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12 August 2004

Marlborough District Council
Seymour Square
PO Box 443
Blenheim

Attention: Angus Laird

Dear Angus

Application for Resource Consent, Anderson Family Trust
U041287
Project A04-1068

Wastewater Treatment and Disposal

We are now recommending the Oasis Clearwater Texass treatment system coupled with the RAAM irrigation effluent disposal already recommended. The Texass system incorporates the PBR principle (Packed Bed Reactor). It is a re-circulating system, effluent is re-circulated over textile media approximately 6 minutes every 30 minutes for further treatment. According to the supplier the system produces BOD_5 of 15mg/l and suspended solids 15mg/l and is suitable for intermittent use. Please find attached amended wastewater design sheets and a specification for the Oasis Clearwater Texass system.

Please give me a call should you require any further information.

Yours sincerely

Jan Dimmendaal, Design Engineer, Smart Associates
MIPENZ

SMART ASSOCIATES Ltd.
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ACENZ

SOIL PERMEABILITY ASSESSMENT / EFFLUENT DESIGN SHEET

To AS/NZS 1547:2000

3.0 Permeameter Test Evaluation

Sheet No:

Intended water Supply:

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

Local experience with existing on-site systems:

Septic Tank or similar (Primary treatment): AWTS or similar (Secondary treatment):

Suitable for domestic use with correctly sized drainage area | Produce high quality effluent suitable for irrigation disposal

Recommendation for this site: *Oasis Clearwater Texass Treatment System (Irrigation Effluent Disposal)*

DRAINAGE CONTROLS:

Need for surface water collector / cut-off drains?

AVAILABILITY OR RESERVE / SETBACK AREAS

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

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

Ksat, (m/day): ESTIMATED SOIL CATEGORY: *Category 3 - High/Moderate Structured Clay Loam*

4.0 Design for System

RECOMMENDED D.I.R. *28* mm/week

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

7 Permanent People At 115L/person/day: *980* L/day from Appendix 4.2D AS/NZS 1547:2000

DESIGN WEEKLY FLOW: *6860* L/week

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

AREA REQUIRED: *245.0* m^2

IRRIGATION LINE LENGTH REC *211.7* m

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

RECOMMENDATION :

Oasis Clearwater Texass Treatment System with RAAM Irrigation
Min 4500 litre capacity treatment and irrigation lines to be a minimum total length of 212m - 11 lines at 20m length. Lines to follow contours and at 100mm below ground level . Installation of irrigation system to be in accordance with the Product Installer Guide. Detailed design of the irrigation system is to be responsibility of the installer- Note: Water reduction fixtures not applicable for this site

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Irrigation System Calculation
Project Title: **Anderson Family Trust** Date: August-04
File Ref: A04-1068 Operator:

Acceptable daily loading rate (mm/day)	4
Daily influent (l/day)	980
Emitter type	.....
Emitter flow rate (l/h)	1.6
Emitter Spacing (m)	1
Dripline Spacing (m)	1.25
Distance from Treatment system to Irrigation Field (m)	5
Field Size (m^2)	245
Field length	16
Number of lines	14
Total Dripline Length (m)	212
Total flow Rate Required (l/h)	339

Pump Duty

Flow (l/h)	339
Head (m)	12

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

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

Oasis Clearwater Environmental Systems Ltd.
18 Anchorage Road, Hornby
PO Box 16276, Christchurch
Phone: (03) 344 0262
Fax: (03) 344 0267

Oasis Clearwater
Environmental Systems Ltd.

1 July 2004

Smart Associates Ltd
31 George Street
BLENHEIM

Dear Sir

Following our recent discussions on packed bed reactor type treatment systems, we enclose relevant performance figures as tested by Environment Canterbury.

Over the last 24 months, Oasis Clearwater Systems has worked in close conjunction with Zabel Environmental Technology and other reputable companies in the USA to develop and produce a range of systems for both domestic and commercial applications, applicable to New Zealand.

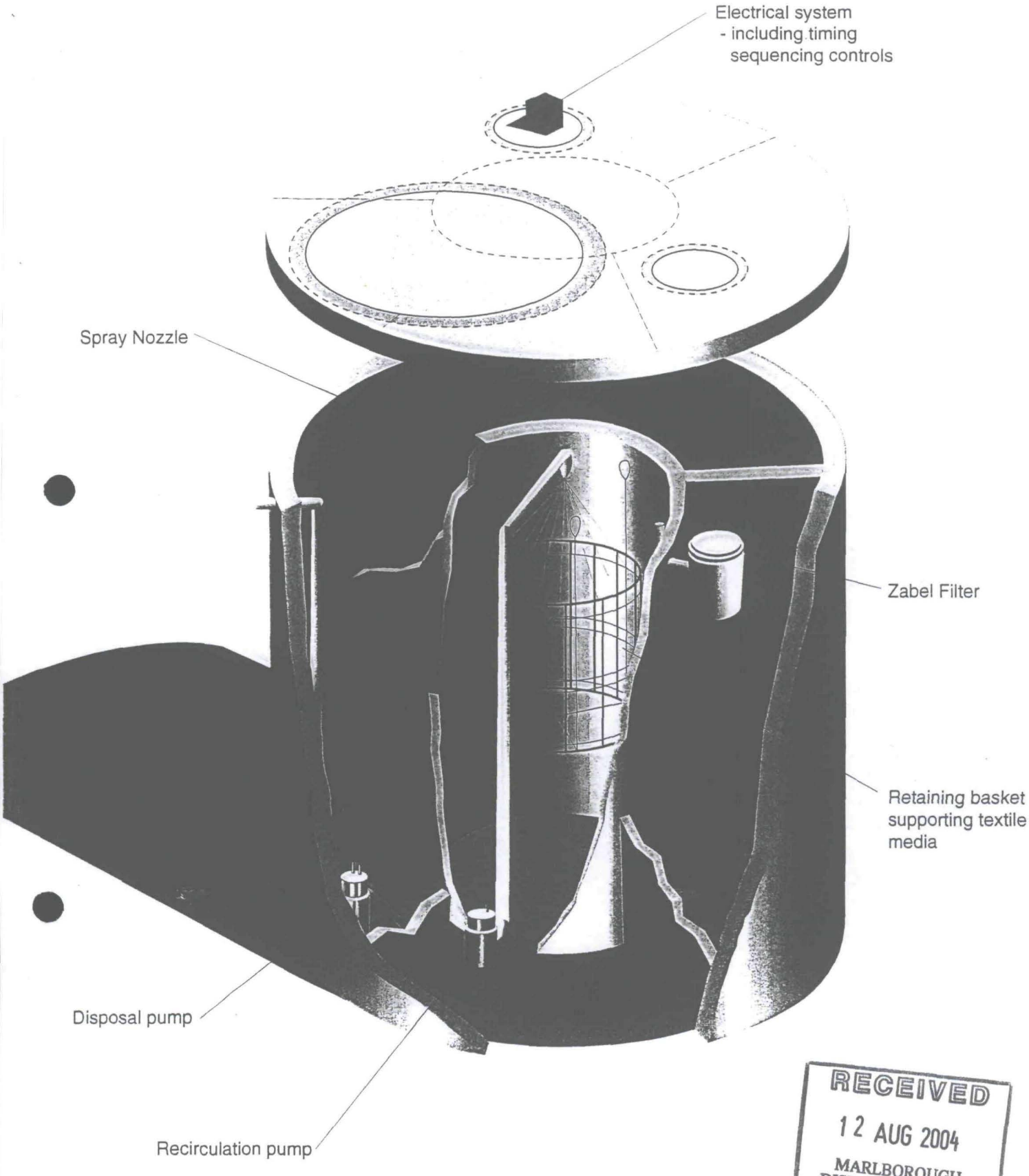
For over 12 months we have had systems installed at various sites in New Zealand, carrying out test results. Our systems are in full production, being manufactured, built and tested at our manufacturing plant in Christchurch. This gives us an advantage in that the system is complete and doesn't have to be assembled on site.

We enclose a range of test results on a property with an average flow rate of 1500 litres/day. You will note from these results that both BOD and SS readings average 15mg/L and less. Total nitrogen loadings are also well below the accepted levels of 30mg/L.

Yours faithfully

Lewis N Austin
Manager/Owner Operator

THINKING GLOBALLY ACTING LOCALLY



TEXASS (TEXTILE ADVANCED SEWAGE SYSTEM)

Oasis Clearwater SYSTEMS Ltd.

WASTE TREATMENT SYSTEM - CUT AWAY ILLUSTRATION

THE TRICKLING FILTER PROCESS

Effluent is dosed onto the trickling filter for short periods of time, several times per hour, being evenly distributed over the trickling filter media using a spray nozzle attached at a distance above the filter.

1.0 INTRODUCTION

Oasis Clearwater Systems Ltd (OCSLtd) is specialised in the manufacture and installation of small household wastewater treatment systems. It's most successful system is based on a combination of a septic tank and biological aerated filter (BAF) contained in a single treatment unit. To extend its range of treatment systems Oasis Clearwater commissioned Global Environmental Engineering Ltd (*g2e*) to develop an alternative package plant based on the trickling filter process. The following report gives details for the design and construction of the treatment plant.

Section 2.0 gives an overview over existing trickling filter technology used in small household package plants. Subsequent sections detail the process and mechanical design and give equipment specifications for the proposed new trickling filter treatment system (TFTS). The design and operational assumptions are outlined in section 3.0. Section 4.0 details the process design; section 5.0 provides the plant and equipment specifications. Installation, commissioning and operation and maintenance requirements are outlined in sections 6.0 and 7.0. The Appendices (A1 to A3) provide a glossary of technical terms, units of measurement and abbreviations used within the report as well as tables outlining technical details of the plant as well as a commissioning and maintenance control sheet. Appendices (D1 to D3) include the process, mechanical and electrical drawings for the plant.

2.0 EXISTING HOUSEHOLD WASTEWATER TREATMENT PLANTS

2.1 General

Household wastewater treatment plants fitted with advanced treatment stages have become increasingly popular in the past years. The choice of treatment processes used in these treatment systems is now extensive. Most of the new systems use treatment processes previously designed for large municipal plants including activated sludge, BAF, SBR, sandfilter, trickling filter and more recently membrane technology.

If adequately designed most of these technologies will be able to achieve relatively high treatment standards. The prevalent choice between package plants focuses therefore increasingly on the amount and ease of servicing and maintenance and the power consumption of these systems.

Activated sludge BAF as well as SBR plants although achieving high final effluent results require more pumps, blowers and controls and have therefore increased service and maintenance requirements. Power draw is normally also slightly higher than for other package plant processes like sandfilter or trickling filters.

The latter are simpler in design and require less mechanical equipment. Some trickling filters further allow to operate the treatment plant in stand-by mode over an extended period of time without loosing treatment efficiency at renewed start-up. This allows the owner to maintain the treatment plant "dormant" and reduce power and maintenance requirements even further at times when treatment plant operation is not needed. This is not possible with activated sludge, BAF or SBR technology without adding significant complexity to the systems control and equipment.

2.2 Trickling Filter Technology

Trickling filters can generally be divided into four categories:

- Rock – or plastic media type
- Textile media type
- Flexible foam type media

Early tickling filter package plants were filled with plastic and rock material. This material is still used in some small treatment plants for household wastewater as well as for industrial applications. Because of the relatively large media and void area, air supply to the biomass growing on the support material is normally excellent. The relative surface to volume ratio remains nevertheless limited (between 90 and 200 m^2/m^3). Consequently package plants using this type of media are larger than activated sludge, BAF or SBR plants for an equivalent load and may have difficulties reaching the same final effluent quality.

Plastic and rock media has to be permanently wetted to keep the biomass viable and active. Discontinuing feeding effluent onto the media will result in the drying out of the biomass resulting in a significant efficiency reduction. Once the trickling filter has stayed without liquid for a extended period the dried biomass will neither be reactivated nor washed off when re-starting the treatment system.

Alternative biological growth media such as textile or flexible foam is also used by some system manufacturers. This material has the advantage to achieve significantly higher surface to volume ratios and allows therefore for much higher applied loading rates. These materials retain moisture. It becomes therefore possible to stop supplying the filter with effluent for an extended period before biomass die-off.

A comparison of some existing systems using textile or foam material with typical loading rates are shown in table 2.2.

TABLE 2.2 TYPICAL LOADING RATES ON TEXTILE & FOAM TRICKLING FILTERS

Media volume [m^3]	Maximum Flow [m^3/day]	Loading [m^3/day m^3 media]	Surface [m^2]	Surface Loading [m^3/h m^2 media]
Textile filter 1				
1.20	2.04	1.70	2	1.02
0.61	1.14	1.87	1.02	1.12
Foam Filter 1				
0.61 (one unit)	1.87	3.06	1.02	1.83
1.22 (two units)	2.49	2.04	2.04	1.22
1.84 (three units)	3.12	1.70	3.06	1.02
Foam Filter 2				
1.2 (one unit)	2.04	1.70	2	1.02
2.4 (two units)	2.55	1.06	4	0.64
Foam Filter 3				
0.81 (four units)	1.70	2.10	0.98	1.73
1.21 (six units)	2.27	1.88	1.48	1.53

Both, textile and flexible foam based systems are equally effective for treating high biological loads on small footprints. Both require on the other hand careful commissioning, setting up of the wetting regime to ensure that biological growth is maintained to a minimum and

4.0 PROCESS DESIGN

4.1 Design and Operational Assumptions

The following assumptions have been made as part of the treatment process design and operation:

- The wastewater originates from a typical household and does not contain any inhibitory or toxic or hazardous waste.
- Stormwater does generally not enter the treatment system.
- The wastewater flows and loads are below the limits given above.
- The wastewater temperatures are in a range of 10 to 30 dgr C.

4.2 Process Design

4.2.1 Process Description

The treatment system is presented in the Trickling Filter Process Flow Diagram, drawing OASIS – 002 included in Appendix D2. This diagram shows all the treatment stages of the system. The wastewater collection and distribution system being distinct to each installation have been excluded from the treatment process design itself and remain the responsibility of the system provider. The Process Flow Diagram shows the relative sizes of the tank compartments as "dry" volumes. The "liquid" volumes and possible variations of the same are given in Table 4.2 below. (Refer also to construction drawing OASIS–001, Appendix D1)

TABLE 4.2 TREATMENT SYSTEM CAPACITY

Compartment	« Dry » Volume [ltr]	Maximum filled volume [ltr]	Minimum filled volume [ltr]
Primary Pre-Treatment	2486	1974 (*)	1859 (*)
Secondary Pre-Treatment	1244	987 (*)	930 (*)
Effluent Collection Chamber	2443	679	170
Recirculation Pumping Chamber	1018	283	71
Disposal Pumping Chamber	1018	283	71
Total	**8209**	**4206**	**3101**
Maximum Variation in Level			
Pre-Treatment (*)		100 mm	
Remaining plant		450 mm	
Maximum Variation in Volume			
Pre-Treatment		172 ltr (*)	
Remaining plant		933 ltr	
Maximum Treated Effluent Storage Volume		**933 ltr**	

(*) may vary from site to site

The treatment system is divided into five compartments. For a better understanding of the following plant description it is suggested that the reader refers also to the detailed construction drawing of the plant included in Appendix D1.

- **Primary & Secondary Pre-Treatment (1st & 2nd compartments)**
  The anaerobic treatment section (or "septic tank section") is located at the inlet of the system and acts as the plant pre-treatment. It protects the advanced biological treatment (trickling filter) from shock loads and an excess of solids. The pre-treatment is separated into the primary and secondary treatment. The primary treatment removes gross solids and floating matter and grease and acts as a cold digester for the sludge produced by the more advanced biological stage from where the effluent is recirculated to this primary treatment stage. The secondary treatment further settles out solids and reduced COD and BOD levels in the effluent. The new treatment system uses the same zones for the primary and secondary pre-treatment as used in the standard Oasis Clearwater Systems treatment plant.

- **Fine Filter**
  From the secondary pre-treatment the effluent passes through a fine filter (Zabel filter) prior entering the effluent collection chamber. This allows to reduce the effluent suspended solids concentration and to further reduce the particular BOD load. The position of the Zabel filter is indicated on the drawings. Its relative position has been set at a level to allow creating a certain buffer capacity in the anaerobic zones of the system. The filter position may have to be adjusted within a certain range by the system supplier to allow for possible changes in the effluent level in the primary zones depending on site-specific requirements.

- **Effluent Collection Chamber (3rd compartment)**
  After the pre-treatment and filtration stage the effluent enters the centrally located collection chamber. In this chamber the primary treated effluent is mixed with secondary treated effluent, which has passed over the trickling filter. The chamber is connected and forms part of the recirculation and the disposal pumping stations. This provides a large storage capacity for treated effluent within the system.

  The effluent leaves the collection chamber through openings at its base to enter the recirculation as well as the final disposal pumping chamber. Provision has been made in the system design to allow fitting these openings with sets of Zeus pump vault filter panels if required. This is to further reduce the suspended solids load to the two pumping chambers.

- **Recirculation Pumping Station (4th compartment)**
  The effluent from the collection chamber is pumped with the recirculation pump to the trickling filter as well as back to the inlet of the plant. The flow splitting rate between the trickling filter and the inlet is set by adjusting the hydraulic headloss in the return pipe through changing the length of the return pipework. The initial splitting rate between the trickling filter and primary zone return is 50/50. During commissioning the length of the return pipe will be adjusted to fit the required distribution rate. If required this rate can be further adjusted in the future through the valves installed on the two lines. The latter should nevertheless be avoided in long term and only be used during testing or setting up of the system.

  The pipework form the recirculation pump to the trickling filter and primary zone has been fitted with an additional connection point with isolation valve. This allows to connect a clean water hose for cleaning of the trickling filter if necessary (please refer to further details in the operation and maintenance section). During the cleaning of the

trickling filter the pipework to the primary zone should be closed using the isolating valve provided.

The recirculation pump operates separate from the effluent disposal pump system. The pump will be activated for short sequences several times an hour. The recirculation pump rate should be maintained even in case that the plant is put on stand-by and no fresh wastewater enters the system (p. ex. owners on holyday). This will ensure that the trickling filter is maintained wet and will allow to maintain a viable biomass on the trickling filter media. The system will in turn ensure rapid availability of maximum treatment capacity when the system is restarted.

- **The Trickling Filter**
  The trickling filter provides the advanced biological treatment of the package plant. It enhances BOD removal and provides nitrification of the effluent. The effluent is treated when flowing over and through the media and is collected in the Effluent Chamber. Through the return of the nitrified effluent to the primary treatment zone the system provides also for partial denitrification.

  The effluent will be dosed onto the trickling filter for short periods of time several times per hour. It is evenly distributed over the trickling filter media using a spray nozzle attached at a distance above the filter. The filter media is made of soft foam material. It has a very high number of pores per square centimetre to provide maximum surface area for the attachment of biomass. It is also free draining to take up a minimum amount of water. The media is contained in a basket made of geotextile netting to provide good drainage and maximum opening for aeration of the biomass.

- **Treated Effluent Disposal Pumping Station (5th compartment)**
  The treated effluent enters the disposal pumping station from the Effluent Collection Chamber. The connection between the collection chamber, the recirculation and the disposal pumping chamber provides for a total storage capacity of treated effluent of about half the maximum daily flow to the plant. This allows to dispose of the treated effluent at the reduced rate of only once to twice a day. The longer the period between the disposal sequences, the better the final effluent quality. During the day the effluent is continuously recirculated to the anaerobic zone and passed over the trickling filter increasing the effluent quality with each pass.

  To reduce the amount of suspended solids entering the final effluent disposal pumping chamber provision has been made in the plant design to fit the openings to the chamber with Zeus pump vault filter screens. This will reduce the maintenance requirements for additional fine filters used on the outlet of the disposal pump (required by some the disposal field equipment). The effluent disposal pump used in this plant is of the same type as currently used on other OCSltd treatment systems. The adequacy of the pump will have to be confirmed by the system manufacturer depending on the type and size of the disposal field, any pre-filter requirements as well as on the local site requirements.

4.2.2 Notes to the Process Design

- **Zabel Filter**
  The proposed fine filter between the primary treatment chambers and the effluent collection chamber is a Zabel filter model A300-12x28-VC. This ensures a filtration down to 0.8 mm particle size at a throughput capacity of up to 11.8 ltr/min. The smaller filter version Zabel model A300-12x20-VC may also be acceptable for smaller [illegible]. The final decision on the size filter to be installed should be made in respect to the length of time that the treatment plant can be run without cleaning the filter. A [illegible] filter

achieves its high filtration rate only after a time of biological growth on the filter surface every cleaning of the filter will for a time increase the solids loading on the trickling filter. This in turn will increase the maintenance requirement on the trickling filter. Minimum cleaning of the Zabel filter will ensure maintaining a maximum particle size filtration and will reduce the maintenance requirement on the downstream treatment units.

- **Recirculation Pumping Rate**
  Once the return/trickling filter spray distribution ratio has been set the recirculation flow rate should be set to initially 5 times the daily inflow to the plant, which corresponds to 10,000 ltr/day. This is done by adjusting the pump P01 running time with timer T01. At a pumping rate of 0.067 m^3/min provided by the pump at 0,5 bar (refer pump specifications) this flow is equivalent to pumping every 30 minutes for 6 minutes. This pumping on/off rate is considered acceptable for pumps such as used by OCSltd (Arwana pump, model KS-03) without significantly reducing it's overall life expectancy.

5.0 PLANT AND EQUIPMENT DETAILS

5.1 General

A list of the treatment plant equipment is given in Appendix A2. It includes a number of equipment items, which are standard on other Oasis Clearwater treatment plants. The selected equipment has been chosen for its proven reliability in similar applications and can be expected to operate over an extended time without failure or disruption. It can be substituted with equivalent equipment made by other manufacturers as long as the replacement equipment is of proven quality and performs the task with the same reliability as the original.

5.2 Treatment Plant Control

The domestic effluent enters the treatment plant by gravity. It passes through a primary and secondary anaerobic pre-treatment zone before it enters the effluent collection chamber through a fine filter (Zabel filter).

The effluent collection chamber is connected to two pumping chambers, the recirculation pumping chamber and the disposal pumping chamber. Both pumping stations operate fully independently of each other.

An electrical schematic of the treatment plant control cabinet is included in Appendix D3 of this document.

- **Pre-Treatment Zones**
  The pre-treatment zones do not require level or other control equipment. On high inflow to the plant the level in this area might temporarily rise. But free flow into the effluent collection chamber will always be possible as long as the Zabel filter is maintained on a regular basis. The filter should not be cleaned too often to ensure it maintains its maximum filtration efficiency (refer to section 7.0 Operation & Maintenance).

- **Recirculation Pumping Station**
  The recirculation pumping chamber is fitted with pump P01 which pumps effluent over the trickling filter in the effluent collection chamber as well as returning effluent to the primary pre-treatment zone. The flow to either of the zones is hydraulically split based on the head loss in the pipework and trickling filter spray nozzle. The recirculation pump

P01 will operate on low level probe LSL01 and timer T01. The level probe will only be used as an emergency cut-out for turning the pump off in case the water level in the pumping chamber is below the minimum P01 operating level. This should not occur during the normal plant operation, but would indicate that the flow between the effluent collection chamber and the pumping chamber is disrupted (possibly by clogged Zeus filters). The operation of the low level switch will initiate an alarm and latch out P01. This will require someone to inspect the treatment plant and manually restart the pump using a push-button on the switchboard.

Whenever the liquid level is above the minimum operating level the pump will start and stop on timer, even if there is no new wastewater coming into the plant. This ensures that flow over the trickling filter and consequently a healthy biomass is maintained and is ready for a new load coming into the system.

P01 will initially be set to operate for 6 minutes every 30 minutes, but the timer will allow to operate the pump for a period of 1 to 15 minutes for up to four times within one hour, 24 hours a day, 365 days a year. This cycle will be set during plant commissioning and the pump will operate whenever the plant main selector switch is switched to "system on".

- **Disposal Pumping Station**
  The disposal pump chamber is fitted with pump P02, which pumps the treated effluent to the disposal field. The disposal pump will operate either on manual or on timer and level probes. The manual start will always override the automatic (timer & high level) start and revert to automatic operation when the low level switch is reached.

  When P02 is operated on manual (push-button start) it pumps until the low level switch LSL02 is reached and then switch off. The manual switch will allow to start P02 whenever the liquid level is above LSL02. LSL02 is to be located slightly above LSL01 (low level switch for P01) to allow P01 to continue operating when the treated effluent has been pumped to the disposal field.

  When P02 is operated on automatic the pump will operate on timer whenever the liquid level is between LSL02 and LSH02. In this case the pump will start for up to 4 times per 24 hours and up to 1 hour per period. The initial pumping rate is expected to be set for 30 minutes every 12 hours, but this will be adjustable during plant commissioning within the range noted above to fit local conditions.

  If the high level switch LSH02 is reached prior the timer start time this probe will start the pump. The pump will stop once the low level LSL02 is reached. The pump P02 stops when the liquid level reaches LSL02 even if the timer still requests the pump to run.

- **Treatment Plant Alarms**
  A high level alarm level switch is located within the effluent collection chamber to indicate an extremely high liquid level. This high level could either be the consequence of a structural failure of the tank, a leakage between the various chambers, a failure of pump P02 or a clogging of the Zeus filters between the effluent collection chamber and the P02 pump chamber. If this level is reached an alarm will be activated for someone to inspect the system.

  An alarm will also be raised upon P01 or P02 pump fault (pump tripped).

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OASIS CLEARWATER ENVIRONMENTAL SYSTEMS LTD

CASE STUDY

TEXASS (Textile Advanced Sewage System)

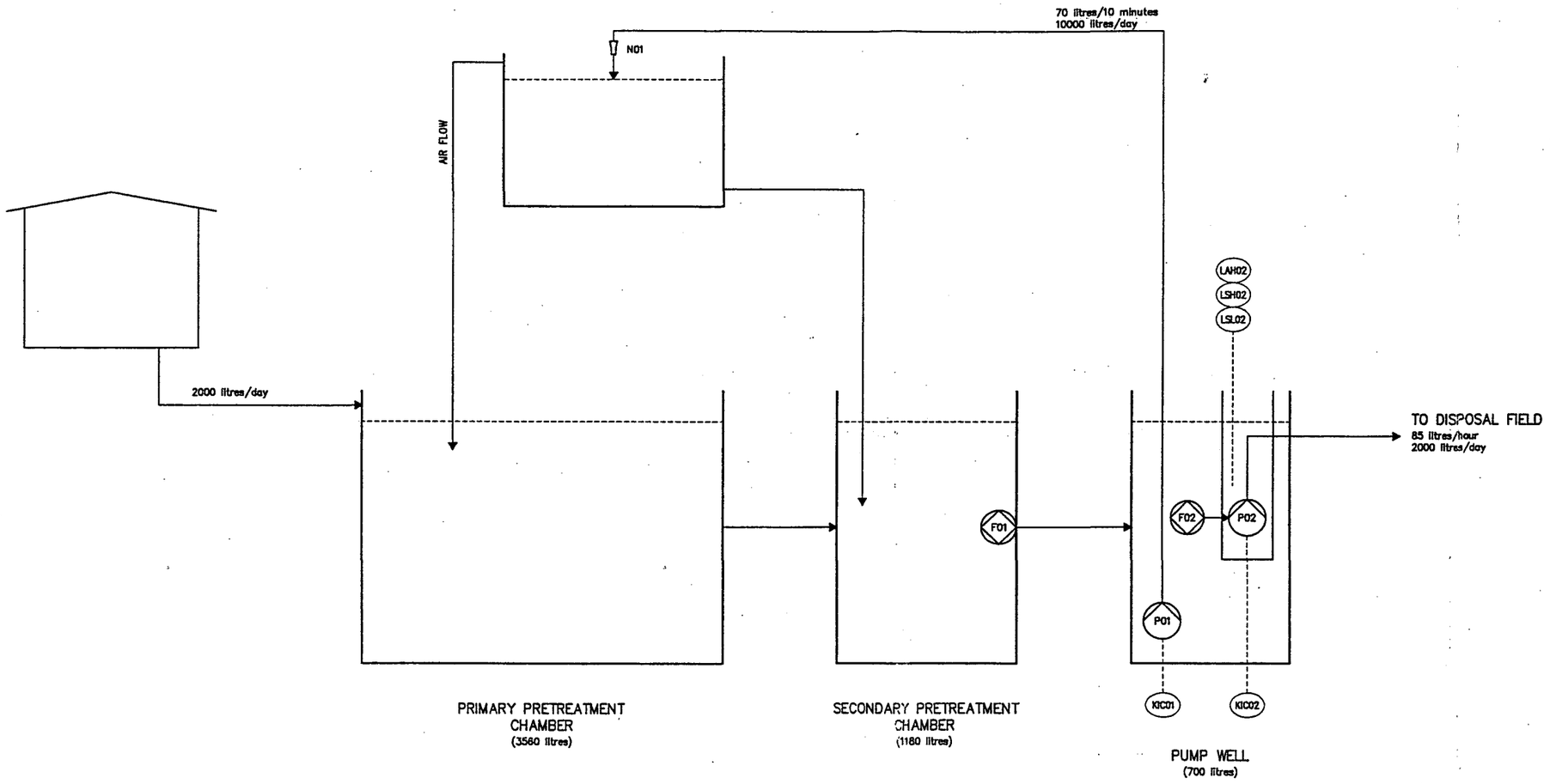
Installed: 10th May 2003

Commissioned: 20th May 2003

Client: Mr J. Barrett, "The Limes", Clarkville

TEST RESULTS AS DETAILED

Test Date	Parameter	Result	Units	Method
25/6/03	Biochemical Oxygen Demand	42	mg/L	APHA 5210 B (20Ed) Total 5 day
	Total Nitrogen	19	mg/L	APHA 4500 N C (20Ed) modified
	Total Suspended Solids	29	mg/L	APHA 2540 D (20Ed) Gravimetric
31/7/03	Biochemical Oxygen Demand	21	mg/L	APHA 5210 B (20Ed) Total 5 day
	Total Nitrogen	17	mg/L	APHA 4500 N C (20Ed) modified
	Total Suspended Solids	12	mg/L	APHA 2540 D (20Ed) Gravimetric
26/8/03	Biochemical Oxygen Demand	23	mg/L	APHA 5210 B (20Ed) Total 5 day
	Total Nitrogen	17	mg/L	APHA 4500 N C (20Ed) modified
	Total Suspended Solids	11	mg/L	APHA 2540 D (20Ed) Gravimetric
24/9/03	Biochemical Oxygen Demand	19	mg/L	APHA 5210 B (20Ed) Total 5 day
	Total Nitrogen	18	mg/L	APHA 4500 N C (20Ed) modified
	Total Suspended Solids	11	mg/L	APHA 2540 D (20Ed) Gravimetric
16/10/03	Biochemical Oxygen Demand	14	mg/L	APHA 5210 B (20Ed) Total 5 day
	Total Nitrogen	18	mg/L	APHA 4500 N C (20Ed) modified
	Total Suspended Solids	5.6	mg/L	APHA 2540 D (20Ed) Gravimetric
19/11/03	Biochemical Oxygen Demand	15	mg/L	APHA 5210 B (20Ed) Total 5 day
	Total Nitrogen	10	mg/L	APHA 4500 N C (20Ed) modified
	Total Suspended Solids	7.7	mg/L	APHA 2540 D (20Ed) Gravimetric
3/2/04	Biochemical Oxygen Demand	16	mg/L	APHA 5210 B (20Ed) Total 5 day
	Total Nitrogen	5.7	mg/L	APHA 4500 N C (20Ed) modified
	Total Suspended Solids	14	mg/L	APHA 2540 D (20Ed) Gravimetric



DRAFT

CONSTRUCTION NOTES:

HARRISON GRIERSON
HG
CONSULTING ENGINEERS SURVEYORS PLANNERS

REF	AMENDMENT	BY	DATE

PROJECT:
HARRISON GRIERSON CONSULTANTS LIMITED
RESEARCH AND DEVELOPMENT

TITLE:
SECONDARY ON-SITE WASTEWATER TREATMENT SYSTEM
TRICKLING FILTER FLOW DIAGRAM

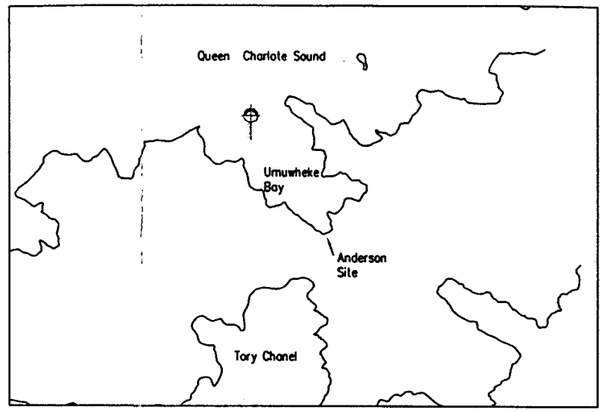
DESIGNED: SAS	DATE: 12.2001	SIGNATURE:	PLOT DATE: 11.01.02
DRAWN: SMB	DATE: 12.2001	SIGNATURE:	CAD REF: 12888-WW100
CHECKED:	DATE:	SIGNATURE:	CAD XREF:
APPROVED:	DATE:	SIGNATURE:	SURVEY BY:
			SURVEY DATE:
			SDR REF:

PLOT STATUS:
NOT FOR CONSTRUCTION

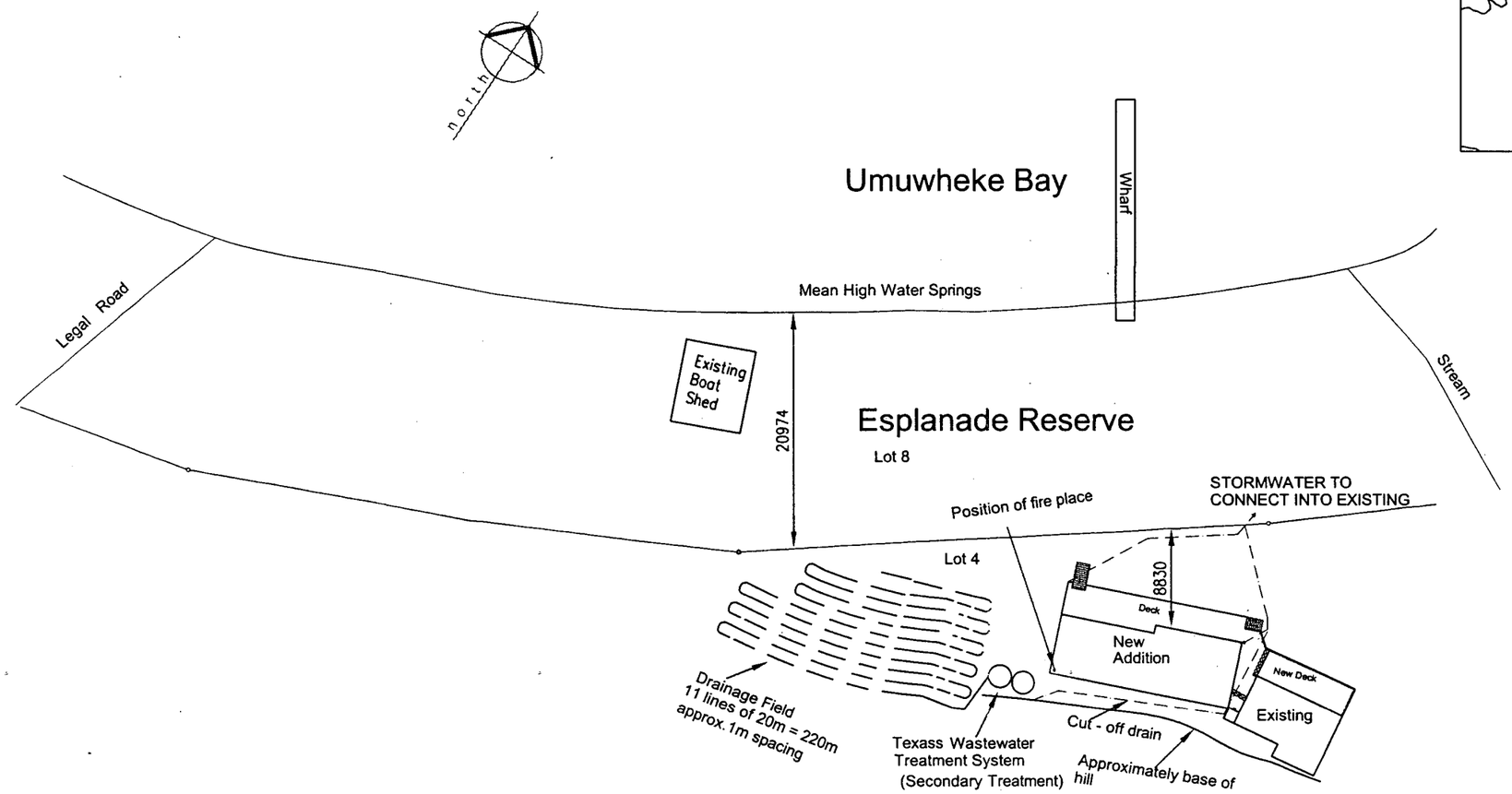
PROJECT No: 11.12888.8	SCALES: 1:10 - A1 1:20 - A3	A1
DRAWING No: 12888-WW100		REV

AMENDMENTS

Rev B: Drawing updated. SB 23.07.04



LOCATION PLAN
Not to scale



1 SITE LAYOUT
Scale 1:500 Proposed

Drawing List

WD01 Location/Site plan
WD02 Floor Plan
WD03 Roof Plan
WD04 Elevations
WD05 Roof framing plan
WD06 Bracing plan
WD07 Drainage plan
WD08 Cross section A
WD09 Cross section B
WD10 Cross section C
WD11 Details
WD12 Details–Stair
WD13 Foundation
WD14 NZS 3604:1999 Details
WD15 Flashing details

RECEIVED
12 AUG 2004
MARLBOROUGH DISTRICT COUNCIL

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design@smartassociates.co.nz
ACENZ

JOB TITLE: ANDERSON JENNIE BACH ,UMUWHEKE BAY ARAPAWA ISLAND	DRAWING TITLE: SITE PLAN			DATE: July.04	DRAWING No: WD01
PROJECT No. A04-1068	DESIGNED: J.S	DRAWN: S.B	CHECKED:	SCALE: As Shown	
				REVISION: B	

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14 July 2004

Natalie Hall-Barlow
PIM Officer
Marlborough District Council
PO Box 443
Blenheim

Dear Natalie

Anderson Family Trust
Umuwheke Bay, Arapawa Island
Project A04-1068

We enclose an application for resource consent to install a new wastewater treatment and disposal system within 30m of the coastline.

The existing septic tank and drainage field is somewhere between the existing house and creek and cannot be brought up to a standard meeting AS/NZS 1547:2000. Its use will be discontinued and the new system will be used for both existing and new additions to the house.

The attached report describes the proposed method and assesses the impact of the treatment and disposal on the subsoil environment. The tanks and drains are buried so that there is no visual effect.

Yours sincerely

John Smart, Director, Smart Associates
CP Eng.

c/c Jenny Anderson

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Engineering Report

For Anderson Family Trust

Wastewater Treatment and Disposal

at

Umuwheke Bay, Arapawa Island
Queen Charlotte Sound

John Smart
Chartered Engineer
Smart Associates Ltd
13 July 2004

Job No A04-1068

Table of Contents

Appendices

1. Introduction

1.1 The Anderson family wish to demolish part of the existing dwelling and add a new extension with deck on the seaward end of their bach on Arapawa Island.

1.2 The house site is constrained by the steep hillside at the rear, the stream and the Foreshore Reserve boundary.

1.3 The extension is to be about 16m long by 6m with 3m wide deck.

1.4 The purpose of this report is to assess the requirements of a new treatment plant and disposal system that meets the requirements of AS/NZS 1547:2000 and dispense with the old existing tank and drainage, which is close to the stream.

Because of site constraints, the drainage field is within 30m of the shoreline although it will be over 30m clear of the stream. Accordingly resource consent application is required.

1.5 The site was visited on 1 May 2004 and soil conditions examined.

2. Wastewater Treatment and Disposal

2.1 A new upgraded treatment system is to be installed in buried tanks on a flat elevated shelf at the end rear corner of the house as indicated on the Site Plan.

Bedrooms number 4, so that the minimum size tank storage capacity is to be 3,500 litres.

2.2 There is insufficient flat area for trenching effluent disposal. The base of the hill and part of the flat area is to be developed as a new drainage field, using buried irrigation drip line pipes.

2.3 Because of the intermittent use of the bach an aerated system is not recommended. The best answer to this situation is an efficient filtration system that removes fine sediment from the effluent to allow drip irrigation without clogging of the emitters.

2.4 Two systems claim to provide such clean water for irrigation disposal: Ecogent and Oasis Clearwater ZEUS system. The latter is to be installed and a copy of the manufacturer's information is attached (Appendix B).

2.5 The two-tank ZEUS system provides tank capacity storage well in excess of the minimum required. However, although clear of fine sediment it still has a high B.O.D. (biologic oxygen demand) rate about 50g/m^3, but not as high as ordinary septic tank discharges of about 100g/m^3. Suspended solids also have to be much lower (less than 50g/m^3) for low risk to blockage.

2.6 The design water flow for 7 person occupancy incorporating standard water saving devices as listed in Appendix C is 805 litres per day.

2.7 Soil varies from the regolith soils of moderate permeability at the base of the hill to the thick topsoil of stony loam on the adjacent flat area. It is conservatively assessed as Category 3 soil of moderate drainage with a design irrigation rate of 28mm/week or 4mm/day. However, Oasis Clearwater recommend soil loading rates of 3mm/day for the ZEUS treatment system.

The total length of dripper line required is 268m. This can be achieved using 10 lines of 25m plus 1 of 18m. See layout shown on the site plan (Appendix A).

2.8 The soil filtering properties in 21m separation of this irrigation drainage field from the High Tide line is considered to be more than adequate to reduce coliform levels to insignificant levels. With reference to Note 1 Table 4.2 B1 of AS/NZS 1547:2000, it is noted that a path length of 0.3 – 0.4m would be sufficient to reduce bacterial numbers to insignificant levels in normal soil, ie 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 Category 3 soil at this location fulfils this mid-range soil category.

The existing long grass and soil plant cover is ideal for absorbing nitrates and phosphates.

2.9 It is important that there is a regular maintenance contract on the system with a registered installer. The owner needs to be aware that filter discs need cleaning on a regular basis.

3. Conclusion

3.1 A wastewater treatment system using the Oasis Clearwater ZEUS double tank and Zabel filter equipment in conjunction with RAAM buried driplines is recommended for this restricted drainage field site.

3.2 A 20m clearance from the shoreline in our opinion is considered a "safe" separation of the proposed drainage field from the shoreline.

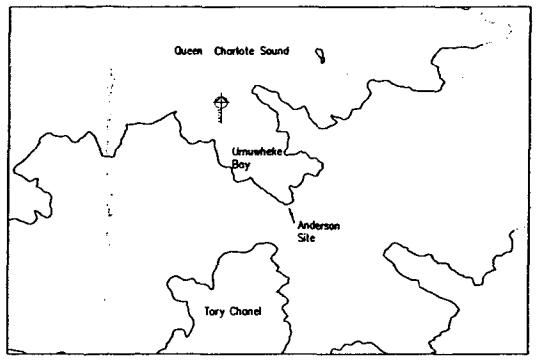
4. Limitations

This report has been prepared solely for the benefit of the Anderson Family for the purpose of applying for resource consent and building consent from the Marlborough District Council. It is valid for two years. No responsibility or liability will be accepted from any third party.

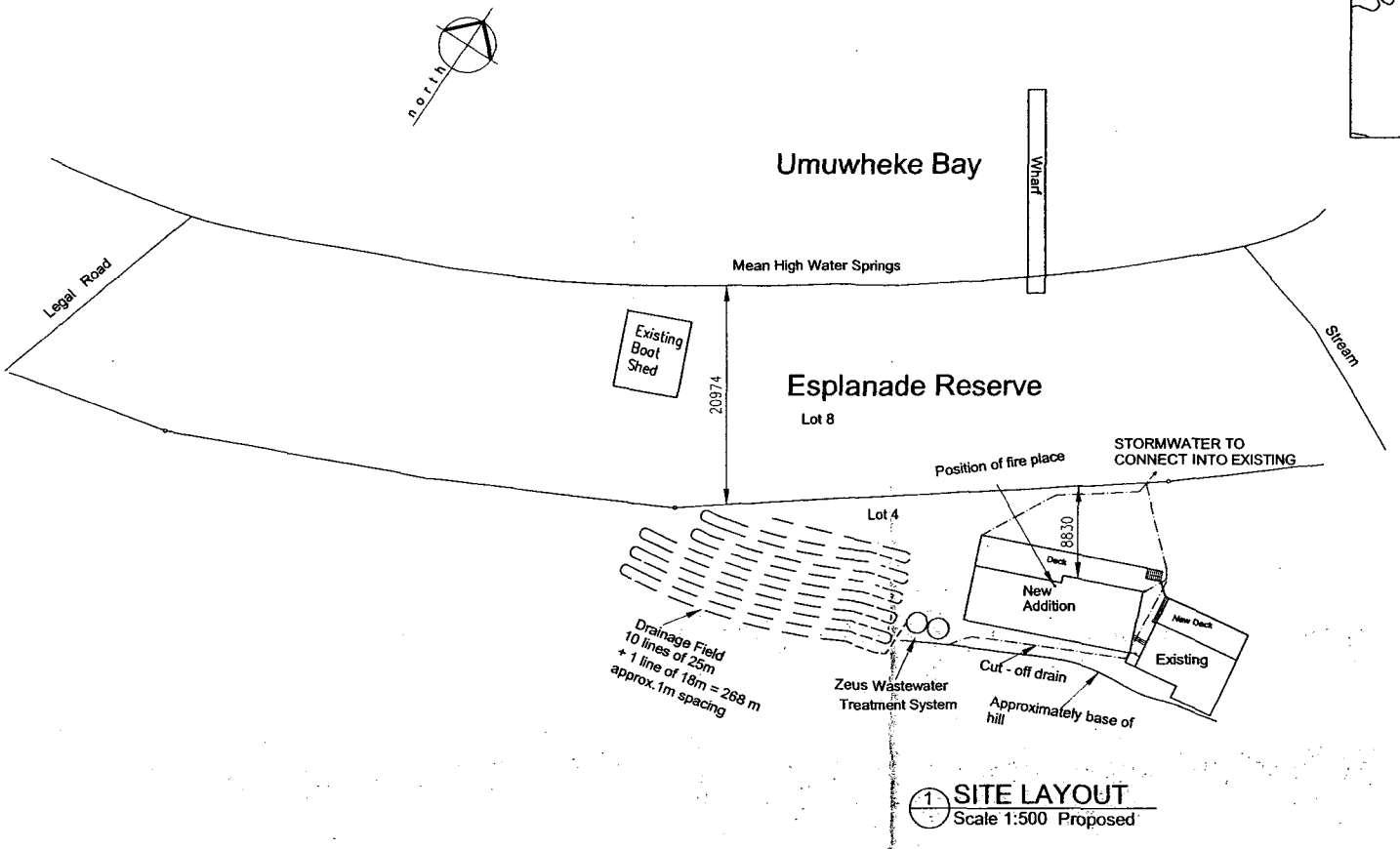
John Smart
Chartered Engineer

13 July 2004

AMENDMENTS



LOCATION PLAN
Not to scale



1 SITE LAYOUT
Scale 1:500 Proposed

Drawing List

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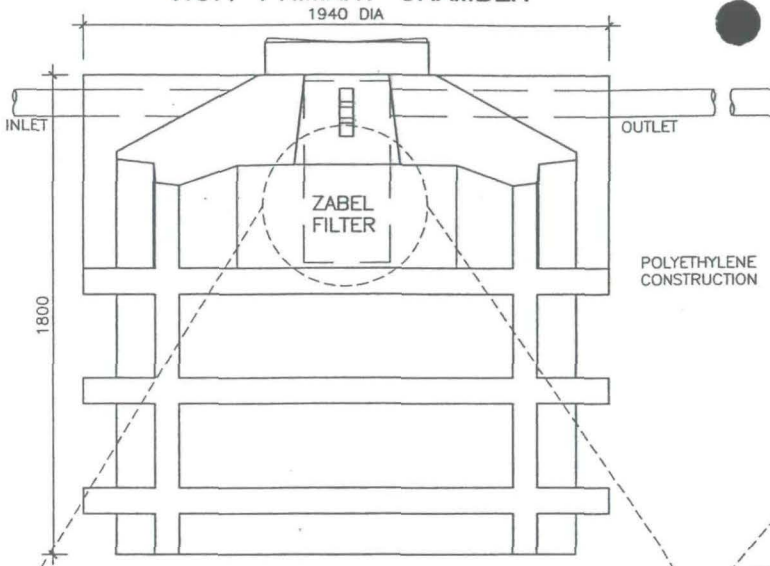
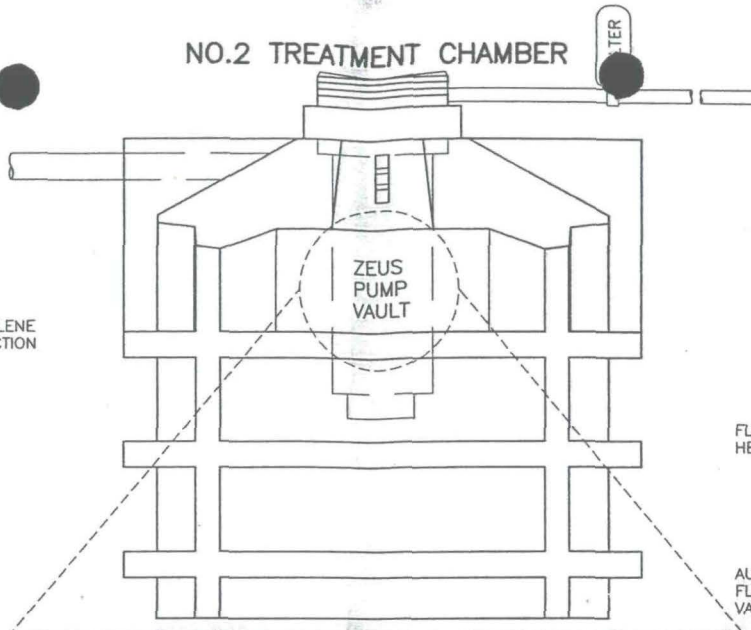
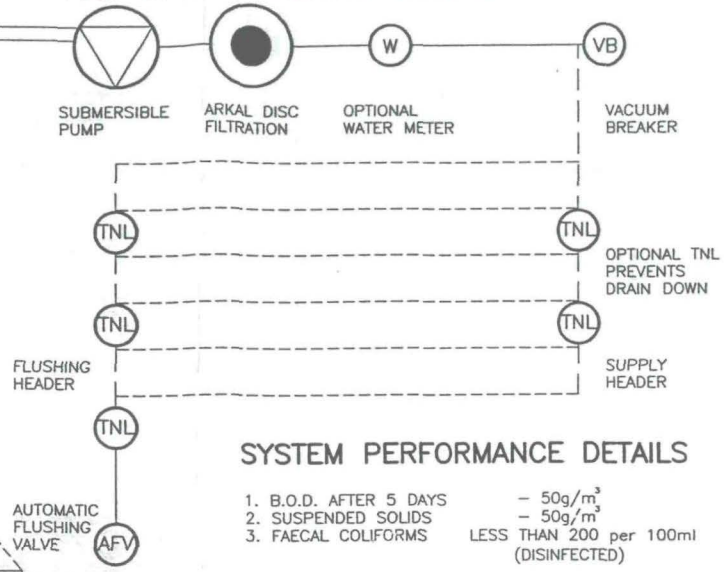
NO.1 PRIMARY CHAMBER



NO.2 TREATMENT CHAMBER



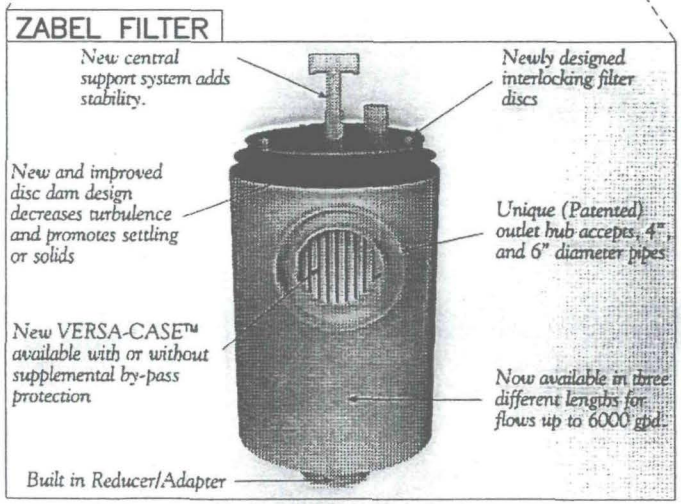
RAAM DRIP IRRIGATION SYSTEM



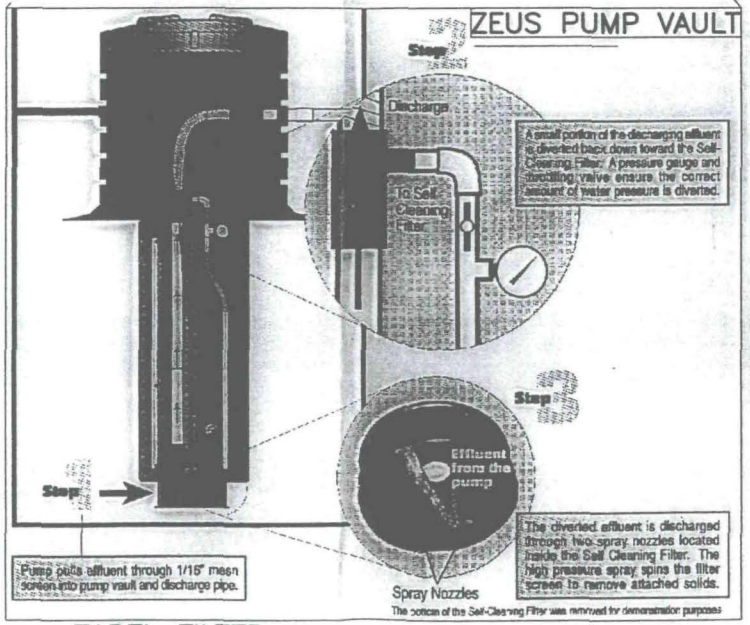
SYSTEM PERFORMANCE DETAILS

1. B.O.D. AFTER 5 DAYS – $50 g/m^3$
2. SUSPENDED SOLIDS – $50 g/m^3$
3. FAECAL COLIFORMS – LESS THAN 200 per 100ml (DISINFECTED)

ZABEL FILTER



ZEUS PUMP VAULT



RAAM DRIP IRRIGATION SYSTEM

POTENTIAL RISK OF BLOCKAGE IN DRIP IRRIGATION SYSTEMS			
	POTENTIAL RISK		
WATER QUALITY INDICATOR	LOW	SLIGHT TO MODERATE	HIGH
PHYSICAL –SUSPENDED SOLIDS (mg/L)	<50	50–100	>100

THE ABOVE INFORMATION ILLUSTRATES THE RELATIONSHIP BETWEEN EFFLUENT QUALITY VERSUS SYSTEM LIFE/SYSTEM BLOCKAGE. THE INFORMATION PRESUMES THAT REGULAR MAINTENANCE 4–6 MONTHLY IS TAKING PLACE, AND THAT 130 MICRON DISC FILTERS PROTECT THE DRIPPER LINES.

IT IS IMPORTANT THAT THERE IS A REGULAR MAINTENANCE CONTRACT ON THE SYSTEM WITH A REGISTERED INSTALLER. IT IS ALSO IMPORTANT THAT THE HOME OWNER IS WILLING TO CLEAN THE ARKAL DISC FILTER ON A REGULAR BASIS.

THE ZEUS TREATMENT SYSTEM

OASIS CLEARWATER SYSTEMS Ltd, IN CONJUNCTION WITH ZABEL ENVIRONMENTAL TECHNOLOGY OF USA HAVE DEVELOPED THE ZEUS (ZABEL ENGINEERED UTILITY SYSTEM) SPECIFICALLY FOR AREAS WHERE SEWAGE TREATMENT SYSTEMS ARE USED INFREQUENTLY OR ON AN INTERMITTENT BASIS, SUCH AS HOLIDAY HOMES.

THE TREATMENT OF THE ZEUS SYSTEM REMAIN ANAEROBIC, AND BY INCORPORATING HIGH PERFORMANCE ZABEL FILTRATION EQUIPMENT AND ZABEL SELF CLEANING PUMP VAULTS, FINAL EFFLUENT IS DISCHARGED THROUGH RAAM DRIP LINES.

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IT IS IMPORTANT IN DESIGNING THE SYSTEM TO SPECIFY CORRECT PRIMARY AND SECONDARY TREATMENT CHAMBERS, DEPENDING ON DWELLING SIZE AND OCCUPANCY AT HEAVY USAGE TIMES.

IN DESIGNING RAAM DRIP LINES FOR USE IN ANAEROBIC CONDITIONS, CONSIDER THESE ISSUES.

- HIGHER LEVELS OF B.O.D.$_5$ ARE MORE CHALLENGING FOR SOILS TO ACCEPT.
- LOADING RATES MAY HAVE TO BE SET AT 1/2 THE LEVEL USED FOR AEROBIC EFFLUENT (MAXIMUM 3mm/DAY).

DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

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Environmental And Pumping Engineers
18 Anchorage Road (PO Box 16-276) – Hornby – Christchurch
Ph: (03) 344-0262 Fax: (03) 344-0267

Z.E.U.S. TREATMENT SYSTEM

FOR INTERMITTENT USE – INCLUDING HOLIDAY HOMES

ENG.
DRN. T.K.
SCALE. 1:20
DATE 06/03

Appendix C

Water Restricting Fixtures (from AS/NZS 1547:2000)

Standard water reduction fixtures include

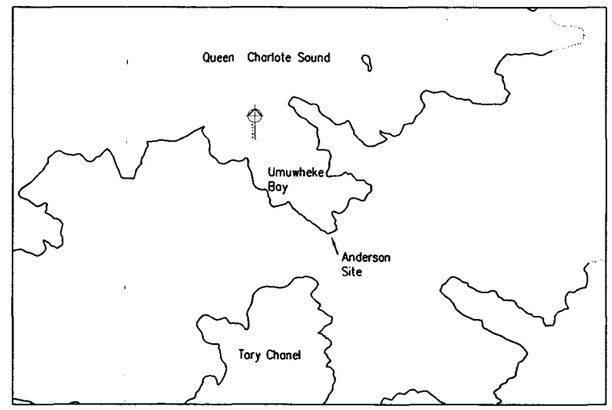
- dual flush 11/5.5 litre water closets
- shower-flow restrictors
- aerator faucets (taps)
- water-conserving automatic washing machines.

Full water-reduction fixtures include

- the combined use of reduced flush 6/3 water closets
- shower-flow restrictors
- aerator faucets (taps)
- front-load washing machines
- flow/pressure control valves on all water-use outlets.

Additionally, water reduction may be achieved by treatment of greywater and recycling for water closet flushing (reclaimed water cycling).

AMENDMENTS



LOCATION PLAN
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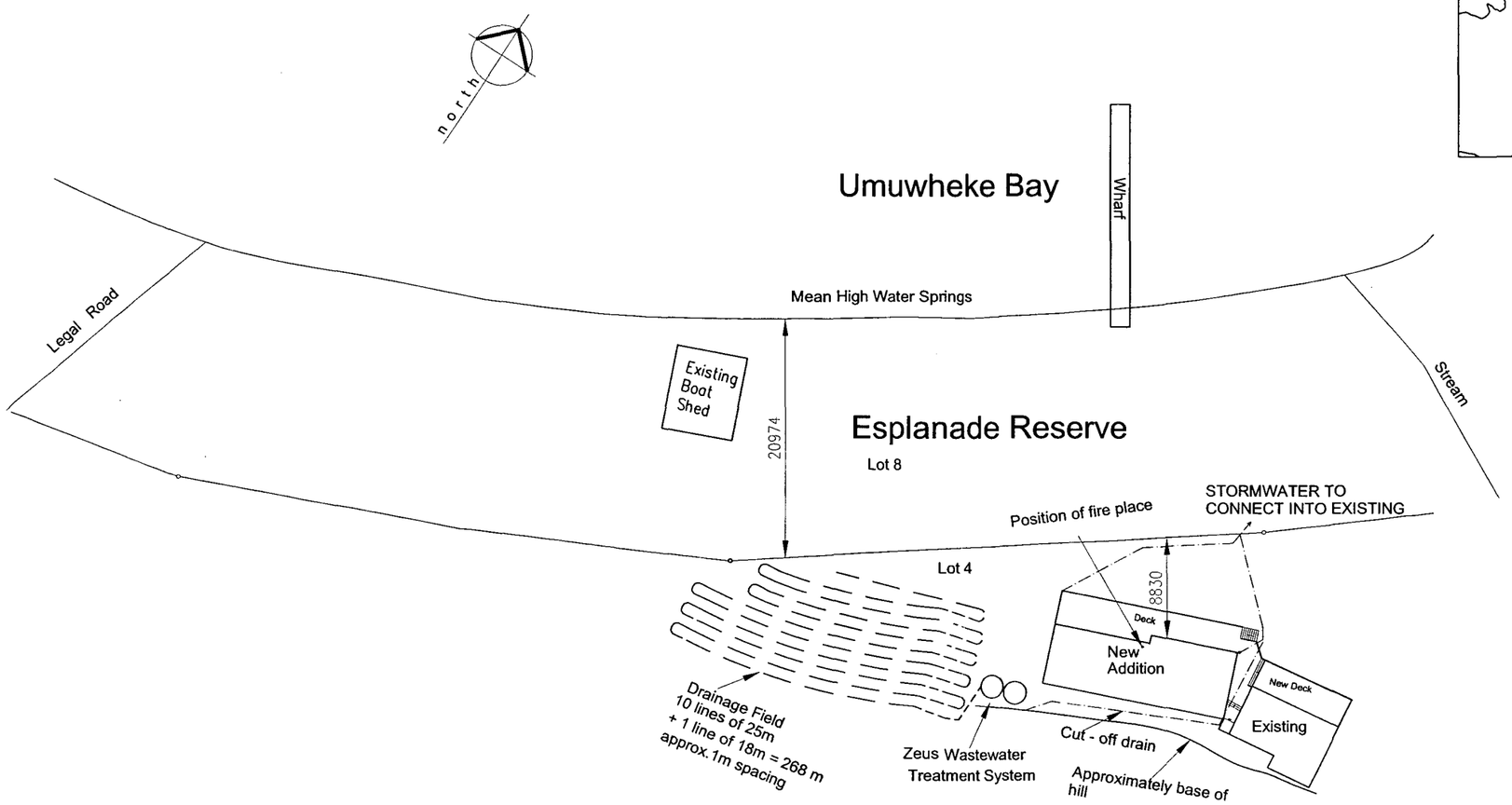

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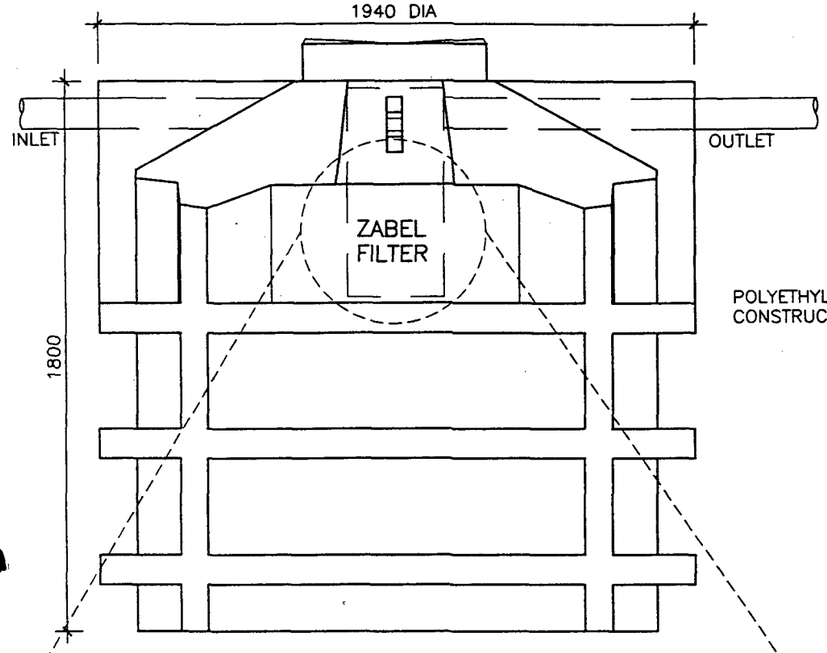

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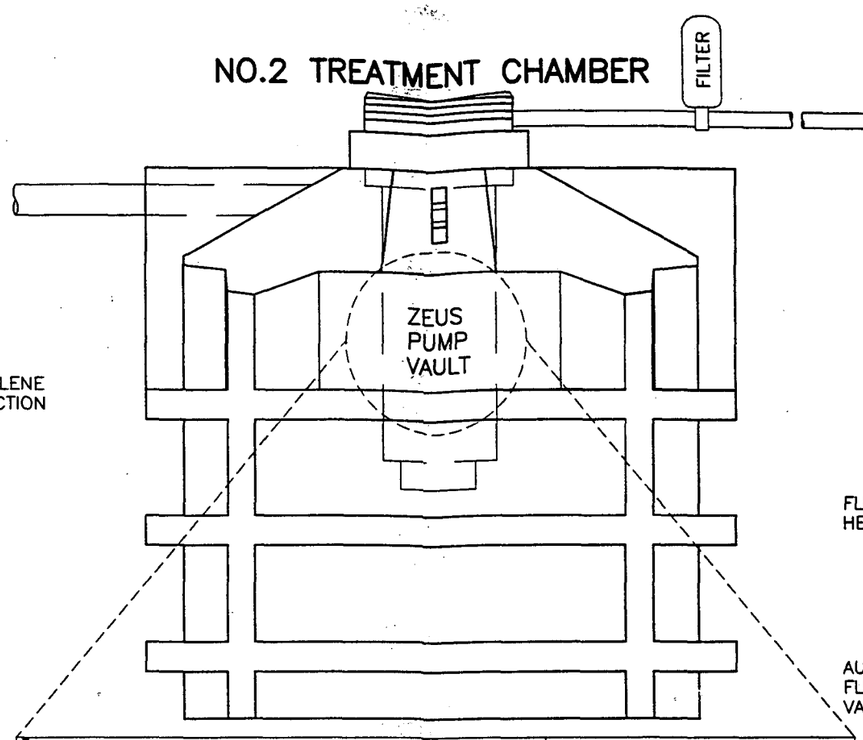

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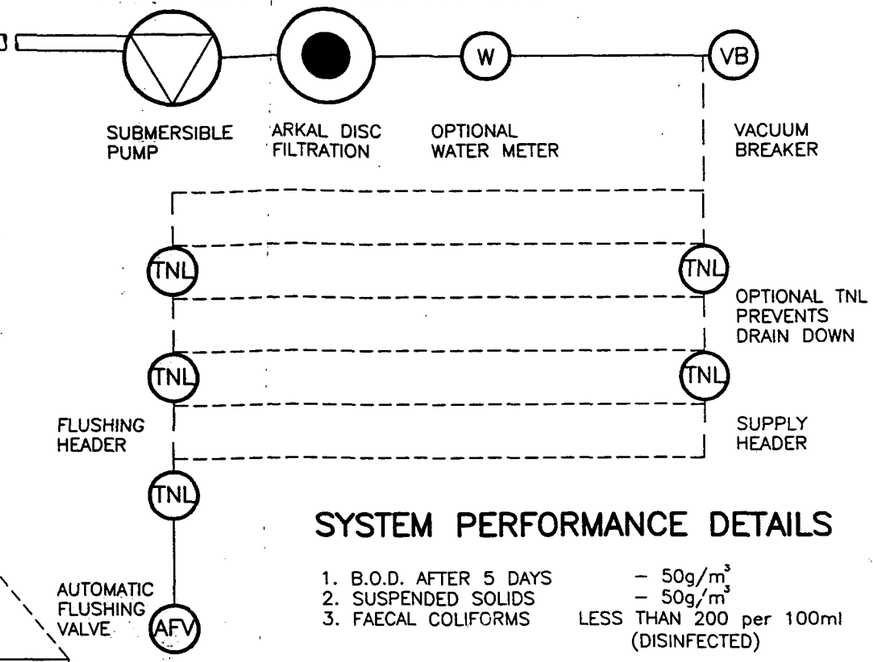

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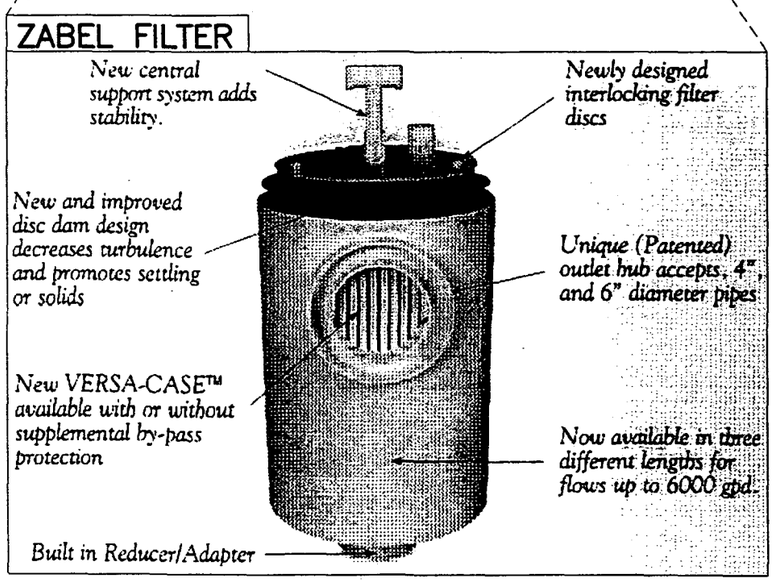

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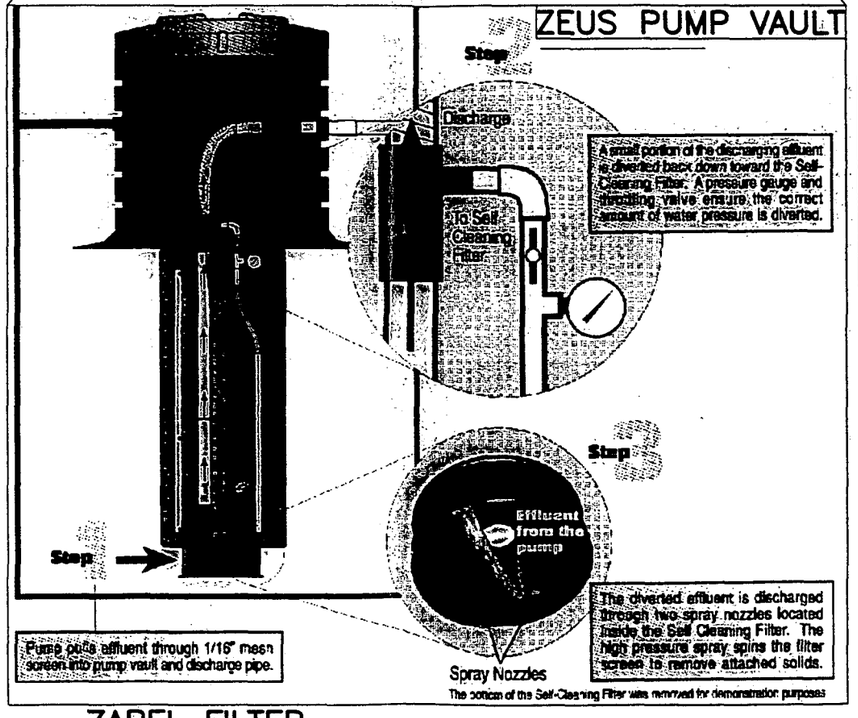

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