			mm/day	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2

				1 Days	*3 Days*	4 Days	7 Days	14 Days	Total
Storage	V	**Largest M**	**mm/day**	**0.2**	***1***	**1**	**1**	**3**	**6**
		(V x L)/1000	**m^3**	**0.6**	***2***	**2**	**4**	**8**	**18**
			L	**596**	***1787***	**2383**	**4170**	**8340**	**17871**

5. Digital Shots

Bore Hole 1
First Sample View: North West

Bore Hole 2
First Sample View: West

Bore Hole 1
First Sample View: North East

Bore Hole 3
First Sample View South East

Bore Hole # 1Eastern View
Second Sample

Bore Hole # 1 Eastern View
Second Sample

6. System Components

• System Components Information

1. Primary **Capacity 22,500ltrs**

The primary tank is a Concrete Tank, the primary tank overflow is fitted with an Everhard Outlet Filter in the outlet square junction.
The tank in a Rutherford Concrete Product known as a 22,500Ltr Tank.

2. Dosing / Balance **Capacity 22,500ltrs**

The Dosing/Balance tank is a Concrete Tank.
The tank in a Rutherford Concrete Product known as a 22,500Ltr Tank
Dosing pump is a Lowara Scuba SC5, Information is attached.

3. Clarifier **Capacity 4500ltrs**

The clarifier is designed to allow separation of suspended solids over a time period before entering the circulation well, it has a surface area of $4.5m^2$.
The tank in a Rutherford Concrete Product known as a 4500 Holding Tank, this tank is modified for its application prior to installation.
De Sludge pump is a Lowara Doc 3, Information is attached.

4. Media Filter **2 x $20m^2$ Area**

The Media Filter is constructed in ground in a liner. Canvacon 5000.
The Media Filters are 8mtrs & 2.5mtrs each
The media is set out in layers:

Layer 1:	20mm aggregate @ 200mm thick
Layer 2:	5mm aggregate @ 600mm thick
Layer 3:	20mm aggregate @ 150mm thick
Layer 4:	20mm aggregate @ 150mm thick

The Manifold distributing the wastewater is constructed out of 25mm Class 12 PVC pipe.
There are 42 x 6mm holes located in the manifold to apply the liquid evenly across the surface of the media filter.

5. Irrigation / Wet Weather Storage Tank Capacity100,000ltrs

The Irrigation / Wet Weather Storage Tank receives the liquid from the clarifier and is then time dosed controlled to distribute the liquid to the set irrigation area.

The Irrigation / Wet Weather Storage Tank has the ability for 10 days of storage, if there is a power failure or mechanical failure.

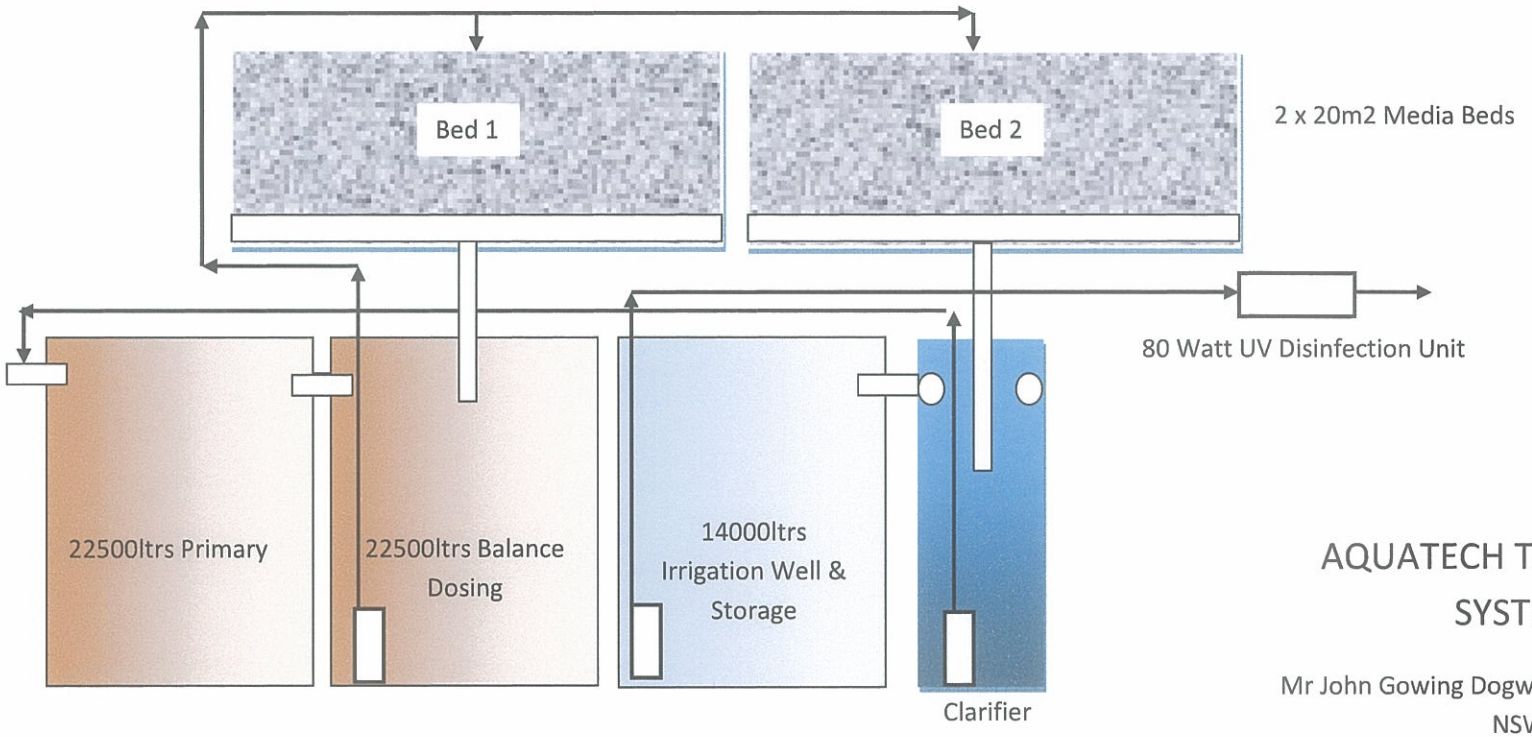
It also has the storage ability for 20 days of storage to dose out surplus from the daily flow.

Irrigation pump is a Lowara Scuba SC7 Pump, Information is attached.

6. UV Disinfection Unit

The Ultra Violet Disinfection Unit is installed after strainer filter on the irrigation supply line.
The unit is a Wadeco PS-M880P1A-E25 which has a 80watt lamp.
If the lamp fails it is wired to the main control unit and will sound the alarm mounted in the dwelling, which can be reset by muting, but the alarm will go off every time the lamp tries attempt to light.

7. Sewerage Management System Design



AQUATECH TREATMENT SYSTEM

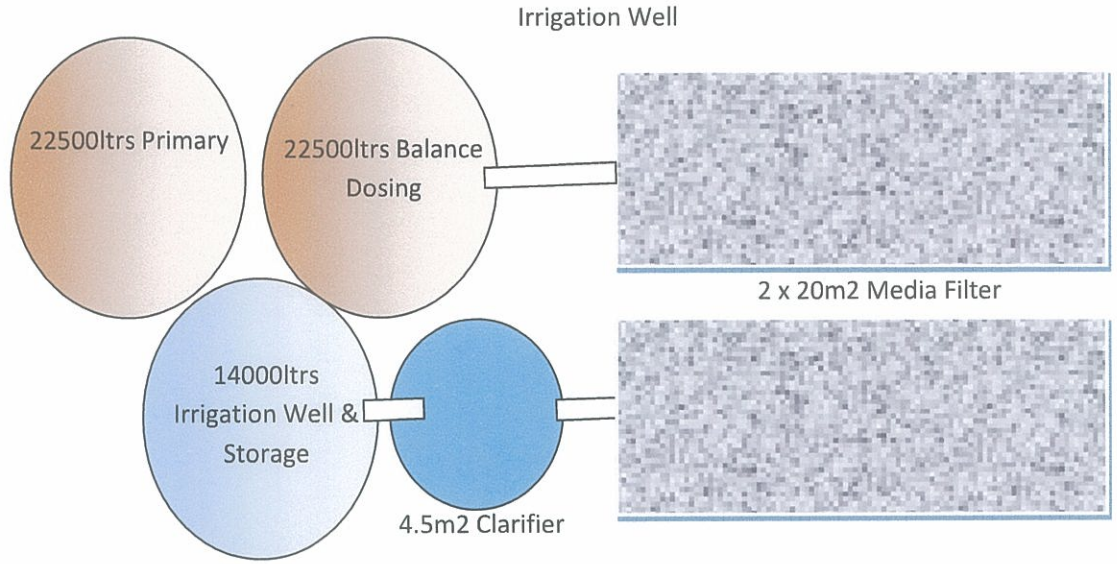
Mr John Gowing Dogwood Road Bungwhal NSW

Split Bed Recirculating Media System

Loading Rate:

Bed 1: 400Ltrs / m2

Bed 2: 200Ltrs / m2



8. Split Bed Sizing Calculations

SPLIT BED RECIRCULATING SAND FILTER SYSTEM

John Gowing Dogwood Road Bungwhal

DOMESTIC & COMMERCIAL PREMISES

A	**DESIGN WASTEWATER FLOW**		
	NUMBER OF EP		80
	DESIGN FLOW RATE PER / EP		115
	WASTE WATER FLOW P/DAY		9200
B		**PRIMATY SEPTIC TANK**	
	2	**CAPACITY REQUIRED**	18400
C		**FILTER DOSING WELL**	
	0.15	**PERMANENT LIQUID LEVEL**	2760
DWF	0.6	**WORKING VOLUME**	5520
	1	**EMERGENCY VOLUME**	9200
		CAPACITY REQUIRED	17480
D		**FILTER BED SIZING AREA**	M2
	400	**RECIRCULATION**	23
	200	**EFFLUENT**	23

	Load	EP	Ltrs/p/p	Load
Long House Units		36	80	2880
Dining Pavilion		36	35	1260
Managers Cottage		6	115	690
Ensuited Cabin		24	80	1920
Café		30	25	750
	Total	132	83.75	7500

Nitogen Loading			
	Load	9200	
x mg/L	10		
	sub total	92000	
divided by	25	3680	m2

E	**RECIRCULATION RATIO : 1**	
E1	**WORKING RATIO**	5
E2	**TOTAL LITRES PER DAY**	9200
E3	**FORWARD FLOW x RATIO LTRS/D**	46000
E4	**NUMBER OF DOSES PER DAY**	144
E5	**TOTAL LITRES PER DOSE @** Forward Flow / doses per day	319.444444
E6	**NUMBER OF BEDS**	1
E7	**SIZE OF BEDS M2**	9
E8	**OUTLETS ON ROTO VALVE**	1
E9	**TOTAL LITRES PER BED PER DOSE**	319.444444
E10	**TOTAL LITRES PER PER M2 PER DOSE**	35.4938272

ALL FIGURES BASED ON AS/NZS 1547:2000 APPENDIX 4.2D

9. Hydraulic Calculations.

10. Midcoast Water Laboratory Analytical Reports.

MidCoast Water Laboratory

Analytical Report

Report No.: 6875

Issue Date: 5/12/2007

Attention: LLOYD AQUILINA
Customer: AQUATECH TREATMENT SYSTEMS
Fax No.: 02 49978187

Address: BARRYS LANE
MARKWELL 2423 NSW

Customer ID: E_MARKW

Sample ID	Client Sample ID	Sampled	Received	Authorised	Description
M07007800	Aquatech TS	21/11/2007	21/11/2007	05/12/2007	

Sample Number	M07007800'				
Client ID	Aquatech TS				
Test	**Unit**				
#GDW17 - (APHA 5210B)					
CBOD5	mg/L	2			
#GDW44 - (APHA 2540D)					
Total Suspended Solids	mg/L	3			
#GMI01 - (APHA 9222D)					
Faecal Coliform	CFU/100mL	250			
NU41 - (APHA 4500-NH3 H)					
Ammonia Nitrogen NH3-N High Level	mg/L	1.4			
NU46 - (APHA 4500-NO2 I)					
Nitrite Nitrogen NO2-N	mg/L	0.340			
NU49 - (APHA 4500-NO3 I)					
Nitrate Nitrogen NO3-N	mg/L	4.46			
NU57 - (APHA 4500- PH & NO3 I)					
Total Nitrogen	mg/L	9.20			
NU62 - (APHA 4500-Norg D)					
Total Kjeldahl Nitrogen Low Level	mg/L	4.40			

ample ID	Comment Level	Method	Test	Comment
07007800	Method	GMI01	-	FC confirmed

AUTHORISED BY:

Tim Manusu
Senior Microbiologist

ABN 3327446218 Tel: 02 6555 4469 Fax: 02 6554 8198
Sweet Pea Rd, Locked Bag 4000 Forster 2428

Method No without # prefix analysed at SWC West Ryde

Analysed as received

MidCoast Water Laboratory

Analytical Report

Report No.: 6891

Issue Date: 7/12/2007

Attention: Lloyd Aqualina
Customer: Aquatech Treatment Systems
Fax No.: 02 49978187

Address: 8 Barry's Lane
Markwell 2423 NSW

Customer ID: E_AQUATECH

Sample ID	Client Sample ID	Sampled	Received	Authorised	Description
M07008229	Aquatech TS	06/12/2007	06/12/2007	07/12/2007	Sampled by Lloyd at 10 am

Sample Number	M07008229				
Client ID	Aquatech TS				
Test	**Unit**				
#GM101 - (APHA 9222D)					
Faecal Coliform	CFU/100mL	<1			

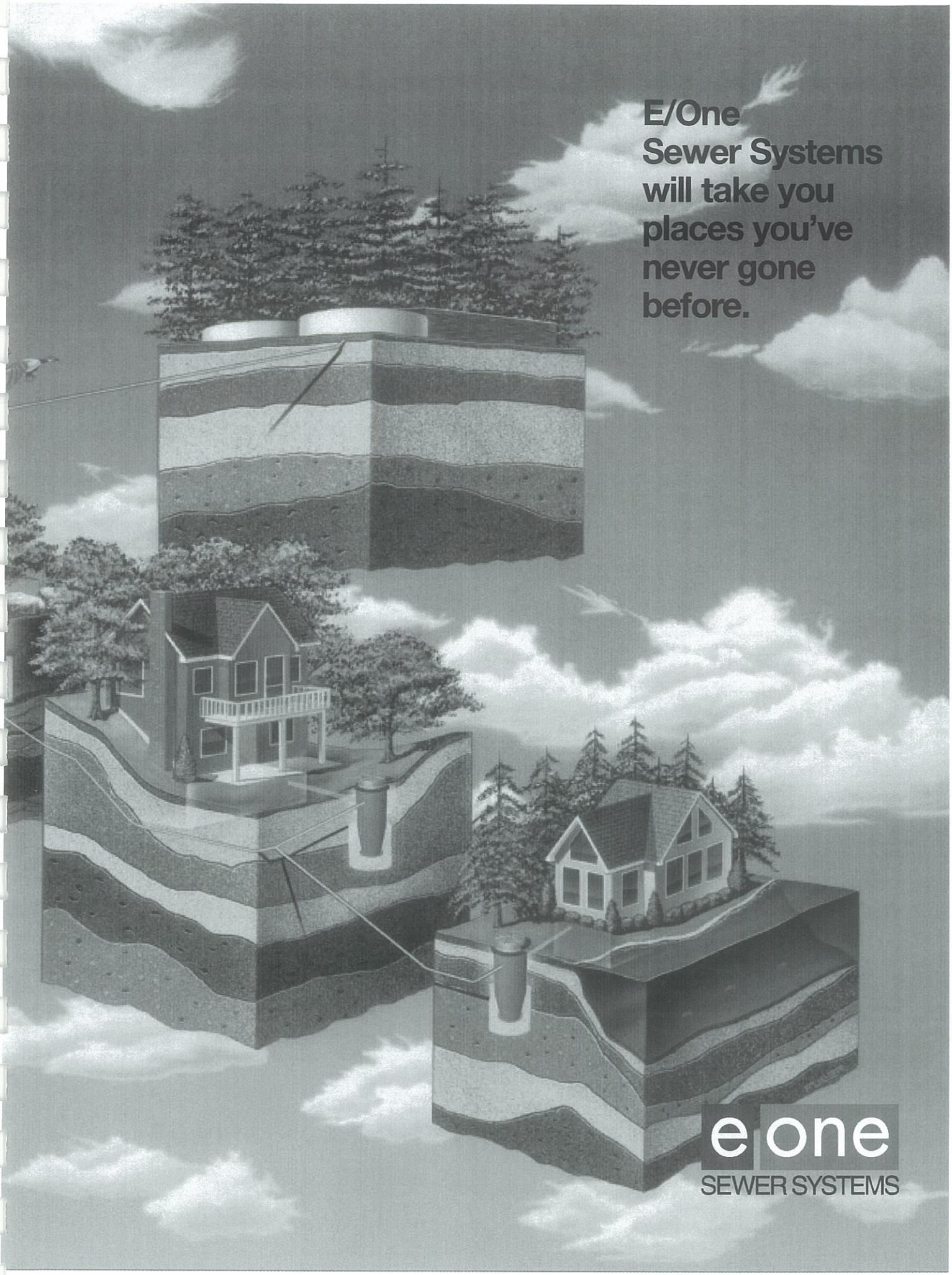
AUTHORISED BY:

Tim Manusu
Senior Microbiologist

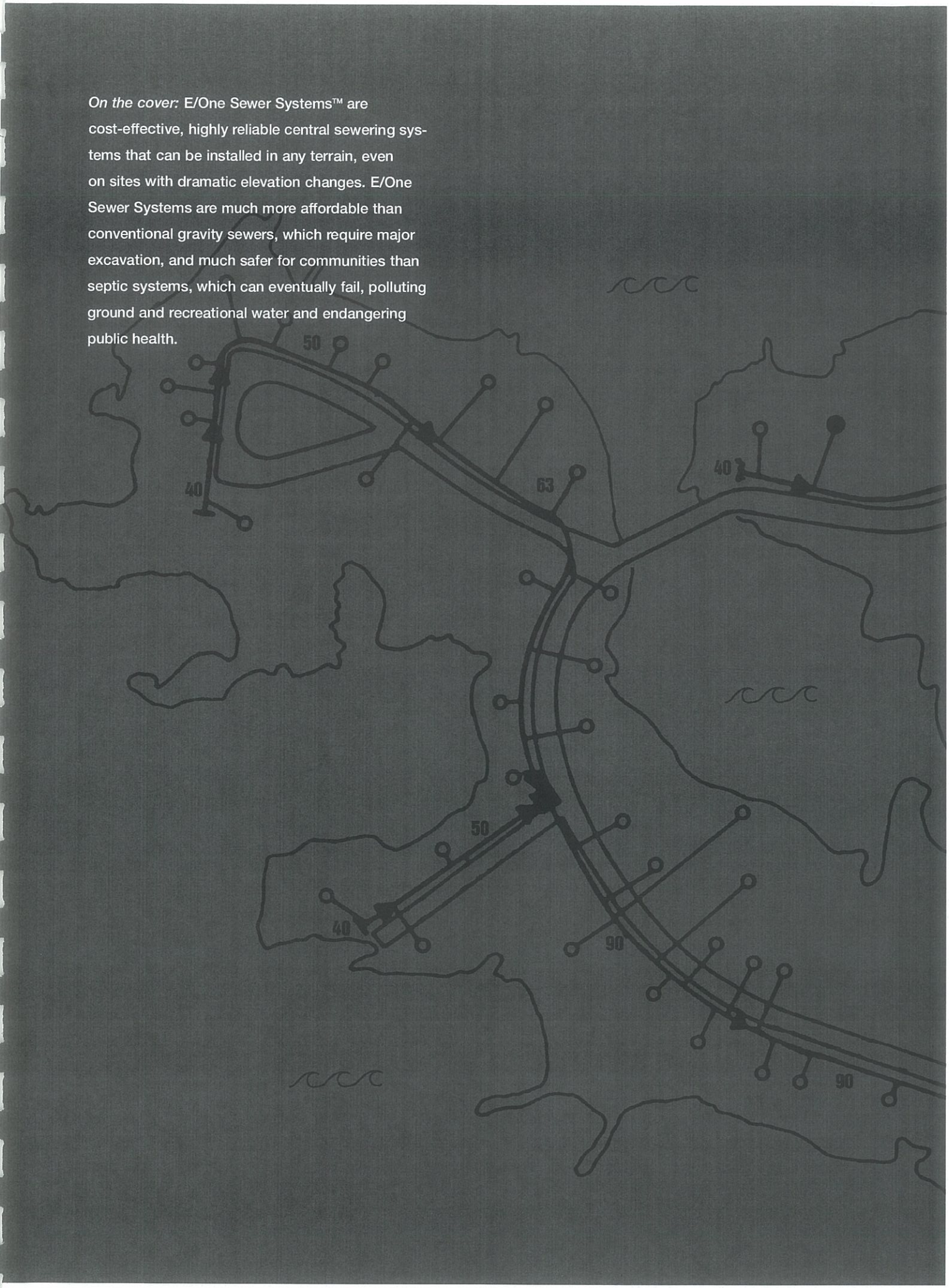
ABN 3327446218 Tel: 02 6555 4469 Fax: 02 6554 8198
Sweet Pea Rd. Locked Bag 4000 Forster 2428

Method No without # prefix analysed at SWC West Ryde

Analysed as received


E/One
Sewer Systems
will take you
places you've
never gone
before.
e one
SEWER SYSTEMS

On the cover: E/One Sewer Systems™ are cost-effective, highly reliable central sewering systems that can be installed in any terrain, even on sites with dramatic elevation changes. E/One Sewer Systems are much more affordable than conventional gravity sewers, which require major excavation, and much safer for communities than septic systems, which can eventually fail, polluting ground and recreational water and endangering public health.



E/One Sewer Systems™ give you the freedom to sewer anywhere–at up to half the cost of gravity sewers.

Rugged hills. Isolated flatlands. Coastal areas. Or sites with high water tables. With E/One behind you, you can sewer where no one has sewered before.

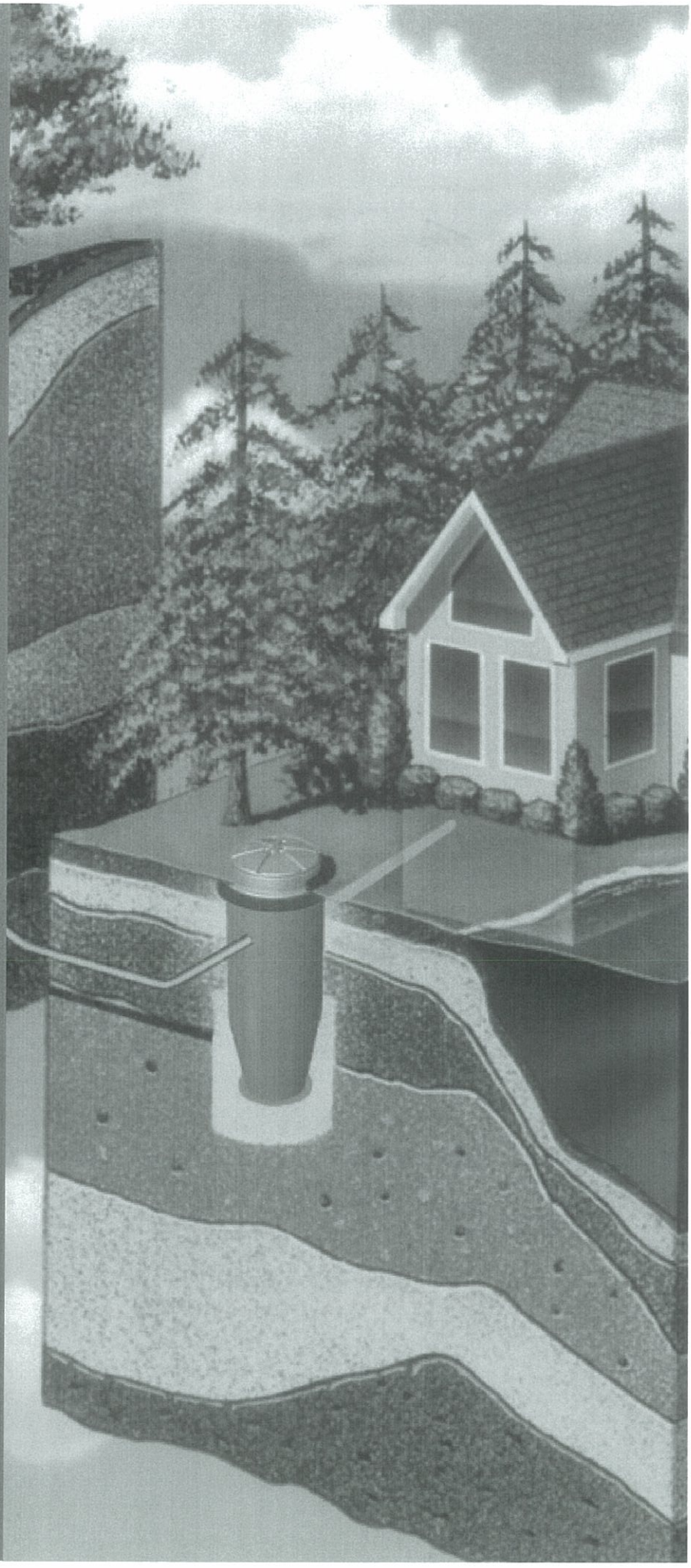
That's because E/One Sewer Systems™ follow the contour of the land. So they can go anywhere. Without destroying the landscape.

They're easier to install than conventional gravity sewers, so they greatly reduce the high cost of sewering. And they're highly reliable. So they lower operating costs.

They're also safer than septic systems, which are environmental time bombs threatening ground and recreational water.

Cost-efficient. Reliable. Goes anywhere. And safer for the whole community.

Isn't that the direction you want to go?



E/One Sewer Systems are at home in communities all over the country.

Many communities have been made possible because of the E/One Sewer System idea and hundreds more have been made safe once again after failing septic systems created serious public health problems by contaminating ground and recreational water.

The E/One Sewer System delivers safe, cost-effective, reliable performance and enables controlled growth, permitting communities to maintain their quality of life at a cost they can afford.

The E/One Sewer System. What it is. How it works. Why it's better.

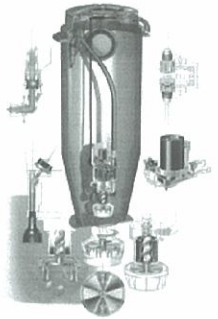
In the world of sewer system technology, less is more. The E/One Sewer System requires only a shallow trench and small 50 mm to 125 mm diameter piping. So, unlike conventional gravity central sewers, which use a 225 mm pipe and require deep excavation, the E/One Sewer System is not destructive to the landscape's natural or built features.

It also costs significantly less to install and operate than a gravity system. It requires less maintenance. But it guarantees big results.

Here's the idea behind the E/One Sewer System: Both the gravity sewer system and the E/One Sewer System are known as central sewer systems. (Septic systems fall into a whole other category of waste disposal—see "The High Cost of Septic Systems" on the following page.) Most cities and many villages use central sewering, which simply means that waste is transferred, usually by a pipe or main, to a central treatment plant.

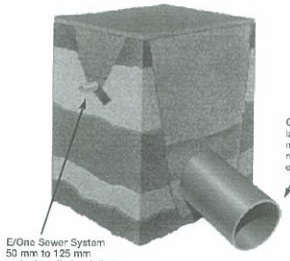
Gravity sewers are the "original" central sewers, with origins in the Roman aqueducts. Unfortunately, the technology behind gravity sewers is also centuries-old: they're bulky systems using a large main and can require major excavation to install. They must be accurately placed and bedded along a continuous downward grade. Plus they're expensive and not entirely efficient in transporting waste because they can tend to leak.

The more advanced E/One Sewer System employs highly sophisticated technology and has become known for its reliability, minimal maintenance, low upfront costs, reduced operating expenses, and ability to be installed at any site, regardless of the challenges of topography. And only the E/One Sewer System with its GP 2000i grinder pump overcomes the challenges of low-pressure systems, performing dependably day in and day out.



Small Is Beautiful.

Conventional gravity sewers use a 225 mm large-diameter pipe, or main, which requires major excavation and severely disrupts the landscape and any built structures such as lawns, driveways, and plantings. The E/One Sewer System uses an unobtrusive small-diameter 50 mm to 125 mm main installed at a minimum depth below the ground, following the natural topography of the land.



engineered to do one job perfectly.™

The GP 2000i grinder pump, the heart of the E/One Sewer System, provides wastewater storage, grinding, and pumping in a single unit. Translation: it lowers operating costs, the cost of waste collection, and reduces maintenance.

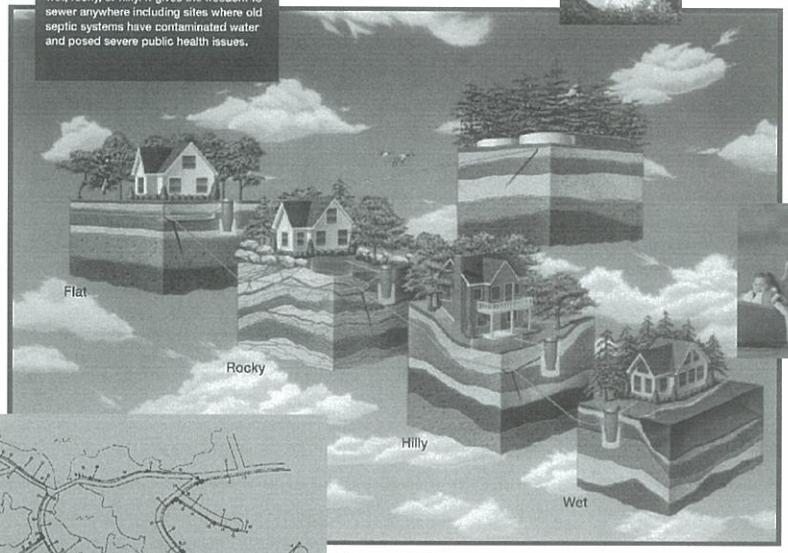
The E/One Sewer System grinder pump is engineered to do one thing perfectly and in the process will help communities control their growth and maintain quality of life.

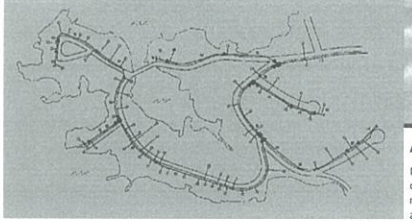
Defy Gravity with E/One.

The beauty of the E/One sewer system is that, unlike conventional central sewers, it defies gravity. Because installation follows the natural contour of the land, it is ideal for all terrain, including land that is flat, wet, rocky, or hilly. It gives the freedom to sewer anywhere including sites where old septic systems have contaminated water and posed severe public health issues.

How Does It Look From Where You Are?

Aesthetics are a major consideration for homeowners. The E/One Sewer System is virtually out of sight—the only visible part is a low-profile cover that blends seamlessly into the environment but provides easy access for servicing operations.





A Sense of Site.

Multi-branch E/One Sewer Systems serve the entire community and give engineers, developers, community planners, and homeowners the freedom to sewer anywhere, on any kind of site.

The Price Is Right.

E/One can solve sewering problems and replace failing septic systems at significantly less cost of conventional gravity sewers. E/One Sewer Systems sharply reduce both front-end costs and ongoing maintenance costs.

The Advantages of the E/One Sewer System.

Homeowners
- Safe—protects water quality and enhances quality of life
- Reduces costs of housing—both initial and ongoing
- Visually benign—only evidence is a low-profile cover that is easily camouflaged
- Does not disrupt the beauty of the landscape or damage built structures
- No maintenance or upkeep required of homeowner
- Central sewer increases value of home

Municipalities/Developers
- Permits freedom to sewer anywhere in any kind of terrain
- Low initial costs make central sewers economically feasible
- Low initial costs make development economically feasible
- Central sewer increases value of development units
- High reliability—maintenance is minimal
- Reduces operating costs
- Protective of public health
- Permits regulatory compliance

Engineers/Operators
- Proven engineering and design
- Ideal for every terrain and building environment
- Cost-effective central sewering solution for new construction or retrofits
- Engineering and technical support during design, construction, installation, and operation
- Reliable performance means reduced O&M costs
- When needed, E/One pumps are easy and safe to access and service
- Designed to keep maintenance to absolute minimum

Contractors/Construction Managers
- Installation follows contour of the land—does not require major excavation
- Needs only shallow trenches—increases ease and safety of installation procedures
- Labor and material costs are much less than gravity sewer systems

The High Cost of Septic Systems.

While septic systems may be a common way of disposing of residential sanitary waste, they are, at best, a temporary solution and come at a high cost to public health. All over the world, septic systems have degraded ground and recreational water, creating serious safety problems. Because of failing septic systems, water is not safe to drink. Children are not free to play near contaminated lakes and streams. Outbreaks of waterborne disease became common. Quality of life is eroded. In addition, failing septic systems decrease real estate values. E/One Sewer Systems can go wherever septic systems were initially used, reclaiming water quality and quality of life while providing an efficient, solution to wastewater disposal and treatment. In fact, communities retrofitting with E/One Sewer Systems have reported dramatic improvements in coliform levels in as little as 30 days after installation.

There's no limit to where you can go with E/One Sewer Systems behind you.

We hope this brochure has served as a useful introduction to how the E/One Sewer System works and why it is a cost-effective, reliable central sewering solution.

Of course, there's more to E/One than our highly engineered product. The people behind the product are here to answer your questions, keep you informed, and work with you on your project every step of the way from concept through design and construction.

For more information, call, fax, or email us at:

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49/76 Bayview Street
Runaway Bay, Queensland 4216
Australia
email: www.eone.com/au

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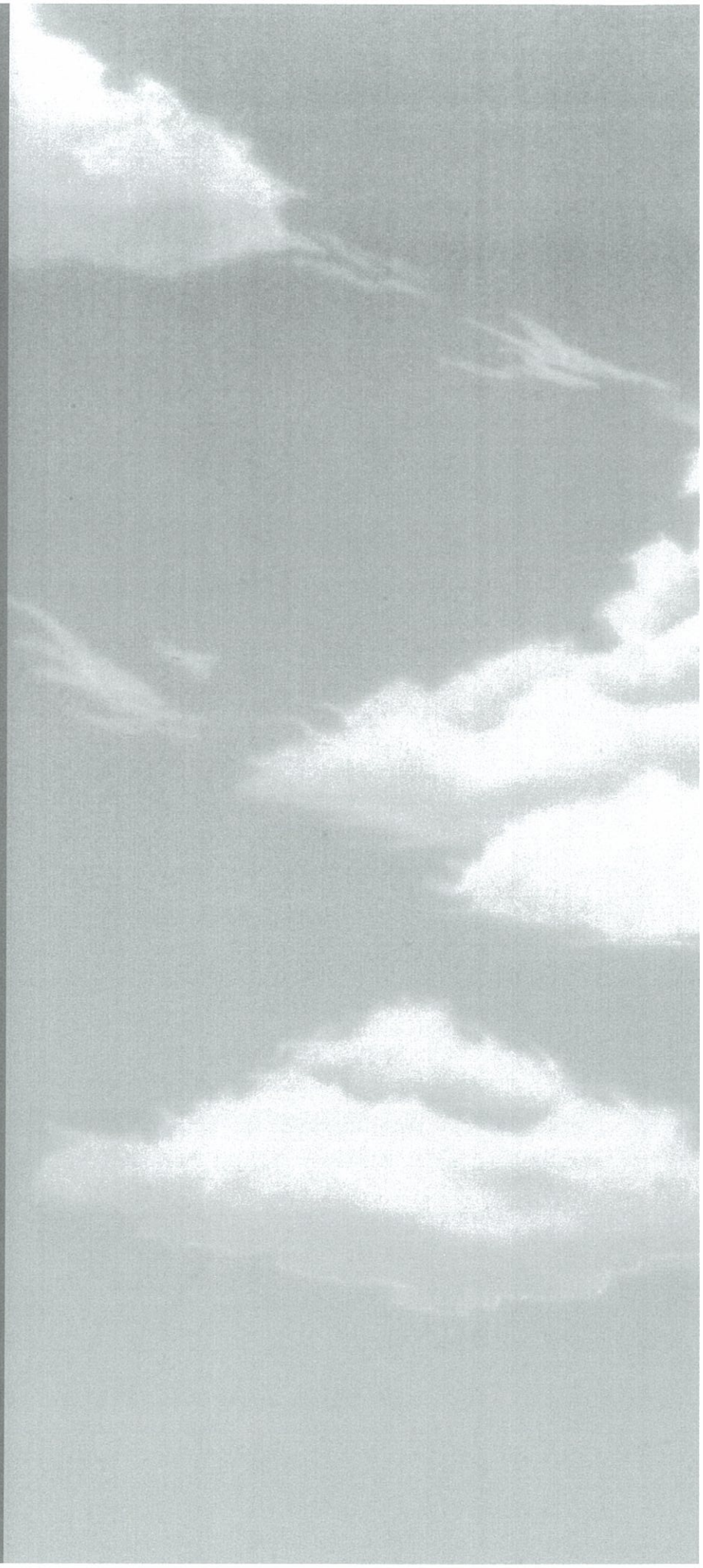

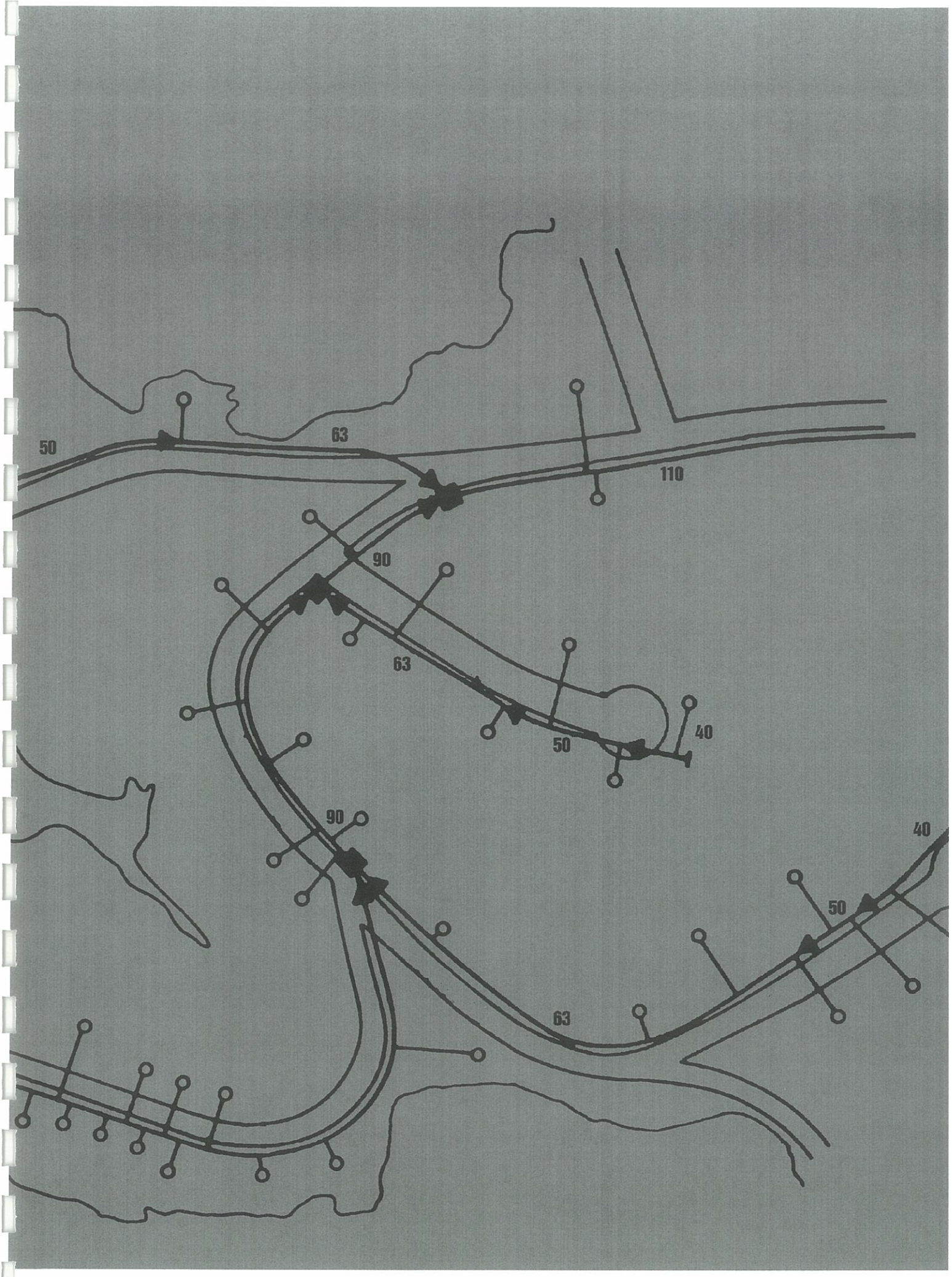
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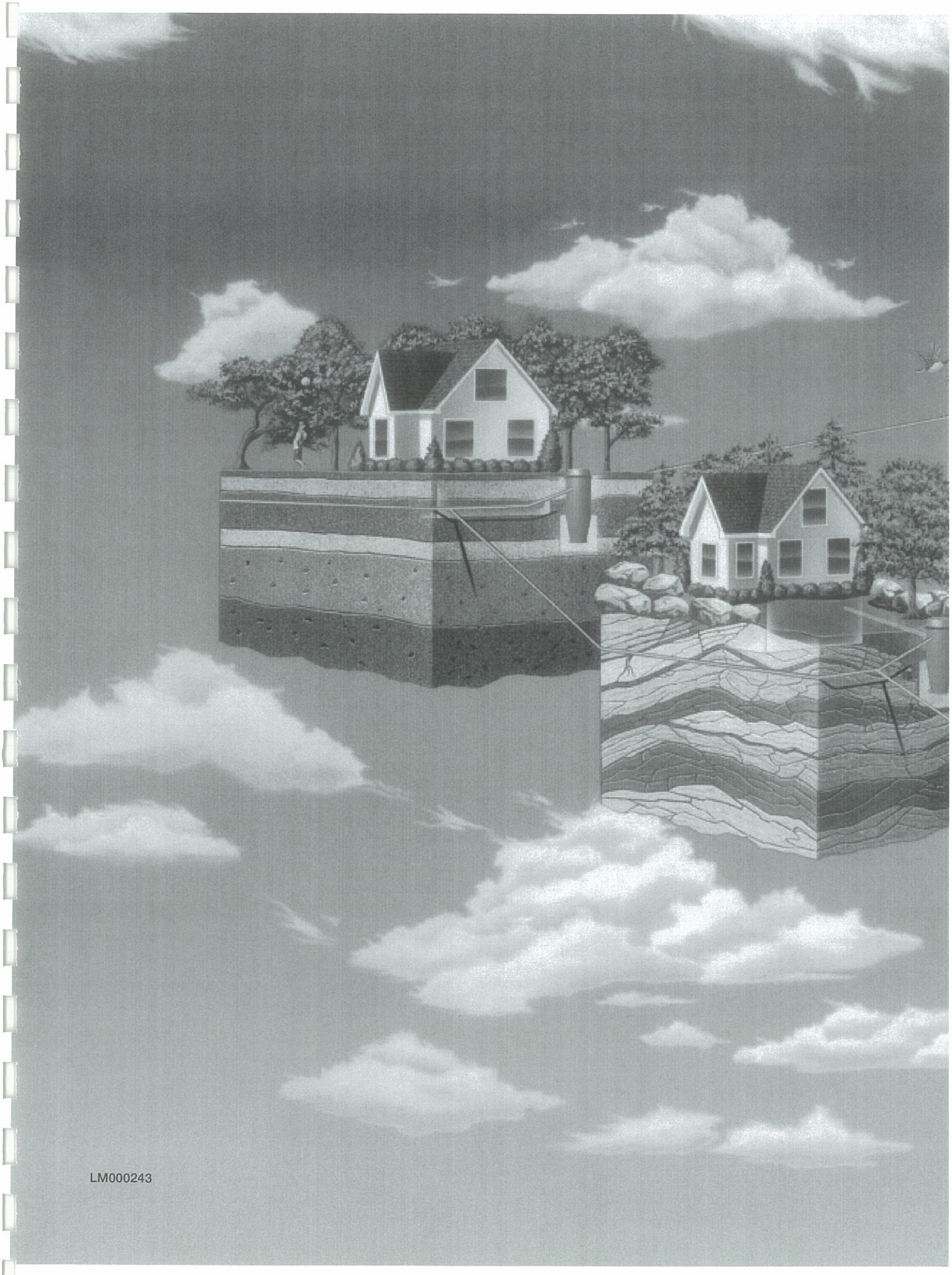

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