SCANNED

davidson group

PROJECT PLANNERS
RESOURCE MANAGERS
CIVIL & STRUCTURAL ENGINEERS
BUILDING DESIGNERS
ENVIRONMENTAL ENGINEERS

**Our Ref: 24675**

11 July 2011

Marlborough District Council
P O Box 443
**BLENHEIM 7240**

**ATTENTION:** Mr A Anderson

**re:** **OKIWI DREAMS LTD, OKIWI BAY (RC: U100750)**

We refer to previous communications with regard to the above, in particular your letters dated 14 December 2010 and 15 April 2011, and our email of 29 June 2011.

The Applicant has had works undertaken to ensure the performance of the wastewater system. Sketch plans of the layout of the dwelling are now also provided as per the attached confirming two bedrooms only.

May this information conclude your requirements in this regard. On behalf of the Applicant, may we thank Council for their patience. Their new mailing address is below.

**DAVIDSON GROUP LTD**

**R W Davis**

RWD:RM

Encl

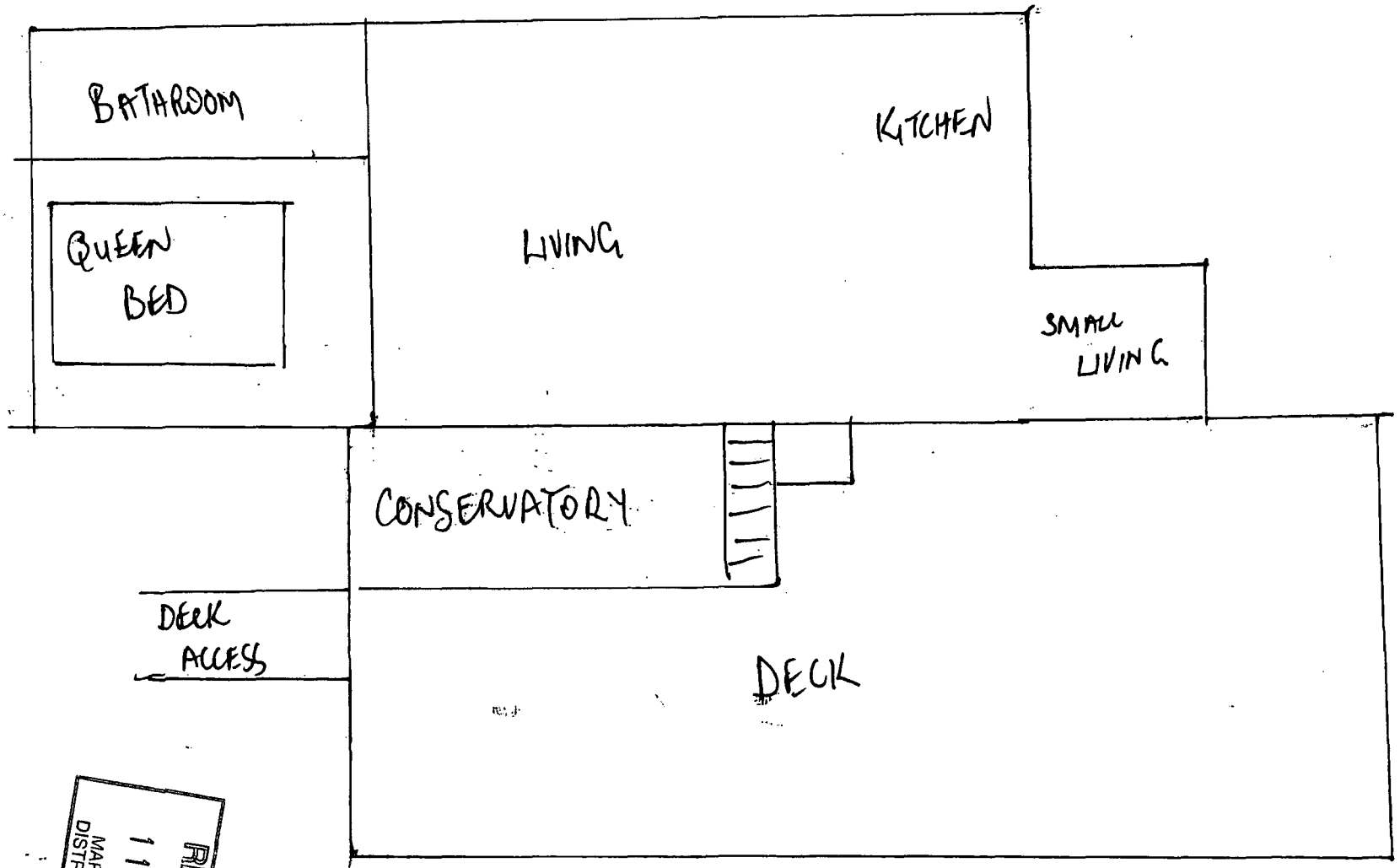
**COPY TO** Okiwi Dreams Ltd
S & C Ryan
46 Cavanagh Drive
Blacks Beach
Mackay 4740
Queensland
**AUSTRALIA**

RECEIVED
11 JUL 2011
MARLBOROUGH DISTRICT COUNCIL

Davidson Ayson House, 4 Nelson St
PO Box 256, Blenheim 7240, NZ
T: 03 579 2099 / F: 03 578 7028
E: service@DavidsonGroup.co.nz
W: DavidsonGroup.co.nz

**Principals**
Ross Davis, CPEng, MIPENZ, BE
Stephen Sheat, CPEng, MIPENZ, BE
Leigh McGlynn, CPEng, MIPENZ, BE

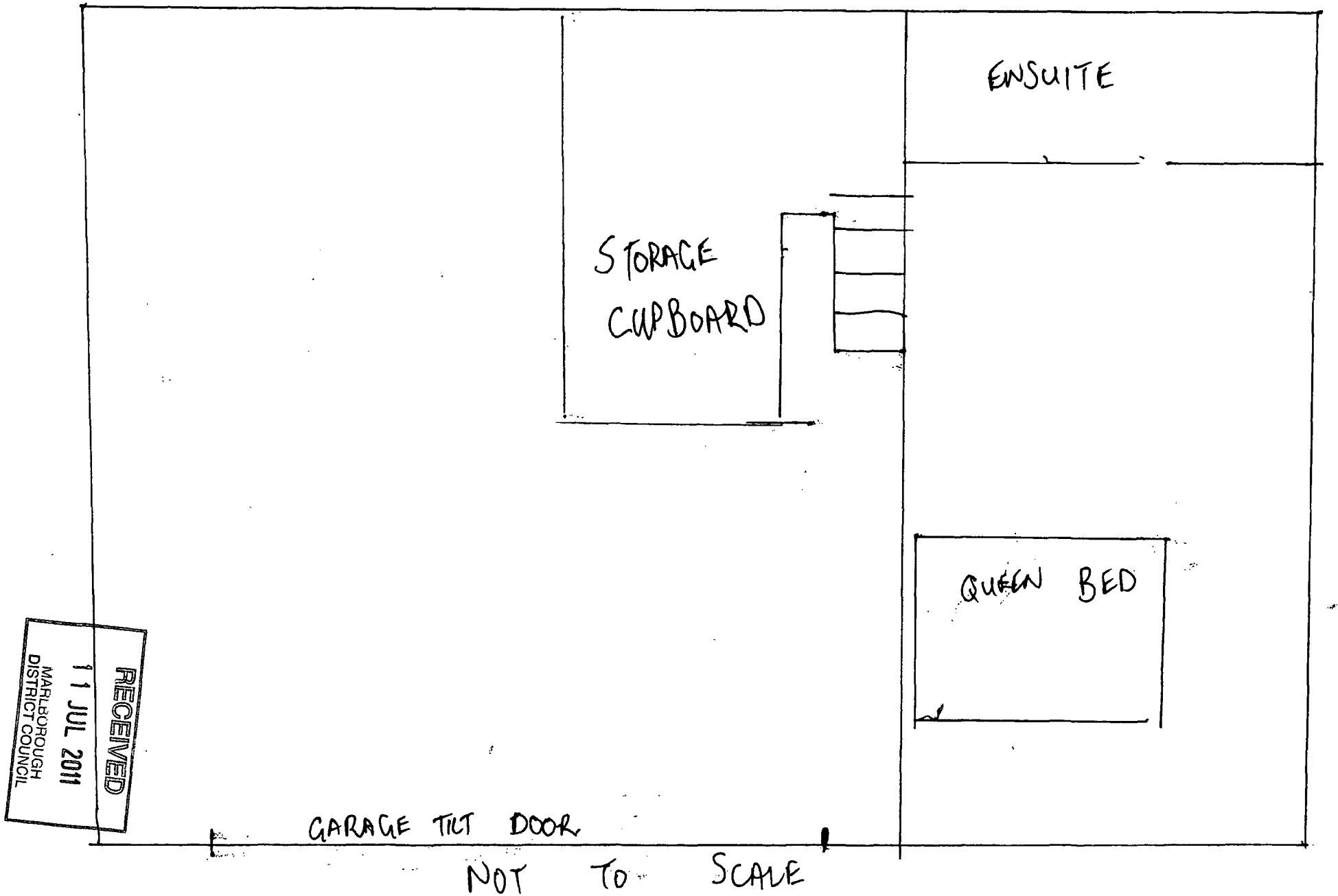
# UPSTAIRS 42 OLD MILL ROAD






NOT TO SCALE

DOWN STAIRS 42 OLD MILL ROAD.






NOT TO SCALE

15 April 2011

ISO 9001:2000
Document Number:
RAD0086-CI646
S92 Final Letter

Davidson Group Limited
PO Box 256
Blenheim 7240

Record No: 116112
File Ref: U100750
Case Officer: Alan Anderson

Attention: Ross Davis

Dear Ross

# Request for Further Information - U100750 - Okiwi Dreams Limited - 42 Old Mill Road Okiwi Bay Croisilles

Regarding your letter dated 31 March 2011, it seems highly unlikely that the families staying at the house during my site visit would be all staying in 2 double beds. It also seems unlikely that 2 double beds would be suitable to accommodate 10 people (as previously advertised on the internet).

This dwelling has been subject to a number of building consents for alterations, some of which have been implemented and some of which have not. Therefore for Council to determine the number of bedrooms in the dwelling and enable the application to continue processing, you must provide the as built plans as requested in my previous letter dated 14 December 2010.

Please undertake the testing recommended by Ian Gunn who is a recognised expert in this field.

Within 10 working days (*3 May 2011*) you must either:

- provide the requested information; or
- provide written confirmation that you can not provide the requested information within the timeframe, but do intend to provide it (Council will provide a revised timeframe); or
- provide written confirmation that you do not agree to provide the requested information.

The processing of your application has been put on hold.

If you have not provided the requested information within the agreed timeframes or if you do not provide all the requested information, the Council will publicly notify your application pursuant to s104 of the Resource Management Act 1991.

If you have any questions regarding this request, please do not hesitate to contact me.

Yours sincerely

Alan Anderson
**RESOURCE MANAGEMENT OFFICER**

davidson group

**ENGINEERING SUBMISSION**
**FOR**
**OKIWI DREAMS LTD**
**43 OLD MILL ROAD, OKIWI BAY**

---



**Our Ref: 24675**
**Date: November 2010**

davidson group

PROJECT PLANNERS
RESOURCE MANAGERS
CIVIL & STRUCTURAL ENGINEERS
BUILDING DESIGNERS
ENVIRONMENTAL ENGINEERS

**Our Ref: 24675**

25 November 2010

**ENGINEERING SUBMISSION**
**FOR**
**OKIWI DREAMS LTD**
**WASTEWATER RESOURCE CONSENT**
**43 OLD MILL ROAD, OKIWI BAY**

## 1. Introduction

Okiwi Dreams Ltd, being Mr and Mrs Ryan, own a fully developed residential allotment at upper Old Mill Road in the densely developed area of Okiwi Bay. We were engaged to reassess their existing on-site wastewater management situation following expiry of their existing Resource Consent U980084, and also to comment on the potential to service an additional bedroom should the owners wish to extend the dwelling in the future.

We have visited the site, assessed the soils and also reviewed the details of the existing system as provided by the owner from work carried out by Worseldine and Wells Consulting Engineers in 1998.

## 2. Treatment System

There is an existing 3,000 litre septic tank in front of the dwelling with an effluent filter. This size of tank does not comply with the Marlborough District Council Guidelines which now require a minimum septic tank size of 4,000 litres.

This size does, however, comply with the Australia / New Zealand Standard which permits a 3,000 litre tank to service a two bedroom dwelling. This capacity also complies for two bedrooms with a five year pumpout and permanent occupation by four persons.

Below we will discuss the need for water use to be restricted in order for compliant wastewater servicing on this property. A reduction in wastewater design flow to 110 litres / person / day will also mean that the existing 3,000 litre tank is acceptable for a total of three bedrooms and permanent usage subject to pumpout frequency being increased to four yearly, rather than five yearly.



Davidson Ayson House, 4 Nelson St
PO Box 256, Blenheim 7240, NZ
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We therefore submit that, in this instance, with reduced water use and an increased pumpout frequency if required, the existing septic tank capacity is adequate.

## 3. Distribution to Effluent Field

The mound system which is in place was originally gravity fed from the septic tank. Currently, there is a small pump chamber adjacent to the western corner of the existing garage, which carries out the function of distributing effluent to the mound. We assume that this pump chamber was installed at the time of the garage construction, as the placement of the garage probably meant that gravity feed to the mound was no longer possible.

We have been provided with no details of this pump chamber and we were not able to access it at the time of our site visit to check its capacity and facilities. For two bedrooms (i.e. four people) with a design wastewater flow of 110 litres / person / day and an allowance for reserve capacity, a pump chamber size of at least 585 litres – say 600 litres – should be provided. We therefore suggest that it should be a condition of the new Resource Consent that a drainlayer or similar professional person open up the pump chamber and verify the capacity and that float controls and a high level alarm are in place.

For a future third bedroom, being six people at 110 litres / person / day, the pump chamber capacity should be at least 878 litres (say 900 litres). Therefore, if the existing capacity is found to be less than 600 litres, then the pump chamber should be replaced with one of at least 900 litres capacity and again have float controls and a prominent high level alarm signal installed.

To clarify, for the existing two bedroom situation, a 600 litre chamber would be adequate, and if the existing pump chamber is undersized, a new chamber of 900 litres capacity should be installed to include provision for a future third bedroom.

## 4. Existing Mound System

The existing effluent field is a mound system as described in the Worseldine and Wells information prepared in June 1998, being their job number 9106 for the Teague residence. A copy of the Worseldine and Wells report is attached.

The mound system was designed for four people at 150 litres / day and a 15 mm / day long term acceptance rate. It therefore was designed with an application area of 40 m². The design and the form of the bed were based on current information prepared by Mr Ian Gunn and the original version of ARC TP58 is referenced in their report. The details of the mound are very similar to those provided in AS/NZS 1547:2000 and hence reflect good practise. 150L/pp

Our assessment of the site from a soils assessment is that the subsoil is a Category 5 silty clay soil in terms of AS/NZS 1547 and that a secondary treatment application rate of 12 mm / day is appropriate. Also, the per person flow rate provided for in the Worseldine and Wells report is less than the accepted 180 litres / person / day. Therefore, with use of a lower application rate and a higher per person flow, the mound would appear not to be large enough in terms of current design standards. The solution to this is to require the installation of full water use reduction fixtures within the dwelling to reduce the per person flow to 110 litres / day. This would then require an effective mound area of only 37 m², which is less than the 40 m² which is in place.

Therefore, with the installation of full water use reduction fixtures within the dwelling, the existing mound system is adequate for the current two bedrooms.

## 5. Future Additional Bedroom

We have been asked to assess the potential for this site to accept wastewater discharge associated with an additional bedroom which may be considered by the current owners in the near future. As above, with low water use, we consider that the existing septic tank is adequate, the pump chamber capacity needs to be confirmed, and that the mound system will not take any more than two bedrooms.

We have therefore considered what additional area is available for the application of primary treated wastewater on this site. The only likely area for this is within the landscaping that exists between the north side of the dwelling and the back of the garage, framed by the driveways, as indicated on the attached plan being drawing number 24675 sheet R1 issue 'A'. This is a well vegetated, terraced landscaping area with high exposure to the sun and wind and ideal for the application of LPED low pressure effluent distribution. For a Category 5 soil at an application rate of 2.9 mm / day, an additional bedroom will require 76 m² of irrigation area. An area of this size is shown on the drawing and with careful layout of pipe work, a suitable LPED system can be established within this landscaped area. Full details of the pipe work and the LPED field have not been prepared at this stage and will not be so until such time as a Building Consent Application is prepared for the additional bedroom and associated works.

In terms of distribution to the LPED area, this can be simply achieved by fitting a three port sequencing valve to the outlet from the pump chamber, with two of the ports feeding the existing mound and one the LPED field. Therefore, a total wastewater solution is available on-site for three bedrooms with no change to the existing treatment or mound, simple upgrading of the pump chamber as required, and the laying of new LPED pipe work within existing landscaping. This would be an economic and low impact solution to cater for the current and future needs of the site.

## 6. Installation, Operation and Maintenance

Appropriate operation and maintenance of the overall wastewater system is paramount to its performance. Records of maintenance work should be copied to Council for inclusion on property records.

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

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

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

## 7. Summary

We have assessed the existing wastewater system, upgrades that are required for this system to comply with current codes, and measures that would be necessary to cater for additional flows associated with a new bedroom should that occur.

A straightforward overall solution is available which makes use of the existing on-site wastewater system subject to the installation of full water use reduction facilities within the dwelling. Once this flow reduction is achieved, the existing system complies for two bedrooms, and simple distribution work can occur to cater for a third bedroom should that be required.

The existing pumping system which feeds the mound needs to be confirmed as to capacity and a high level float with alarm. If the capacity is less than 600 litres, then a 900 litre version should be installed with a float and prominent alarm.

There is no apparent environmental effect from the existing mound system as per the Worseldine and Wells documentation. The additional area proposed for application is well landscaped, clear of the stream both vertically and horizontally, and with a low rate irrigation method to be used there will be no adverse effect therefrom. Note that the hydraulic design of this field and its construction details will be provided at the time of a Building Consent should the proposed additional bedroom go ahead.

Overall, the wastewater servicing on this site requires minor work to provide an economically and sustainable solution for the future.

## 8. References


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

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

**8.3** A.S./N.Z.S. 1546.1:2008 'On-Site Domestic Wastewater Treatment Units, Part 1: Septic Tanks.

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

**8.5** Marlborough District Council (11 July 2005) 'Guidelines for New On-Site Wastewater Management Systems'.

**8.6** Marlborough Sounds Resource Management Plan.

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


**DAVIDSON GROUP LTD**

**R W Davis**

RWD:RM

**APPENDIX**

**A1.** On-Site Wastewater Management Details

- Field Assessment Report
- Test Pit Log
- Owner Guidelines

**A2.** Copy of Worseldine and Wells (1994) Ltd, Resource Consent Application, Teague Residence, June 1998, Job No 9106.

**A3.** Drawing number 24675 sheet;

R1 Site Plan

**DAVIDSON GROUP LTD**

**ON SITE WASTEWATER MANAGEMENT**
**FIELD ASSESSMENT REPORT**

**JOB NAME:** Okiwi Dreams Ltd **JOB NO.** 24675

**LOCATION:** 42 Old Mill Road, Okiwi Bay **DATE:** 17 June 2010

**REFERENCE:** 1. ARC TP#58
2. AS/NZS 1547:2000 'On Site Domestic Wastewater Management'

| | | | |
|---|---|---|---|
| **1.** | Percolation Rate (if available) | | |
| **2.** | Site Exposure | - to sun<br>- to wind | High<br>Moderate |
| **3.** | Topsoil Depth | | 0 mm (but bark mulched) |
| **4.** | Soil Description: | | light brown moist firm silty clay |
| **5.** | Soil Category (1 - 6) | | 5 |
| **6.** | Coarse Fragments - size/abundance | | Sub-angular rock pieces up to 100mm approx / few |
| **7.** | Ribbon Length | | 100-150mm |
| **8.** | Soil Structure (Pedal Content) | | High |
| **9.** | Performance of existing systems nearby | | Unknown |
| **10.** | Nearby water bodies<br>- Separation Distance | | Yes - stream<br>Refer old plan |
| **11.** | Nearby wells | | No |
| **12.** | Intended water supply | | Reticulated |
| **13.** | Runoff to be controlled | | No |
| **14.** | Ground water to be controlled | | No |
| **15.** | Any stability considerations, If yes, comment. | | No |
| **16.** | Depth to water table | | N/A |
| **17.** | Vegetation cover | - Existing<br>- Proposed | Landscaping<br>Landscaping |
| **18.** | Gravity head to proposed field? | | Uphill 2-4m from pump |
| **19.** | Reserve areas available? | | No |

**20.** Other Comments

Limited area available for additional effluent field in benched landscaping between house and garage. Other steeper, retained and rocky areas plus riparian areas to be avoided.

davidson group

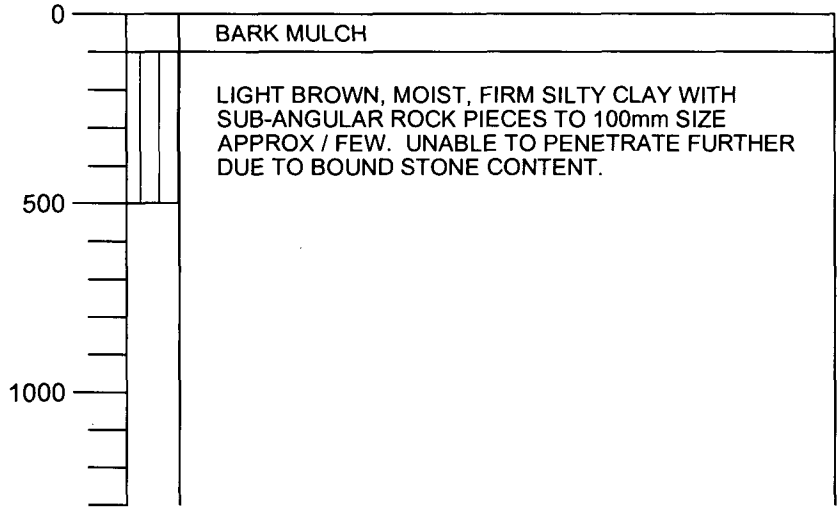
OKIWI DREAMS LTD
42 OLD MILL ROAD, OKIWI BAY
WASTEWATER INVESTIGATION

test pit results

Job No 24710
Sheet No 1
Name RWD
Date 17/06/2010

EXCAVATION METHOD SPADE & AUGER

## TEST PIT 1



# DAVIDSON GROUP LTD

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

### Helpful Information for Homeowners/Occupiers

## 1. GOOD HOUSEHOLD PRACTICES

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

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

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

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

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

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

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

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

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

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

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

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

(iii) No vehicles or heavy stock should be allowed on effluent fields;

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

## 2. MAINTENANCE

### (a) General

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

### (b) Septic Tanks

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

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

(ii) Have grease traps cleaned out regularly (typically three monthly or as required);

(iii) Keep the access cover of the septic tank exposed;

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

### (c) Secondary Treatment Systems

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

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

**(d) Effluent Field**

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

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

**(ii)** Evapotranspiration and irrigation areas should have their vegetation maintained to ensure that these areas take up nutrients with maximum efficiency;

**(iii)** Ensure pumps, alarms and sequencing valves are operating correctly;

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

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

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

COPY



# RESOURCE CONSENT APPLICATION

TEAGUE RESIDENCE

OLD MILL ROAD, OKIWI BAY

ON-SITE

EFFLUENT DISPOSAL

Prepared by WORSELDINE & WELLS (1994) LTD
26 Nile Street
Nelson

June 1998

Job No. 9106

# TABLE OF CONTENTS

**Summary**

The following report outlines the proposed wastewater management system that has been designed to serve the new residence of Mr Teague in Old Mill Road, Okiwi Bay.

The disposal system presently installed is deemed unsuitable for future use and needs to be replaced. The existing septic tank component is of sufficient capacity and will therefore be retained.

The proposed system involves pre-treatment by way of the currently installed 3000 litre septic tank. Flows are then screened through a Biotube effluent filter before being dose-loaded by siphon to a mound system where further treatment is received prior to disposal.

The major disposal pathway promoted is that of plant uptake and subsequent evapo-transpiration to the atmosphere.

The disposal site is within 30 m of an open waterway. An assessment of effects is therefore provided so that this discharge may be evaluated as part of the resource consent process.

## 1.0 Present System

Wastewater flows derived from the existing one bedroom dwelling presently drain to a 3000l septic tank. The effluent passes through a filter before gravity loading an Everglas vaulted trench system.

The sizing of the trench will be insufficient to serve the proposed two bedroom house. It is also considered that the Everglas system is an inappropriate disposal solution for this site considering the proximity of the water table.

The Everglas system may be left in position to act as a sub-surface drain used to intercept groundwater flows, diverting them away from the disposal site of the proposed system.

## 2.0 Outline of Proposed System Upgrade

### 2.1 Septic Tank

Wastewater flows shall continue to drain to the existing 3000L septic tank. This tank has sufficient capacity to ensure adequate retention for the pre-treatment of flows derived from the proposed two bedroom dwelling.

Some alterations to the tank will be required in order to accommodate the dosing siphon unit described in the following subsection.

### 2.2 Dosing Siphon

An Orenco OSI 204 siphon unit shall be installed with the septic tank to load the disposal field by dosed volume. The siphon is housed inside a Biotube effluent filter and a PVC vault that is mounted from the roof of the tank through the existing access hole.

The siphon is tripped by the vacuum created at the high water level and will send a volume of around 240l to the disposal area. This action may occur 2 – 3 times each day.

To install the siphon the contents of the tank will need to be pumped out. Care should be taken to ensure that any risk of tank flotation due to a high water table is eliminated.

A hole will need to be drilled in the side of the tank for the 50mm siphon outlet at a distance of 750mm from the top of the tank. This outlet should be set into position and sealed with epoxy. The previous outlet should be removed, blocked and sealed.

A small access riser with a removable lid is to be installed above the siphon, and epoxied in position.

## 2.3 Effluent Filter

The Zabel filter presently installed at the tank outlet becomes redundant and so may be removed. A Biotube effluent filter surrounds the siphon unit to be installed and offers a greater filtration surface while also significantly increasing the pump-out interval of the tank.

## 2.4 Disposal by mound system

A mound system shall be utilised to release the effluent flows safely on-site. The mound is shaped to promote evapo-transpiration as the preferred disposal pathway with uptake by the grass cover and plantings. Any remaining effluent is leached through the fill media, achieving a high quality of treatment prior to reaching groundwater.

### 2.4.1 Mound Construction

The effluent is dose-loaded to a gravel distribution bed within the mound at an elevated position above a sand filtration media of minimum depth 600mm.

The side batters of the media are 3:1 on the uphill side and 2:1 on the downhill side. The approximate extent of the mound at its base is 15m across the slope by 6.6m (refer figure 2, Appendix Two).

The sand and gravel distribution bed are overlaid with filter cloth, and covered with 150mm of topsoil and planted in grass. Additional plantings are made on and beyond the downhill slope to provide extra assistance in disposing of flows by way of evapo-transpiration.

### 2.4.2 Distribution

Flows are transported from the septic tank to the mound by way of an 80mm diameter pipe with no abrupt change in grade or opportunity for developing an air lock. A minimum grade of 1 in 60 applies.

The pipe carries flows smoothly down to the level of the distribution bed within the mound, which requires the pipe to protrude above the existing ground surface near to the mound. A bridge formed of fill will be necessary to provide support for the pipe in this section and adequate cover provided.

Three 25mm diameter lateral pipes branch off the transport pipe within the mound and run along the length of the gravel distribution bed. These pipes are evenly spaced and housed within a 65mm diameter NovaFlo pipe following cleanwater testing.

A number of small 3mm diameter squirt holes are drilled at even intervals along the crown of the laterals. The siphon loads the laterals and flows discharge at pressure within the NovaFlo before draining to the gravel for distribution.

## 3.0 Assessment of Effects

Wastewater flows derived from the household contain various contaminants that have the potential to impact adversely on both human health and the natural surroundings.

The following section outlines the features that are incorporated into the designed system to ensure that a reliable and high quality process is utilised in returning wastewater flows safely to the environment.

### 3.1 Treatment quality

Pre-treatment of wastewater occurs in a 3000L septic tank. This provides ample retention of the design flows (600L/day) managed by this system to bring about significant reduction in pollutant concentrations.

Removal efficiencies are high and further enhanced by the presence of an effluent filter that prevents carry-over of any solids exceeding 3mm. Over 90% of solids are removed and the organic load reduced by around 65% to give a consistent high quality effluent with typical parameters of: Biological Oxygen Demand (5 days) ($BOD_5$) is less than 100mg/l and Suspended Solids (SS) is less than 30mg/l.

The effluent is dosed to the disposal mound where it is subjected to further treatment as flows percolate down through a minimum 600mm depth of sand media. Through the action of aerobic bacteria the $BOD_5$ and SS parameters are futher reduced to levels typically both less than 15mg/l.

Faecal coliform bacteria derive from toilet wastes entering the system and are used as a general indicator of bacteria levels present. Those bacteria passing through with flows to the disposal mound experience high die-off rates during filtration through the sand media. The indicator populations exist at levels between 10 and 1000/100ml in the treated effluent.

The other major pollutant present in wastewater flows is the nutrient content. Most phosphorus is removed by absorption in the filtration process, however the soluble forms of nitrogen are far more mobile.

Typical concentrations of total nitrogen and phosphorus present in sand mound effluent are 30 – 50 mg/l; and 5 – 10 mg/l respectively.
(Gardner et al,1997)

### 3.2 System Features

There are several features incorporated into this system that aim to mitigate any potential adverse impact associated with on-site wastewater disposal.

The Biotube effluent filter prevents the carry-over of solids that may cause clogging of infiltrative surfaces and subsequent triggering of system failure.

The siphon allows for intermittent dosing of flows to the mound so that the sand is able to recover between loading cycles. This avoids having a permanently saturated region that may promote the build-up of biomat, resulting in creeping failure.

The sand media has ample available pore space to provide the aerobic conditions that enhance breakdown of contaminants and provides a large surface for treatment bacteria to attach. The depth of sand is 600mm which is sufficient to ensure that there is, at all times, adequate depth of media available above groundwater for treatment to occur.

The grass cover of the mound and plantings on and below the downhill slope of the mound assist in the disposal process while also offering a form of nutrient control by way of plant uptake.

### 3.3 Impact on Receiving Environment

The proposed system produces a consistently high quality of effluent and responds well to varied loads due to voids storage within the fill media. Flows are able to re-join the water cycle with minimal impact.

The disposal site is in close proximity to an open waterway and is therefore subject to constraints imposed by the presence of a high water table. Disposal to an elevated position within the mound ensures that effluent quality is not compromised under normal operating conditions.

The level of most major contaminants are significantly reduced to within limits considered acceptable for on-site disposal. Therefore no adverse threat to aquatic systems is likely as a result of effluent disposal.

There is no associated health risk since flows are unlikely to surface due to the incorporation of design provisions such as voids storage, conservative loading rates and appropriate batter angle. Also, great reductions in pathogen numbers are experienced as part of the treatment process.

The nitrogen content present in the treated effluent remains at relatively high levels. This is common to all on-site systems as there is little opportunity for the removal of nitrogen by denitrificaion. Plant uptake must therefore be relied upon to assist in reducing nutrient levels.

The area reserved for plantings on and below the mound should have a regularly maintained grass cover along with suitable shrubs to intercept the effluent or any nutrients leached to groundwater.

There will inevitably be some nitrogen that finds a pathway to the nearby stream. However, the design allows the provision of approximately $100m^2$ of planted area between the disposal point and the waterway. This should bring about a significant reduction in the amounts of nitrogen leached to the stream.

There are no firm guidelines as to the acceptable levels of nitrogen that are leached from individual on-site disposal systems. There is, however, a potential for the nutrient content to contribute to a cumulative impact on the water quality of downstream ecosystems. It seems this is best controlled by the density of septic systems permitted in a catchment. (Gardner et al,1997)

## 4.0 Conclusion

A suitable on-site treatment and disposal system has been designed to manage wastewater flows derived from this site.

Due consideration has been made of the overall likely impacts this discharge may have on the receiving environment. A description of system features is given to explain the measures taken to mitigate any likely or foreseen impacts.

Any queries regarding the wastewater management system outlined in the preceding report should be directed to the writer.

D Kirk
**WORSELDINE & WELLS (1994) LTD**

REFERENCES

Gunn, I, (1994) On-site wastewater disposal from Households and Institutions, TP58, Arc Environment

Gardner, T, Geary, P, Gordon, I (1997) "Ecological sustainablity and on-site effluent treatment systems" in Australian Journal of Environmental Management – Volume 4

## APPENDIX 1

Design basis for the proposed wastewater treatment and disposal system.

Design Flow

| | |
|---|---|
| No. of bedrooms | = 2 |
| Design population | = 4 |
| Per capita design flow | = 150 L/cap/day |
| Design flow, Q | = 600 L/day |

Application Rate

| | |
|---|---|
| Soil category | = 3 → 4;good to moderate drainage |
| Most conservative LTAR | = 15mm/day (Gunn, 1994) |
| Area of sand/Soil interface | = 40m$^2$ (approx) |
| Load to soil interface | = 600/40 |
| | = 15mm/day |
| Basal area of mound | = 80m$^2$ |
| Basal loading | = 600/80 |
| | = 7.5 mm/day |

| | |
|---|---|
| Sand media category | = 2 ; Free draining |
| Least conservative LTAR | = 50mm/day |
| Distribution bed area | = 600/50 |
| | = 12m$^2$ ; say 1.2m by 10m |

Mound Design

| | |
|---|---|
| Depth of fill | = 600mm |
| Uphill batter | = 3 to 1 |
| Downhill batter | = 2 to 1 |
| Depth of topsoil cover | = 150mm |
| Minimum depth of cover above distribution bed | = 200mm |
| Maximum depth of cover above distribution bed (at crown) | = 300mm |

Filter cloth covers sand media to prevent clogging by fines. Use washed sand as a filter media with less than 5% fines (Builders mix unsuitable).

Distribution

| | |
|---|---|
| Squirt hole diameter | = 3 mm |
| Design flow rate of siphon | = 110L/min |
| Minimum flow through each hole | = 1.45L/min |
| No. of squirt holes | = 72 |
| Spacing between holes | = 400mm |

| | |
|---|---|
| No. of laterals | = 3 |
| Length of each lateral | = 10m |
| Distance between lateral centres | = 400m |

Gravel size is 6 to 25mm. Washed with no fines.

Layout

Laterals are laid level along their length with squirt holes positioned at the crown of the pipe.

Following cleanwater testing 65mm diameter Novaflo is sleeved over each lateral and the pipe circuit completed as shown in Fig. 2 of Appendix Two.

The transport pipe from the siphon must be laid with smooth transitions using formed bends where necessary. There must be no abrupt change in grade or direction that may cause an air lock.

## APPENDIX 2

## DRAWINGS

(A) SITE LAYOUT

(B) MOUND CONSTRUCTION

## APPENDIX 3

## PLANT SPECIES SUITABLE FOR USE WITHIN EFFLUENT DISPOSAL AREAS

1. The following list is not exhaustive, many other plants are suitable. While most of the plants listed are hardy, some will need varying degrees of protection until established.
2. It is preferable that evergreen species be planted within effluent disposal areas, although some deciduous trees offer very good transpiration when in leaf.

### SHRUBS

| | |
|---|---|
| Butterfly Bush (rapid spreading habit) | Coprosma crassifolia |
| Coprosma | Coprosma rotundifloia |
| Coprosma, Round leaved | Coprosma areolata |
| Coprosma, Thin-leaved | Phormium Tenax |
| Flax | Gunnera species |
| Gunnera (herbaceous plant) (larger varieties are best) | Hebe Species |
| Hebe | Clianthus puniceus |
| Kaka-beak | Coprosma lucida |
| Karamu, Shining | Cosprosma Australis |
| Kanono | Fuchisia excorticata |
| Kotukutuku | Salanum aviculare and Solanum laciniaturn |
| Poroporo | Brachyglottis repanda |
| Rangiora | Asclepias physocarpa |
| Swan Plant | |

## DECIDUOUS TREES

| | |
|---|---|
| Beech | Fagus species |
| Birch | Betula species |
| Black Locust | Robinia pseudoacacia |
| Elm | Ulmus species |
| Willow, Bitter | Salix species |
| Willow, Pussy | Salix caprea |

## EVERGREEN TREES

| | |
|---|---|
| Akiraho | Olearia paniculata |
| Alder, Evergreen | Almus jorulensis |
| Blackwood | Acacia melanoxylon |
| Karaka | Corynocarpus laevigatus |
| Karo | Pittosporum crassifolium |
| Kawa-kawa | Micropiper excelsum |
| Kohuhu | Pittosporum tenuifolium |
| Lacebark, Long-leaved | Hoheria sexstylosa |
| Lacebark, Narrow-leaved | Hoheria angustifolia |
| Lemonwood | Pittosporum eugenoides |
| Makomako | Aristotelia serrata |
| Manuka | Leptospermum species |
| Pine | Pinus radiata |
| Pukatea | Laurelia novae-zelandiae |
| Puriri | Vitex lucens |
| Sheoak | Casuarina glauca |
| Tree Lucerne | Chamaecytisus palmensis |

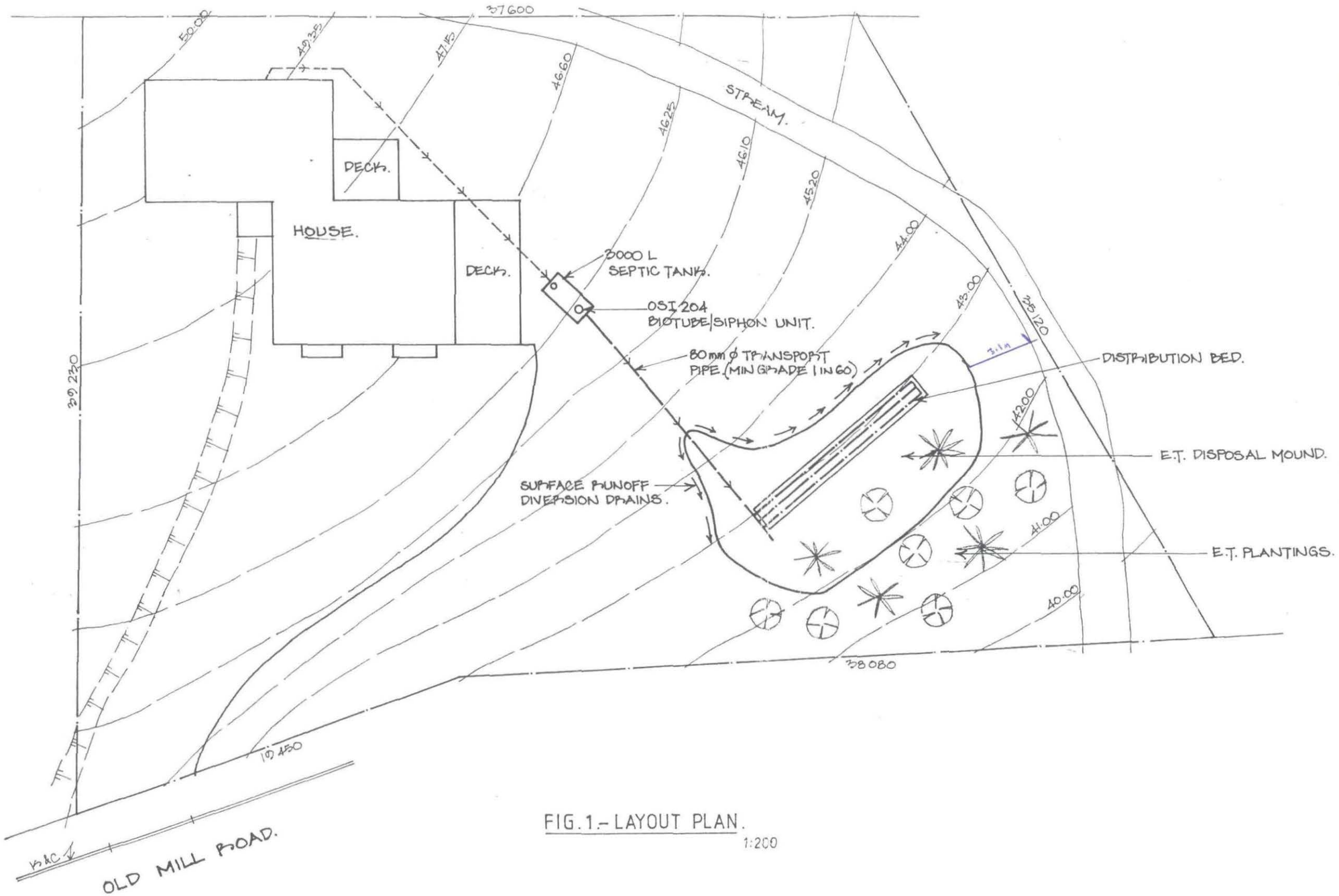



FIG.1.- LAYOUT PLAN.
1:200

NOTES.

(1) Verify all dimensions on site.
(2) Do not scale from drawing

ACENZ

(3) TOP OF SEPTIC TANK IS AT LEVEL 46.30 m.
(4) MINIMUM FALL BETWEEN TOP OF SEPTIC TANK AND DISTRIBUTION BED IS 2.50 m
(5) TRANSPORT PIPE TO BE LAID TO GIVE A SMOOTH TRANSITION BETWEEN SEPTIC TANK AND MOUND, WITH NO OPPORTUNITY FOR AIR LOCK.
(6) TRANSPORT PIPE TO BE BRIDGED PRIOR TO MOUND, SUPPORTED WITH FILL AND COVERED.
(7) PLANTED AREA TO BE GRASSED AND REGULARLY MAINTAINED (CLIPPINGS REMOVED)

| No. | Amendment | Date |
|---|---|---|

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| | |
|---|---|
| Design. | D.K. |
| Drawn. | R.E. |
| Checked. | |
| Approved. | |
| Date. | JUNE 98 |

job title:
TEAGUE HOUSE - OKIWI BAY
PROPOSED WASTEWATER
MANAGEMENT SYSTEM.

drawing title:
LAYOUT PLAN.



scale: 1:200

JOB No 9106

SHEET 1

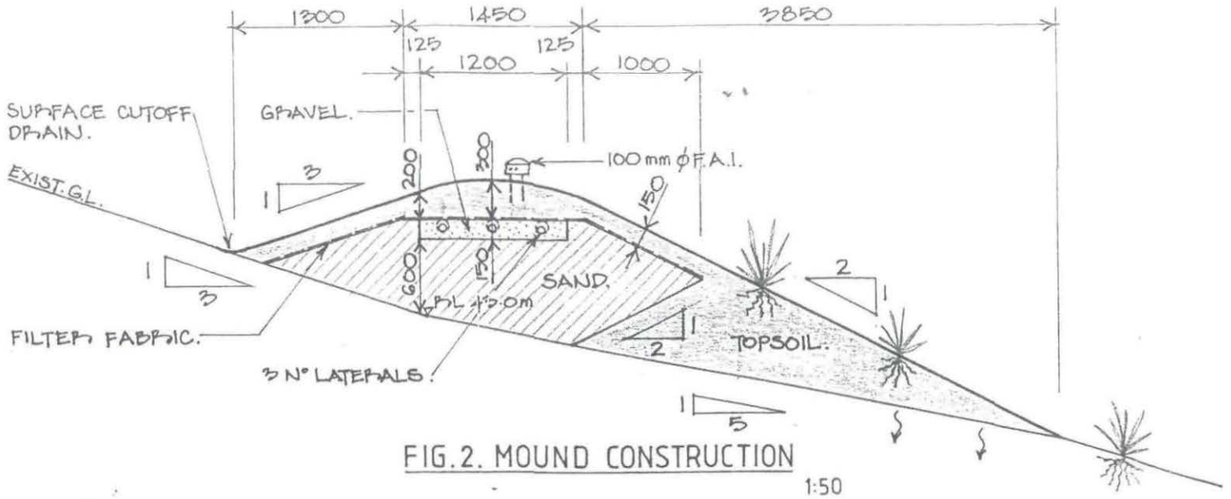



FIG.2. MOUND CONSTRUCTION

1:50

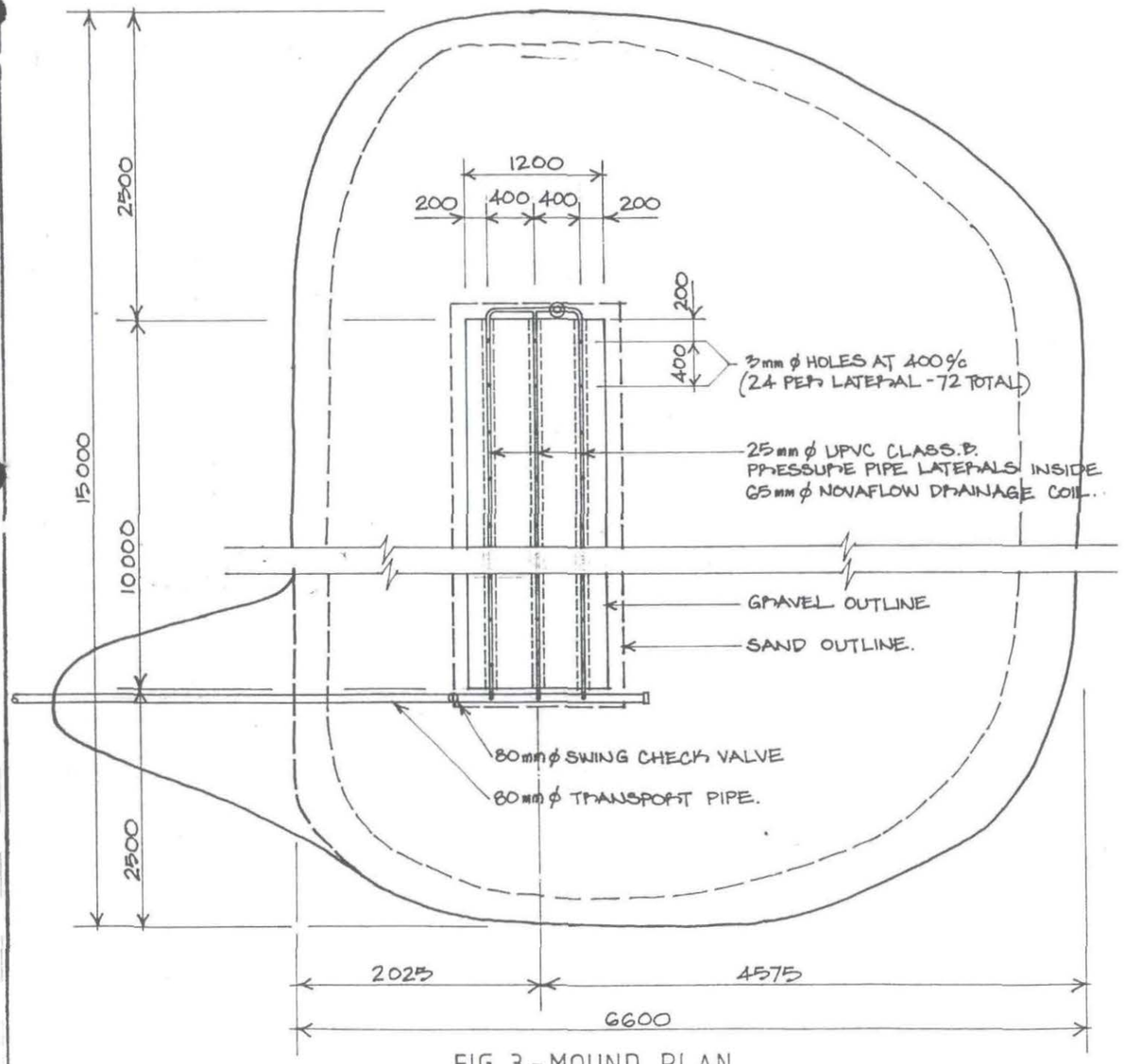
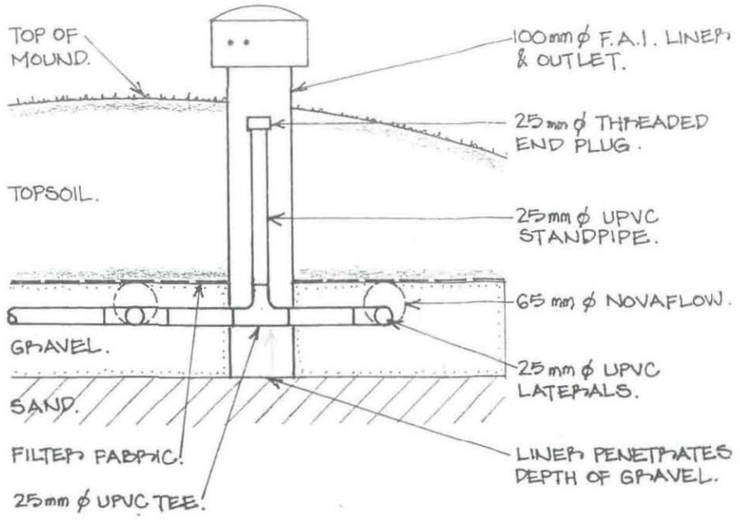
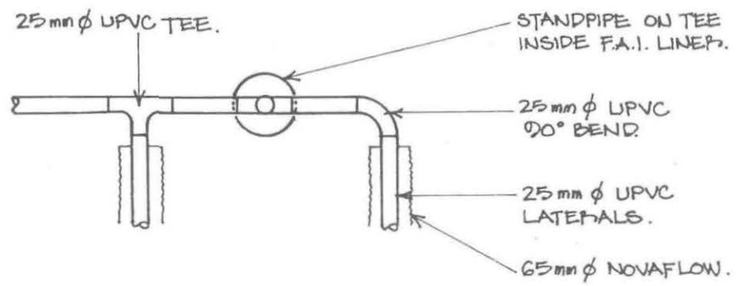



FIG.3.- MOUND PLAN

1:50



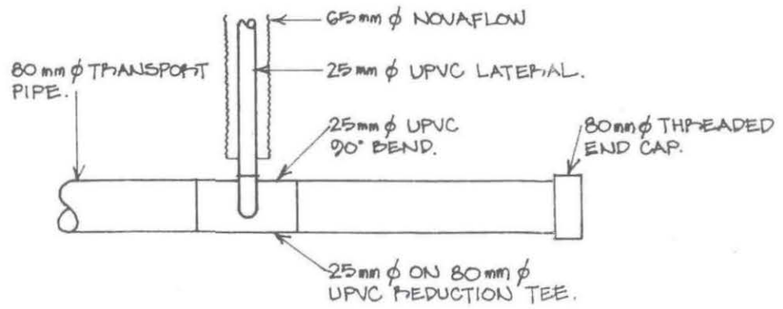

Elevation




Plan

DETAIL.A.

1:10




DETAIL.B.

1:10

NOTES.

(1) Verify all dimensions on site.
(2) Do not scale from drawing.
(3) MOUND FILL MEDIA:
- (i) SAND (COARSE)
  - WASHED, <5% FINES (BUILDER MIX UNSUITABLE)
  - APPROX VOLUME = 25 $m^3$
- (ii) GRAVEL
  - WASHED, NO FINES
  - 6 TO 25 mm
  - APPROX VOLUME = 2 $m^3$
- (iii) TOPSOIL
  - APPROX VOLUME = 30 $m^3$

(4) GROUND SURFACE UNDERLYING THE MOUND TO BE BENCHED TO SUIT THE SITE.
(5) ALL DISTRIBUTION PIPEWORK TO BE UPVC CLASS B PRESSURE PIPE.
(6) FILTER FABRIC TO BE POSITIONED BETWEEN INTERFACE OF TOPSOIL AND THE GRAVEL AND SAND FILL.
USE BIDUM A12 GEOTEXTILE.

| No. | Amendment | Da |
|---|---|---|

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| | |
|---|---|
| Design. | D.K. |
| Drawn. | R.E. |
| Checked. | |
| Approved. | |
| Date. | JUNE. 9 |

job title:

TEAGUE HOUSE - OKIWI BAY. PROPOSED WASTEWATER MANAGEMENT SYSTEM

drawing title:

- MOUND CONSTRUCTION.
- MOUND PLAN.
- DETAILS



| scale: | |
|---|---|
| 1:50 | |
| 1:10 | |
| JOB N° 9106 | SHEET 2 |


PLAN
1:200

0mm 100mm

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NOTE:

FINAL DESIGN AND DETAILS OF FUTURE EFFLUENT FIELD AND DISTRIBUTION SYSTEM TO BE PROVIDED AT BUILDING CONSENT STAGE BY ENGINEER WHO SHALL ALSO INSPECT AND CERTIFY CONSTRUCTION.

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RESOURCE MANAGERS
CIVIL & STRUCTURAL ENGINEERS
BUILDING DESIGNERS
ENVIRONMENTAL ENGINEERS

Davidson Ayson House, 4 Nelson St
PO Box 256, Blenheim 7240, NZ
T: 03 579 2099 / F: 03 578 7028
E: service@DavidsonGroup.co.nz
W: DavidsonGroup.co.nz

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