FILE

Davidson Partners Ltd

ENGINEERING REPORT
FOR
S & J HARVEY

This 2002 material largely superceded

December 2002

Davidson Partners Ltd

Structural Engineering
Civil Engineering
Building Design
Project Management

Practising in association with Ayson and Partners, Registered Surveyors

Our Ref: 22501

23 December 2002

ENGINEERING REPORT FOR S & J HARVEY

LOCATION DETAILS: Elaine Bay, Tennyson Inlet

LEGAL DESCRIPTION: Lot 10 D.P. 5635

DATE OF SITE VISIT: 7 October and 26 November 2002

ZONING: Sounds Residential

CONTENTS

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Our Ref: 22501

A. SYNOPSIS

A1. Scope of the Investigation

Davidson Partners Ltd was engaged by Mr and Mrs Harvey to provide engineering advice as necessary for their proposed development of Lot 10 D.P. 5635 at Elaine Bay. This advice has included comments on the suitability of the site, vehicle access and appropriate measures for on site wastewater management.

We note that this area of Tennyson Inlet has been designated as a Stability Hazard by the Marlborough District Council and therefore any building or effluent field will require Resource Consent. We have commented on this issue as part of our assessment.

Our investigation included a thorough visual inspection on and around the property, the carrying out of scala penetrometer tests, the assessment of the soils in the area for wastewater management and the picking up of relevant features by survey. We have also inspected other information available on this area.

A2. Summary and Conclusions

A2.1 The long narrow site has gentle slopes other than at the south western boundary where it begins to fall away towards the existing track and road. There are no stability concerns and the whole of the site is considered suitable for building. However, an area considered most suitable is shown on the plans and allows for maximum view and a wastewater disposal area.

A2.2 Ground conditions are good with suitable foundation material being available within less than 1.0 m of the existing ground level.

A2.3 Standard construction will be suitable on this site; however the owners intend to use pole frame construction to achieve their desire to view out across Elaine Bay in a north easterly direction.

A2.4 The clay soils of the site are poorly drained and one of our penetrometer tests (P2) struck wet soils at approximately 1.1 m depth. There is also sparse and stunted vegetative growth on this property. Very conservative water use and careful distribution of the treated wastewater is required to be able to suitably develop the site within the constraints of the soil type.

A3. Recommendations

The building site and effluent field shown on the plans are suitable for house construction and the controlled discharge of treated domestic wastewater respectively, provided that;

(a) Water from the roof and storage overflow, together with any driveway drainage, be collected and piped/channeled to the water table of Elaine Bay Road to the north west.

(b) The drinking water is assessed to ensure that it complies with current drinking water standards.

(c) The wastewater treatment and distribution systems are supplied and installed strictly in accordance with the recommendations of our report, including the installation of maximum water conserving devices within the dwelling.

(d) The wastewater system design be reviewed at the time of Building Consent to confirm its suitability to serve the proposed dwelling.

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B. REPORT

B1. Site Description

The property lies at the head of Elaine Bay, adjacent to where the Elaine Bay Road branches off from the Croisilles – French Pass Road and heads down to the foreshore. The property does not have a direct foreshore access.

The vegetation cover is manuka and pine although the tree growth is relatively sparse and stunted.

The building site investigated is located at the south eastern end of the property. The general ground slopes are gentle (0 – 10°).

B2. Geotechnical Investigation

The institute of Geotechnical and Nuclear Sciences book 'Geology of the D'Urville Area' identifies the land at the head of Elaine Bay as an earth flow deposit (i.e. the result of historical land movement from the slopes above which has filled in the head of the bay) and this designation may have been part of the origins of the instability Hazard Zoning of this area.

Our scala penetrometer tests and observations of the site however confirm that this debris has long since stabilized and consolidated such that firm bearing is available within 1.0 m of existing ground level. The striking of rock by the penetrometer at 1.2 m – 1.5 m depth will be due to the existence of large rock fragments within the earth flow and is not representative of an original rock surface beneath the site.

The flat to gentle slopes on the property do not give rise to any existing or potential future instability other than what might be caused by extreme natural events. We do note the existence of a fault trace approximately along the line of the Elaine Bay Road in this area.

B3. Geotechnical Assessment

The building site identified on the drawings is considered stable and at very little risk of future instability. There is no threat from surrounds and we consider a very good building site to be available even given the existence of the property within a Natural Hazard Zone.

The fault trace is not considered active.

B4. Building Site

The extent of the proposed building site has been shown on the drawings in the owner's desired position near the south eastern end of the property. There is an existing iron tube which we located on our survey and forms a permanent mark for future reference.

The site would suit any type of foundation, and the owners' intention of pole frame construction to achieve a suitable floor level will be more than adequate. The pole platform foundations will require engineering design and inspection as is normal with that type of construction.

The above is based on the interpretation of visual examination and limited soil tests only, and does not preclude the possibility of differing soil properties and or other relevant physical features being present between the test locations or hidden from view. Allowance should be made for further assessment during development of the site with additional work being carried out as necessary.

B5. Wastewater Investigation

An investigation was carried out in accordance with AS/NZS 1547:2000 "On Site Domestic Wastewater Management".

The soil of the site is a plastic, brown, silty clay with strong cohesion and poor drainage. It does not support vigorous vegetative growth and there also appears to be a perched water table at approximately 1.1 m below the ground surface near the south east end. The area available on the site for an effluent field will be at the same level or slightly uphill of the proposed building and will therefore require pumping to the effluent field area.

The site has high exposure to sun and wind and a topsoil depth of 150 mm. The clay soil ribbons to 50 – 75 mm and the soil category was assessed as 5. There are no nearby water bodies and there are no issues with control of surface runoff or instability.

Refer to our field notes in the Appendix.

B6. Wastewater Assessment

We have carried out a detailed assessment of the treatment and distribution systems required for suitable management of wastewater on this site. Refer to our design notes in the appendix.

B6.1 Loading

A three bedroom dwelling is proposed and thus we have used a standard design occupancy of five persons.

There is a good creek water supply to this property and therefore full wastewater allowance would normally be 180 l/person/day. However, due to the severe limitations imposed by the soil type, it is necessary to install the maximum water conserving devices as detailed in AS/NZS 1547, i.e. low water use washing machine and toilet, aerated taps, shower flow restrictor, and to exclude the installation of any dishwasher or garbage grinder or other high water use item. We also recommend the oversizing of the wastewater treatment system to ensure the peak loads are buffered and that a high level of treatment is maintained at all times.

We have therefore designed on the basis of five people at 115 l/person/day, i.e. a daily design flow of 575 litres.

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B6.2 Septic Tank

For five persons, low water use, and a five year pump out frequency, a 3,000 litres septic tank would be adequate. However, we recommend to ensure that peak loads are buffered and a high standard of treatment is maintained that the septic tank size be increased to 4,500 litres. An effluent filter must be fitted to the outlet of the tank as per standard practice.

The septic tank treatment system proposed will not meet the standards in the Proposed Marlborough Sounds Resource Management Plan in the following areas;

(a) Septic Tank Compartments (2 minimum)

The New Zealand Standard for Septic Tanks (AS/NZS 1546.1:1998) specifically allows single chamber tanks (Clause 3.4.2).

(b) Quality

We consider that the quality limits in the Plan are too stringent and that septic tanks in good operation are unlikely to better the BOD and SS limits (100 and 60 g/m^3 respectively) and will certainly not achieve the faecal coliform limit (less than 10^3) per 100 ml.

However, with an effluent filter to the outlet of the tank, as we have specified, the effluent quality will be below the BOD/SS limits, but not the faecal coliform limit (probably $10^3 - 10^4$).

To reduce the faecal coliform content to less than 10^3 per 100 ml will likely require tertiary treatment such as ultra violet, ozone or chlorination treatment.

We therefore consider that the Plan has set a faecal coliform limit which in practical terms, for development in the Sounds, cannot be met.

B6.3 Effluent Field

We consider that the poor drainage of the plastic clay soils on the site renders trench systems unsuitable in this instance.

The effluent field needs to be an irrigation type system where there is a thin spread of treated wastewater over the ground for uptake by evapotranspiration. We have assessed the appropriate application rate at 2.9 mm per day and consider that simple low pressure distribution of septic tank pretreated wastewater would provide an adequate and robust system for the management of treated wastewater on this site. The effluent field area will benefit from applications of mulch to improve the condition of the soil and planting to assist with the evapotranspiration which will deal with the discharge.

We recommend an irrigation field layout covering at least 200 m^2 be provided with pumped distribution through laterals at 1.0 m centers. The dosing chamber supplying the effluent field must be designed with at least 24 hours emergency storage and a capacity which will provide this is specified on the plans.

The layout and extent of the irrigation field should be confirmed once the house design is completed and the owners have finalized how they wish to set out their site. It is emphasized that allowing suitable area dedicated for the management of wastewater is very important to the appropriate development of this site.

B6.4 Additional Work

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

(a) Unusual soil characteristics not normally tested for

(b) An increase in design load

(c) Disposal of inappropriate substances to the septic system

(d) Poor maintenance

(e) Poor workmanship or departure from construction drawings

(f) Severe site constraints (e.g. limited room)

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

B7. Stormwater Disposal

The water from the roof and/or storage overflow and/or runoff from the drive way should be collected and piped or channeled to the water table of the access road. In no circumstances should a concentrated discharge be allowed onto any other property.

B8. Water Supply

We understand that a good creek water supply is available to this property. This could readily be supplemented by the storage of roof water.

The water supply should be tested periodically to ensure it complies with current New Zealand drinking water standards, which presently would require filtration for giardia and crypto spiridium and UV exposure for faecal coliforms, preceded by pre-filtration and tank storage settling.

B9. Vegetation Clearance

The maintenance of vegetation in this area is not considered essential for long term stability. However, we consider it prudent in the Sounds to limit vegetation clearance to that required for house construction and access formation in order to benefit from the assistance that vegetation provides to the stability of surface soils and control of soil moisture.

Furthermore, the uptake by plants of treated wastewater discharged to the ground assists the reliable functioning of land application systems. Vegetation should be maintained and encouraged around the building site and effluent field.

B10. Access

Vehicle access is currently available onto the site from Elaine Bay Road. There is also a legal right of way at the south eastern end of the property but the grades along this route will make achieving suitable all-weather access difficult. We consider that the main access for the future should remain from Elaine Bay Road to the north west.

B11 Resource Management Issues

B11.1 Hazard Zone

The Marlborough District Council has designated this area of Elaine Bay as an area of known instability. The planning maps therefore show a Hazard Zone within which the subject property is included.

The District Plan states that the establishment of any building or any wastewater discharge within a Hazard Zone requires specific Resource Consent. We consider that the site in question exhibits good stability and will remain so long term, and therefore is entirely suitable for the proposed development even though it is located within a Natural Hazard Zone.

B11.2 Proximity to Existing Effluent Fields

The nature of the lot sizes in a residential area such as Elaine Bay means that any new effluent field will be located within 50 m of an existing. Many areas have a large number of effluent fields close to each other without apparent effect. It is our opinion that a number of effluent fields in close proximity which have been engineered and constructed to the appropriate standard should have no cumulative effect and in fact have no more impact than a single large effluent field.

B12. Disclaimer

B12.1 The Marlborough Sounds area is a high rainfall area and prone to high intensity and localized rainfall events.

While the instability on building sites in the Sounds is higher than for building sites on flat ground not close to hills (where the risk is practically nil), we consider that the building sites identified should remain stable for the life of the buildings. However, given the variable nature of the ground and weather patterns, no guarantee can be provided.

If instability of the land surrounding the building sites were to occur during the lifetime of the buildings, some remedial work may be required if this threatens to undermine the foundations.

B12.2 This report has been prepared solely for the benefit of the relevant Local Authority and our client, according to their instructions. No liability is accepted by this firm or by any principal, or director, or any servant or agent of this firm, in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at its own risk.

The assessments made shall not be made available to or relied upon by any other party without the specific approval of Davidson Partners Ltd.

B12.3 This disclaimer shall apply notwithstanding that the report may be made available to any other person in connection with any application for permission or approval, or pursuant to any requirement of law.

This report is based on conditions presently found on site and is consistent with standards currently being applied.

Our Ref: 22501

B12. References

B12.1 Crites, R and Tchobanoglous, A (1998). 'Small and Decentralized Wastewater Management Systems'.

B12.2 Fietie, L (1991). 'General Authorisation for Sewage Tank Effluent Disposal – Technical Support Document'. Pollution Control Section, Canterbury Regional Council.

B12.3 Gunn, I (1997). 'On-Site Wastewater Systems and Bacterial Reduction in Sub-Soil Disposal Areas, A Review'. On-Site New Zealand Special Report 97/2.

B12.4 Potts, R J (1997). 'Small Sewage Treatment Plants'.

B12.5 ARC Environment, Technical Paper No. 58, Second Edition 'On-Site Wastewater Disposal from Households and Institutions'.

B12.6 AS/NZS 1546.1:1998 'On-Site Domestic Wastewater Treatment Units, Part 1 : Septic Tanks.

B12.7 AS/NZS 1547:2000 'On-Site Domestic Wastewater Management'.

B12.8 Marlborough Sounds Resource Management Plan (Proposed).

B12.9 Centre for Environment Training "On Site Wastewater Management Training Course", Christchurch 2001.

B12.10 Institute of Geological and Nuclear Sciences 'Geology of the D'Urville Area" by M. R. Johnston, 1996.

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Our Ref: 22455

APPENDIX

1. Professional Opinion

2. Test Results

   Scala penetrometer tests

3. On Site Wastewater Management Details

   - Field Assessment Report
   - Land Application System Design
   - Owner and Installer Guides

4. Plan 22501 sheets;

   C1 Site and Locality Plan
   C2 Sections
   C3 Effluent Disposal, Typical Septic Tank Details
   C4 Effluent Disposal Field, Typical Details

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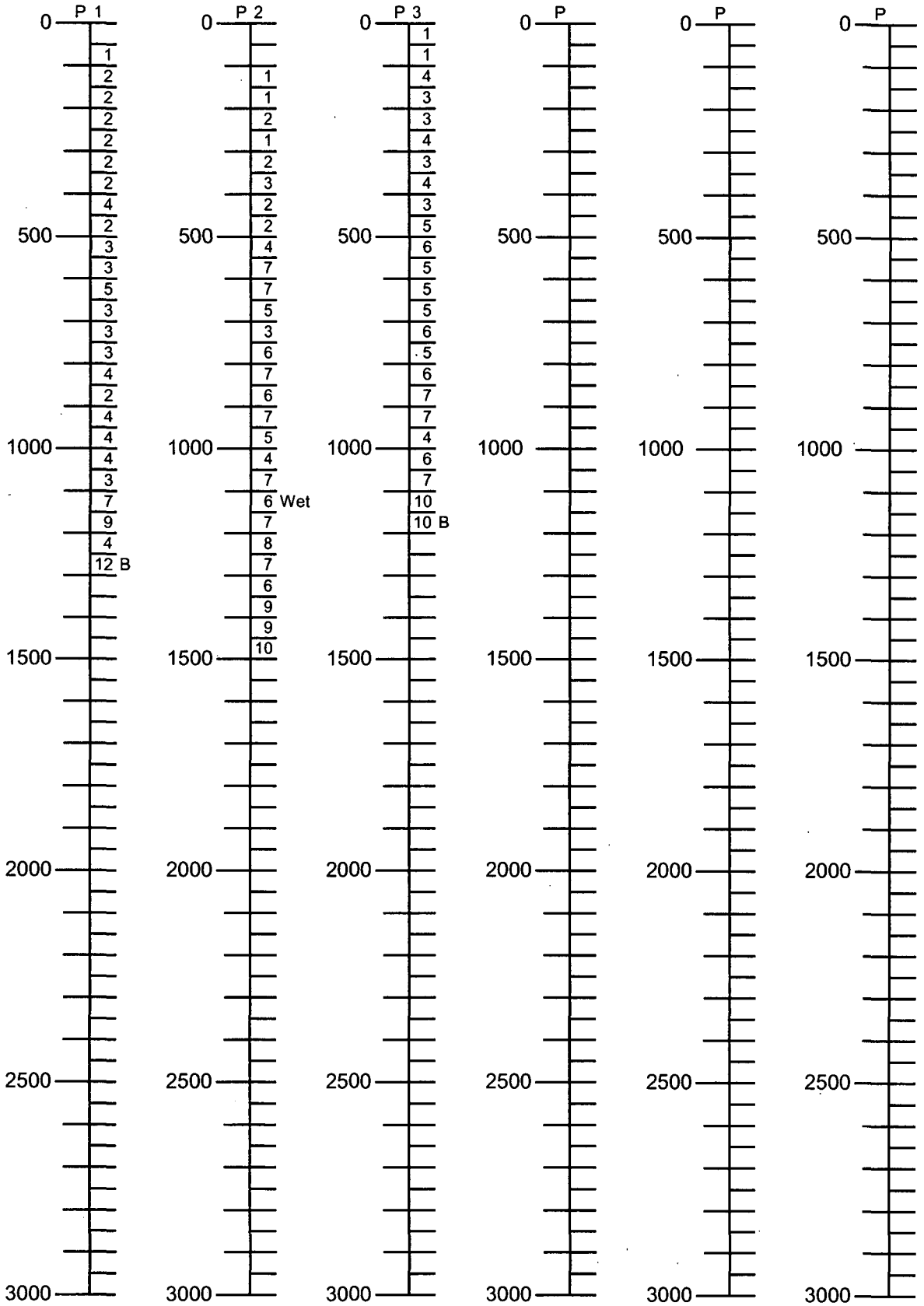
Structural Engineering
Civil Engineering
Building Design
Project Management

S & J Harvey
Elaine Bay

scala penetrometer results

Job No 22501
Sheet No 1
Name JC + CM
Date 26/11/02



PENETRATION IN BLOWS PER 50mm

EOP = end of penetrometer

DAVIDSON PARTNERS LTD **ON SITE WASTEWATER MANAGEMENT** **FIELD ASSESSMENT REPORT**		**JOB NO.**	22501
		SHEET NO	1
		NAME	WLM
CLIENT	S & J Harvey	**DATE**	26-Nov-02
LOCATION	Elaine Bay		

Last Updated 16.12.02

REFERENCES : 1 ARC TP # 58
2 AS/NZS 1547:2000 "On Site Domestic Wastewater Managaement"

1 Percolation Rate (if available)		N/A
2 Site Exposure to	- sun	High
	- wind	High
3 Topsoil Depth		150 mm
4 Soil Description (colour, moisture, firmness, type)		Dark brown, plastic, silty CLAY
5 Soil Category (1 - 6)		5
6 Coarse Fragments (size / abundance)		15%
7 Ribbon Length		50 - 75 mm
8 Soil Structure (Pedal Content)		Moderate
9 Performance of Existing Systems Nearby		N/A
10 Nearby Water Bodies ?		No
- Separation Distance ?		
11 Nearby Wells ?		No
- Separation Distance ?		
12 Intended Water Supply		Creek
13 Runoff To Be Controlled ?		No
14 Ground Water To Be Controlled ?		No
15 Any Stability Considerations ?		No
16 Depth to Water Table		1.1m
17 Vegetation Cover	- Existing ?	Manuka
	- Proposed ?	Mulch
18 Gravity Head to Proposed Disposal Field		0 m
19 Reserve Area Available ?		50%
20 Other Comments ?		Stunted vegetation. Likely poor drainage. Will require pumped system.

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

Helpful Information for Homeowners/Occupiers

1. GOOD HOUSEHOLD PRACTICES

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

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

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

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

- **(i)** Use biodegradable soaps;
- **(ii)** Use a low-phosphorus detergent;
- **(iii)** Use a low-sodium detergent in the dispersive soil areas;
- **(iv)** Use detergents in the recommended quantities;
- **(v)** Don't use powerful bleaches, whiteners, nappy soakers, spot removers and disinfectants including cold water washing products.
- **(vi)** Don't 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 where there is a full load.

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

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

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

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

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

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

2. MAINTENANCE

(a) General

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

(b) Septic Tanks

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

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

(ii) Have grease traps cleaned out regularly;

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

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

(c) Secondary Treatment Systems

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

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

(d) Effluent Field

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

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

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

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

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

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

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

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GUIDELINES FOR INSTALLERS OF ON-SITE DOMESTIC WASTEWATER MANAGEMENT SYSTEMS

References

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

1. GENERAL

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

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

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

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

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

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

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

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

3. GOOD CONSTRUCTION TECHNIQUE

(a) Treatment and Distribution Systems

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

(ii) All tanks located in areas where high seasonal groundwater levels are known to occur shall be weighted down or provided with anchorage in accordance with clause 10.3.3 of A.S./N.Z.S. 1546.1:1998 (copy attached).

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

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

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

(b) **Land Application Area**

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

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

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

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

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

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

In particular for trenches and beds:

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

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

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

10.3.2 *Thickness*

The thickness of the tank walls, base, access opening covers and lids shall be not less than 6 mm.

Polyolefin materials that allow a thinner component to be made shall meet the performance requirements and tests of this Standard.

10.3.3 *Anchorage*

All plastic (polyolefin) septic tanks shall be provided with a means of anchorage.

C10.3.3

Typical examples are:

(a) Hydrostatic flange

An integrally moulded flange of similar size to the anchor collar in 10.3.3 (b).

(b) Anchor collar to be affixed at the time of installation:

An L-shaped anchor collar section constructed not less than 65 mm wide and not less than 6 mm thick to be fixed to the outside circumference of the tank with durable material protected from the corrosive environment. The collar may be continuous around the circumference or may be in at least two sections each not less than 600 mm long and fixed to opposite sides of the tank.

For a vertical cylindrical tank the flange is fixed not more than 300 mm from the base, and for a horizontal cylindrical tank the flange is situated along the line of the great horizontal perimeter.

(c) Loops to be affixed at the time of installation

Each 'side' of the tank is held into the ground by a piece of pipe, typically 100 mm PVC sewer grade pipe, attached to the tank by two durable plastic ropes. These ropes are anchored in the rim of the tank and have a loop in the other end at excavation ground level. Both pipes have a length of not less than the diameter of the tank and each is passed through two loops. Backfilling then covers the pipes.

10.4 Manufacture

10.4.1 *Materials*

10.4.1.1 *Polymer*

The polymer utilised by the manufacturer shall be suitable so that the finished product meets the performance requirements as set out in this Standard.

10.4.1.2 *Fasteners*

All fasteners shall be of durable material, resistant to the corrosive environment, and be either:

(a) Stainless steel, grade 316 (see AS 1449 or NZS/BS 1449); or

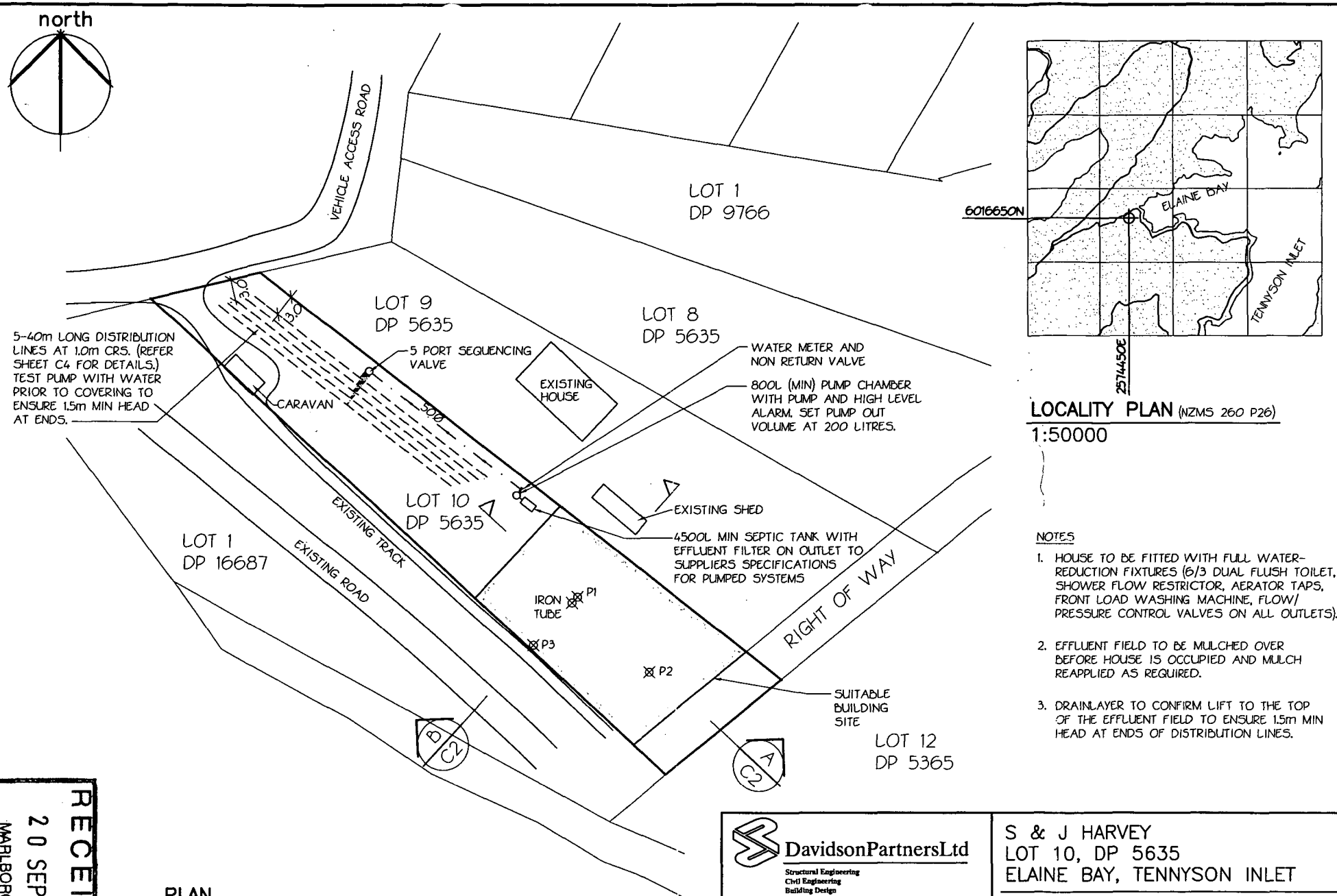
(b) Copper alloy, grade 443 (see AS 2738.2 or NZS/BS 1400); or

(c) a suitable equivalent

10.4.2 *Manufacturing process*

10.4.2.1 *General*

The manufacturing process shall be carried out in a controlled manner to produce a consistent product checked by a quality assurance process.



LOCALITY PLAN (NZMS 260 P26)
1:50000

NOTES

1. HOUSE TO BE FITTED WITH FULL WATER-REDUCTION FIXTURES (6/3 DUAL FLUSH TOILET, SHOWER FLOW RESTRICTOR, AERATOR TAPS, FRONT LOAD WASHING MACHINE, FLOW/PRESSURE CONTROL VALVES ON ALL OUTLETS).
2. EFFLUENT FIELD TO BE MULCHED OVER BEFORE HOUSE IS OCCUPIED AND MULCH REAPPLIED AS REQUIRED.
3. DRAINLAYER TO CONFIRM LIFT TO THE TOP OF THE EFFLUENT FIELD TO ENSURE 1.5m MIN HEAD AT ENDS OF DISTRIBUTION LINES.

RECEIVED
20 SEP 2006
MARLBOROUGH DISTRICT COUNCIL

PLAN
1:500

0mm 100mm

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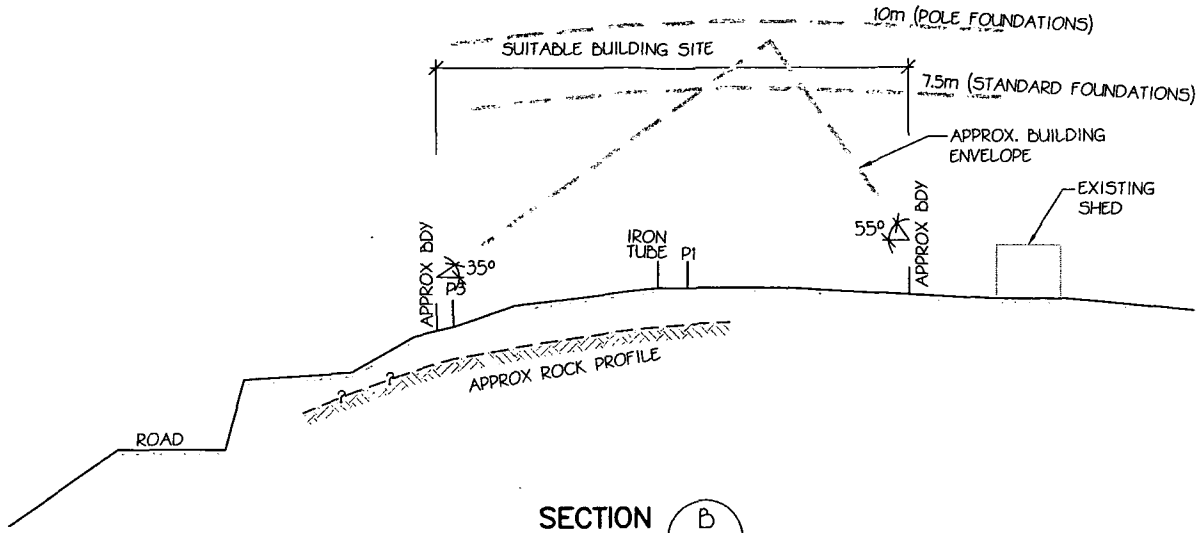
site and locality plan

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
12/02	A3	22501	C1	A

DES RWD DRN JC CK CAD



SECTION B / C1
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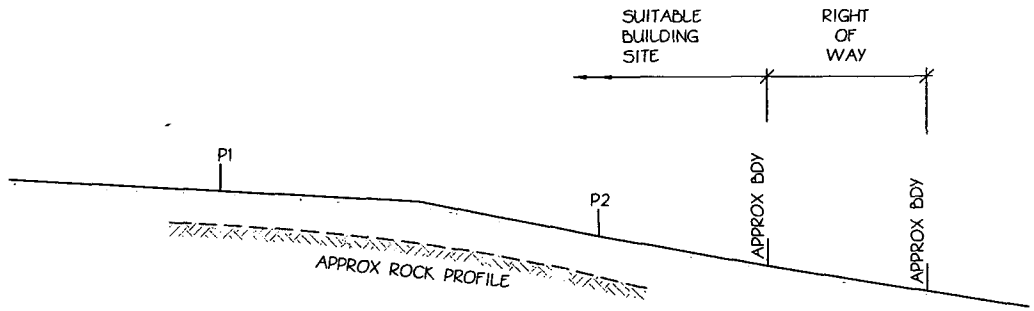

SECTION A / C1
1:200

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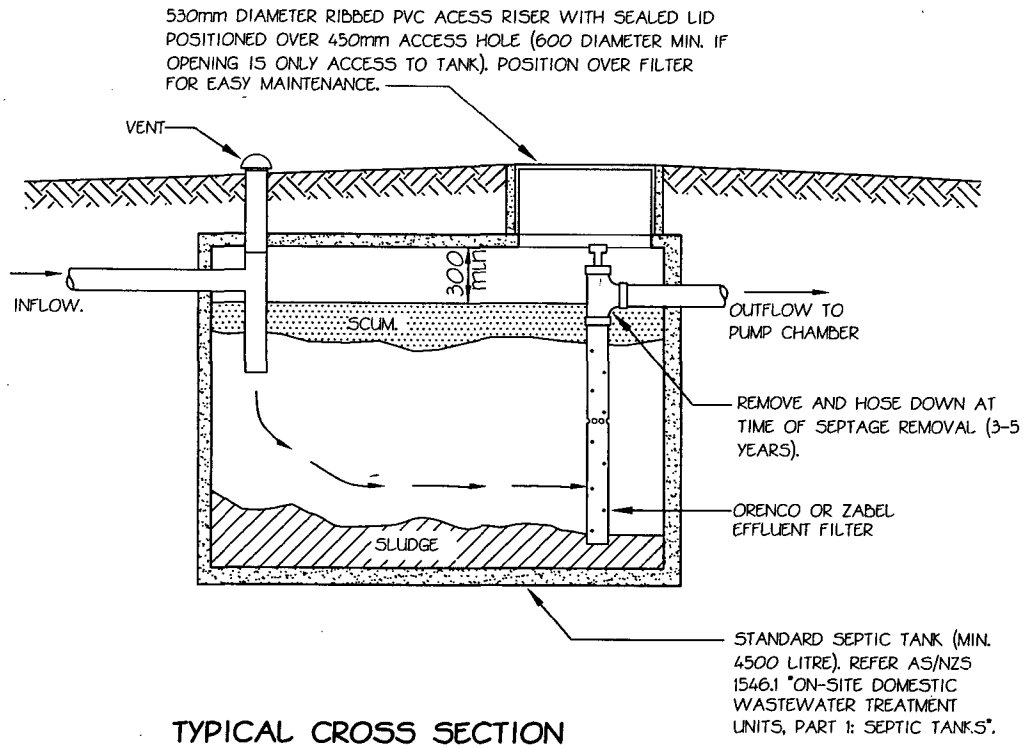
S & J HARVEY
LOT 10, DP 5635
ELAINE BAY, TENNYSON INLET

sections

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
12/02	A3	22501	C2	A

DES RWD | DRN JC | CK | CAD

0mm 100mm



TYPICAL CROSS SECTION

1:25

SUGGESTED OPERATION AND MAINTENANCE

SEPTIC TANK

1.) THE INFLOWING HOUSEHOLD SEWAGE SHOULD NOT CONTAIN ANYTHING OTHER THAN HUMAN WASTE AND TOILET PAPER, AND FOOD MATERIAL SUCH AS MAY GO DOWN A KITCHEN SINK DRAIN. GARBAGE GRINDERS ARE NOT RECOMMENDED, ALTHOUGH THEY NEED NOT BE FORBIDDEN. MORE FREQUENT DESLUDGING OF THE SEPTIC TANK MAY BE NEEDED IF A GARBAGE GRINDER IS USED. NORMAL USE IN THE HOUSE OF SOAPS, DETERGENTS, BLEACHES, PLUMBING FIXTURE CLEANERS, DRAIN CLEANERS AND DISINFECTANTS WILL NOT HARM THE FUNCTIONING OF THE SEPTIC TANK OR THE SOIL ABSORBTION SYSTEM.

2.) PROHIBITED DISCHARGES TO THE SEPTIC TANK INCLUDE:
OIL/GREASE FROM E.G. A DEEP FRIER.
STORMWATER AND ANY DRAINAGE OTHER THAN SEWAGE GENERATED IN THE HOUSE.
PETROL, OIL, AND OTHER FLAMMABLE/EXPLOSIVE SUBSTANCES.
HOUSEHOLD, GARDEN, GARAGE, AND WORKSHOP CHEMICALS (E.G. PESTICIDES, PAINT CLEANERS, PHOTOGRAPHIC CHEMICALS, MOTOR OIL AND TRADE WASTE).
DISPOSABLE NAPPIES AND SANITARY NAPKINS.

3.) SEPTIC TANKS NEED TO BE PUMPED (SEPTAGE REMOVED WHEN THE SLUDGE AND SCUM HAVE BEEN ACCULATED TO THE EXTENT THAT THE CLEAR SPACE (BETWEEN SCUM AND SLUDGE) HAS A VOLUME LESS THAN 1000 LITRES). SEPTAGE REMOVAL MAY NEED TO BE DONE AS OFTEN AS EVERY THREE YEARS BUT AT NO LONGER THAN FIVE YEAR INTERVALS.

EFFLUENT FILTER

1.) THE SEPTIC TANK SHOULD BE PUMPED PROIR TO REMOVAL OF THE FILTER TO PREVENT ANY SOLIDS FROM ESCAPING TO THE TRENCHES WHEN THE CARTRIDGE IS REMOVED.

2.) THE FILTER SHALL BE CLEANED AT THE SAME TIME AS THE NORMAL SEPTIC TANK SERVICING (3-5 YEARS).

3.) REMOVE THE CARTRIDGE AND RINSE OFF WITH A GARDEN HOSE, BEING CAREFUL TO RINCE ALL SEPTAGE MATERIAL BACK INTO THE TANK.
IT IS NOT NECCESSARY 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.

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S & J HARVEY
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ELAINE BAY, TENNYSON INLET

effluent typical septic tank details

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
12/02	A3	22501	C3	A

DES RWD | DRN J.C | CK | CAD C:\ACAD\std-dwg\4029std\stdA3\a202(b-4).dwg

0mm 100mm

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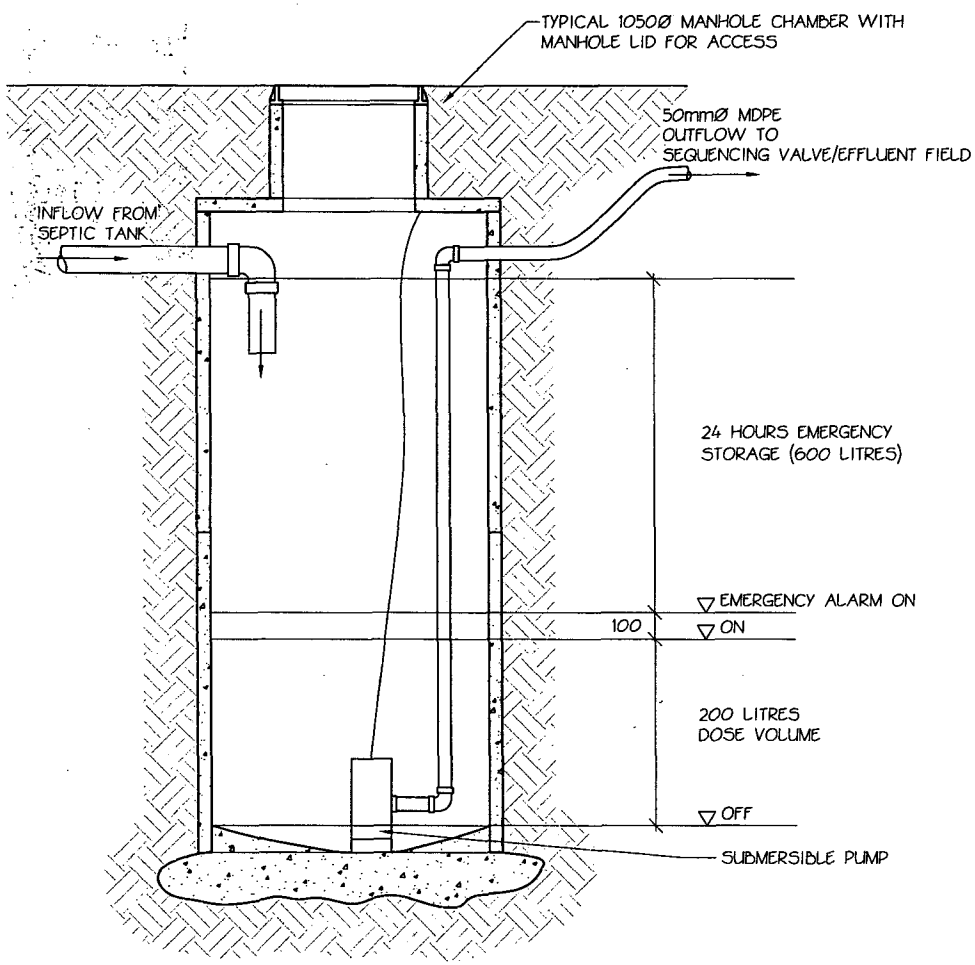
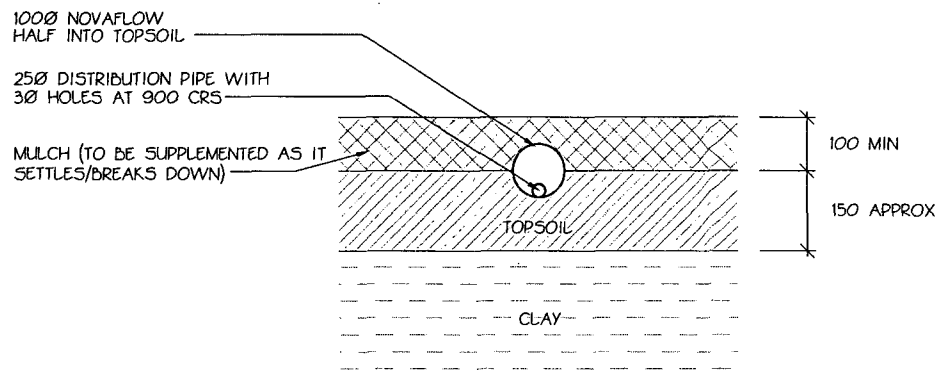


PUMP CHAMBER
1:20

NOTE:
1. PUMP CHAMBER SHOWN IS AN EXAMPLE ONLY. OTHER TYPES COULD BE APPROVED, E.G. MODIFIED SEPTIC TANK



EFFLUENT FIELD
1:10

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S & J HARVEY
LOT 10, DP 5635
ELAINE BAY, TENNYSON INLET
typical pump chamber and LPED disposal field details

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
12/02	A3	22501	C4	A

DES RWD DRN J.C. CK CAD

0mm 100mm

DavidsonPartners Ltd

Structural Engineering
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Project Management

Practising in association with Ayson and Partners, Consulting Surveyors

Our Ref: 23630

4 September 2006

STATEMENT OF PROFESSIONAL OPINION AS TO LAND STABILITY

DESCRIPTION: Lot 10 DP 5635, Elaine Bay

FOR: G and L Dubosson

I, William Leigh McGlynn, of Davidson Partners Ltd, P O Box 256, Blenheim,

hereby confirm that:

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

2. Site investigations have been carried out under my direction and are described in our site investigation report dated 23 December 2003 and supplementary report dated 4 September 2006, attached. The following professional opinion is based on the assumption that the data obtained from these investigations is representative of the whole area under consideration. In my professional opinion having examined the site it is reasonable for Council to assume that the data referred to above is representative of the whole area under consideration.

3. In my professional opinion, not to be construed as a guarantee, and having regard to the specifics of the site which I have investigated to the extent that acceptable engineering practices require giving due regard to acceptable engineering principles and practices for land and foundation stability then the building site and wastewater disposal areas shown on the plans are suitable for house construction and wastewater disposal, providing that the following recommendations described in our accompanying report (Engineering Report for G and L Dubosson) are adhered to:

(a) Water from the roof and storage overflow, together with any driveway drainage, be collected and piped/channelled to a Right of Way water table or direct to the adjacent watercourse.

ACENZ

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Principal
Ross Davis, BE, CPEng, MIPENZ
Stephen Sheat, BE, CPEng, MIPENZ
Leigh McGlynn, BE, CPEng, MIPENZ

4. This professional opinion shall remain current for a maximum of two years.

DAVIDSON PARTNERS LTD

W L McGlynn

LM:KR

Our Ref: 23630

DAVIDSON PARTNERS LTD WASTEWATER MANAGEMENT LOADING AND GREYWATER TANK DESIGN		JOB NO. 23630 SHEET NO 1 NAME LM DATE 2.09.06
CLIENT	DUBOSSON	
LOCATION	ELAINE BAY	

Last Updated 28.07.05

REFERENCES : 1 ARC TP # 58 Third Edition
2 AS/NZS 1547:2000 "On Site Domestic Wastewater Management"

1 **LOADING**

Number of bedrooms	2	
Occupancy (N)	4	
Wastewater allowance (A)	90	litres / person / day
Soil category (from field assessment)	5	

2 **SEPTIC TANK DESIGN**

Number of people (ex 1.3 above)	4		
Number of people for design purposes	4		
(peaking factor =	1)		
Daily flow	360	litres	
Miinimum residence time required	32	hours	
Pump out interval required	10	years	
Sludge/scum accumulation	40	litres / person / year	
Allowance for scum / sludge	1600	litres	
Minimum tank size	2080	litres	
Let tank size be	**2100**	**litres**	(1800 litres min.)
Settling volume available	500	litres	
Settling time available	33	hours	OK,> min. res. time

DAVIDSON PARTNERS LTD ON-SITE WASTEWATER MANAGEMENT BED DESIGN		JOB NO. 23630 SHEET NO 2 NAME lm DATE 02-Sep-06
CLIENT	DUBOSSON	
LOCATION	ELAINE BAY	

3 **BED DESIGN**

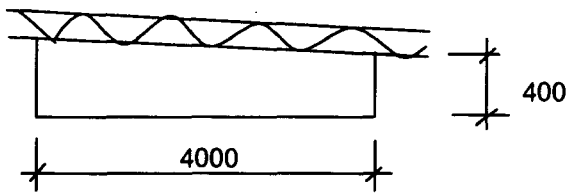
3.1 Design Loading Rate

DLR = 5 mm / day (Upper bound for beds ok if greywater only)

3.2 Bed Dimensions Proposed

width = 4000 mm

depth = 400 mm



3.3 Bed Width for Design, W = 4000 mm

3.4 Bed Length , L (min.) = (N x A)/(DLR x W)

= 18.00 m

Let bed length = 18.00 m

Area '= 72 m2

DAVIDSON PARTNERS LTD
ON-SITE WASTEWATER MANAGEMENT
LPED DESIGN

JOB NO.	23630
SHEET NO	3
NAME	lm
DATE	2/09/2006

CLIENT: DUBOSSON
LOCATION: ELAINE BAY

4	**LPED DESIGN**						
4.1	Preliminary	number of people				4	
		wastewater flow per person				90	l / p /d
		therefore, total load, Q				360	litres/day
		soil cat.				5	
4.2	Design Basis						
	2.1	LPED in Trench		Y/N		Y	
		Storage has been allowed for in the 'Trench Storage Design' and the length (L) determined.		L	=	36	m
	2.2	LPED on / in topsoil		Y/N			
		design irrigation rate (DIR)					mm/day
		minimum land application area (A)= Q/DIR					m^2
		if let wetted width (WW) =					m
		then, total length of LPED required (L) = A/WW					m
	2.3	Length			=	36.0	m
4.3	Design	LPED pipe diam.				30.45	mm
		volume of network (V) = pipe area x L				0.026	m^3
						26	litres
		total dose volume if 1 field = 10 x V				262	litres
		ideal max.dose vol = daily load / 3				120	litres
		let no of subfeilds be				**1**	
		length per subfield = total length / no. of fields				36.0	m
		dose vol / subfield = 10 x vol/subfield =				262	litres
		let dose vol =				**250**	**litres**
		no. of doses per day				1.44	
4.4	Check Line Losses						
		Head at end of each line				1.5	m
		What is the max. lateral length? (center fed?)				9	m
		Hole diameter?				3	mm
		Hole spacing?				0.5	m
		Total head loss per lateral				0.06	m
		Flow Variation				0.02	l/min
		Flow Variation (%) (should be < 10%)				1.7%	OK
		Maximum Flow / lateral				26.2	l/min
		Number of laterals / subfield				4	
		Maximum Flow per subfield				105	l/min
4.5	Pump Details						
		Pump running time= dose vol / flow per subfield (should be ~ 3 min, adjust dose vol?)				2.4	min
		Head = Line loss in laterals				0.2	m
		Head at end of laterals				1.5	m
		Head to bed (to be checked on site)				6.0	m
		Add 0.5m min head for dstrn manifold				0.5	m
		Loss in 50 dia delivery pipe @					
		Average slope (deg)		11			
		Pipe length (m)		31.4			
		Line loss (m/m)		0.02		0.6	m
		Allow for bends, etc				0.50	m
		Total Head				**9.4**	**m**
		Flow				**105**	**l/min**

25 no.

DAVIDSON PARTNERS LTD ON-SITE WASTEWATER MANAGEMENT LPED LINE LOSS CHECK		Job No	23630
		Sheet No	4
		Name	lm
CLIENT	DUBOSSON	Date	2/09/2006
LOCATION	ELAINE BAY		

Lateral Length	9	m
Spacing	0.500	m
No.of Holes	18	
Hole Ø	3	mm
Area	7E-06	m²
Pipe Ø (I.D)	30.45	mm
υ	1.31E-06	m²/s
Head at end of L	1.50	m

Total Head Loss	0.06	m
Flow Variation	0.02	l/min
Flow Variation	1.7%	
Maximum Flow	26.2	l/min

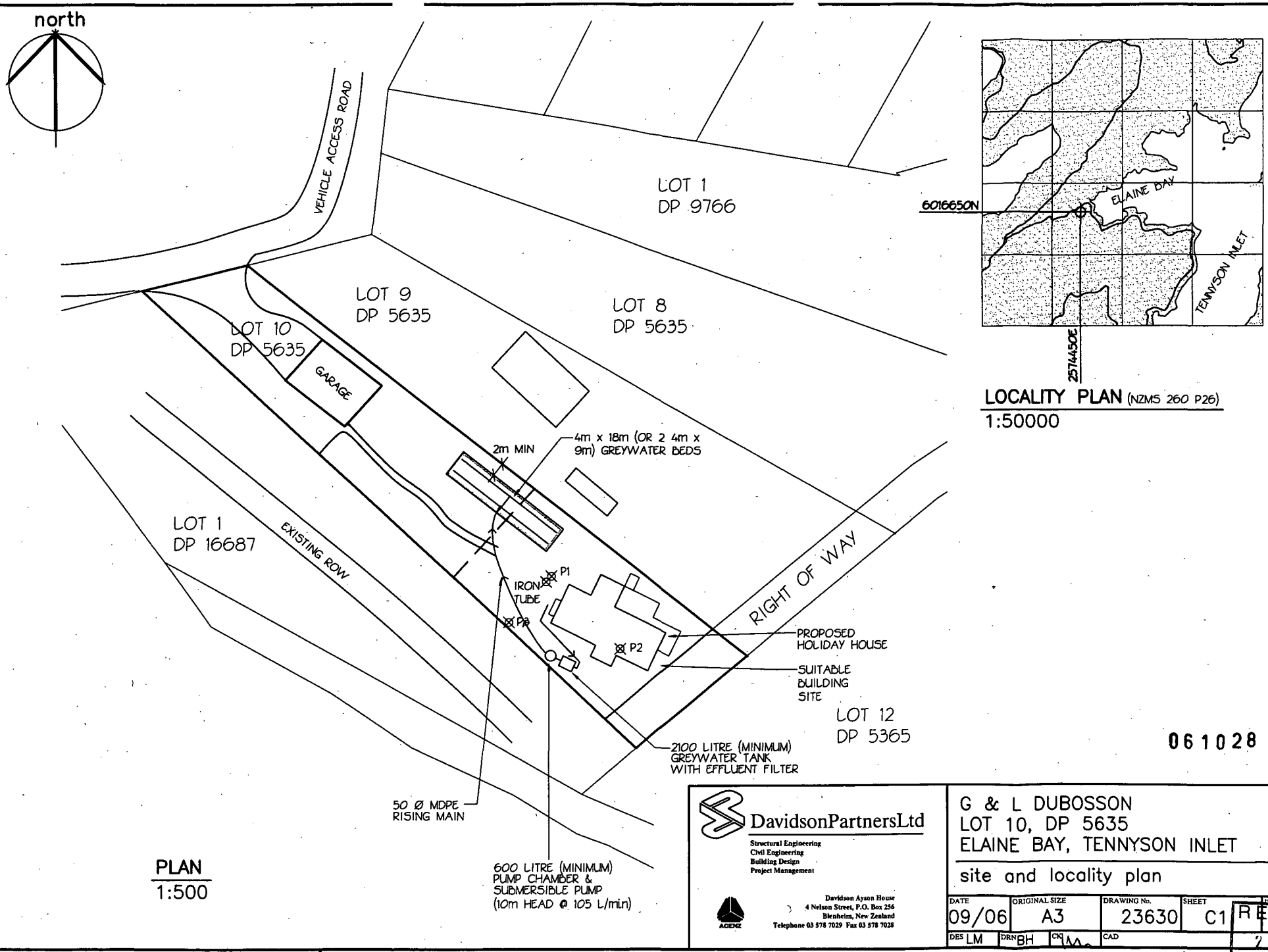
Hole	Chainag (m)	Head (m)	Q_{HOLE} (l/min)	Q_{PIPE} (l/min)	V*=Q/A (m/s)	i (m/m)	Hl (m)	Cumulatve Hl(m)	Reynolds No	Flow
18	8.75	1.50	1.45							
17	8.25	1.50	1.45	1.45	0.03	0.0001	0.0001	0.0001	771	Laminar
16	7.75	1.50	1.45	2.90	0.07	0.0003	0.0001	0.0002	1542	Laminar
15	7.25	1.50	1.45	4.35	0.10	0.0007	0.0004	0.0006	2313	Transitional
14	6.75	1.50	1.45	5.80	0.13	0.0012	0.0006	0.0012	3085	Transitional
13	6.25	1.50	1.45	7.25	0.17	0.0018	0.0009	0.0021	3856	Transitional
12	5.75	1.50	1.45	8.70	0.20	0.0025	0.0012	0.0033	4628	Transitional
11	5.25	1.50	1.45	10.15	0.23	0.0032	0.0016	0.0049	5400	Transitional
10	4.75	1.51	1.45	11.60	0.27	0.0041	0.0020	0.0070	6172	Transitional
9	4.3	1.51	1.45	13.05	0.30	0.0050	0.0025	0.0095	6945	Transitional
8	3.8	1.51	1.46	14.51	0.33	0.0061	0.0030	0.0125	7719	Transitional
7	3.3	1.52	1.46	15.96	0.37	0.0072	0.0036	0.0161	8493	Transitional
6	2.8	1.52	1.46	17.42	0.40	0.0084	0.0042	0.0203	9268	Transitional
5	2.3	1.53	1.46	18.88	0.43	0.0097	0.0049	0.0252	10044	Transitional
4	1.8	1.53	1.46	20.34	0.47	0.0111	0.0055	0.0307	10822	Transitional
3	1.3	1.54	1.47	21.81	0.50	0.0125	0.0063	0.0370	11601	Transitional
2	0.8	1.54	1.47	23.27	0.53	0.0141	0.0070	0.0440	12382	Transitional
1	0.3	1.55	1.47	24.74	0.57	0.0157	0.0078	0.0519	13164	Transitional
0	0.0	1.56		26.22	0.60	0.0174	0.0043	0.0562	13948	Transitional

DAVIDSON PARTNERS LTD ON-SITE WASTEWATER MANAGEMENT PUMP CAMBER CAPACITY		JOB NO. 23630 SHEET NO 5 NAME lm DATE 02-Sep-06
CLIENT	DUBOSSON	
LOCATION	ELAINE BAY	

5 **PUMP CHAMBER CAPACITY**

Pump chamber to have capacity for the dose volume in addition to the volume at full load from a 24 hour pump breakdown or power outage.

Dose volume	=	250 litres
Daily load	=	360 litres
Total capacity	=	**610 litres**



LOCALITY PLAN (NZMS 260 P26)
1:50000

PLAN
1:500

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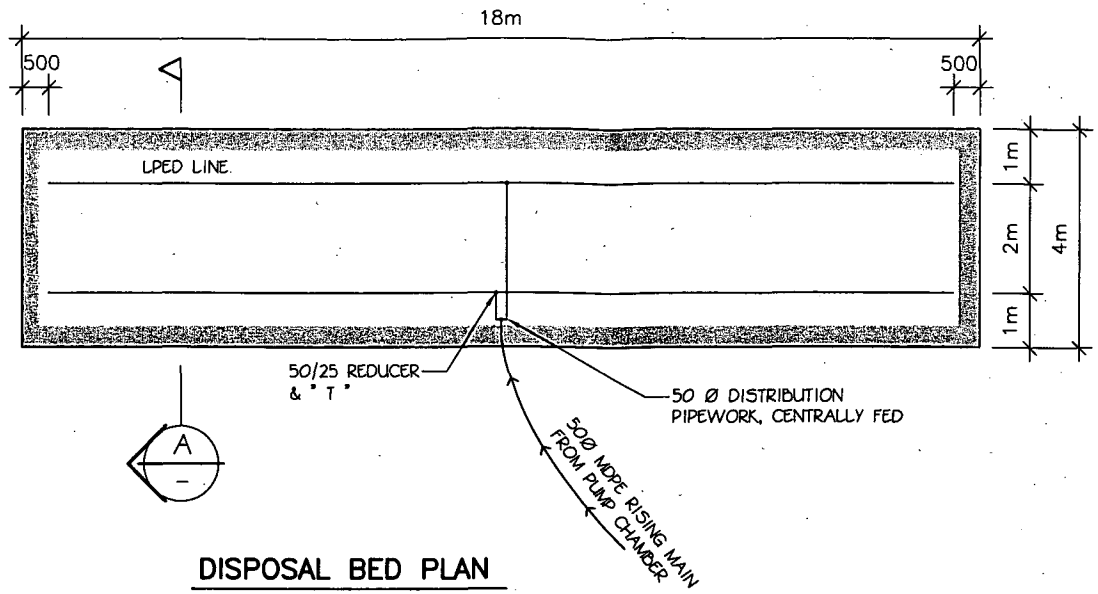
LOT 10, DP 5635
ELAINE BAY, TENNYSON INLET

site and locality plan

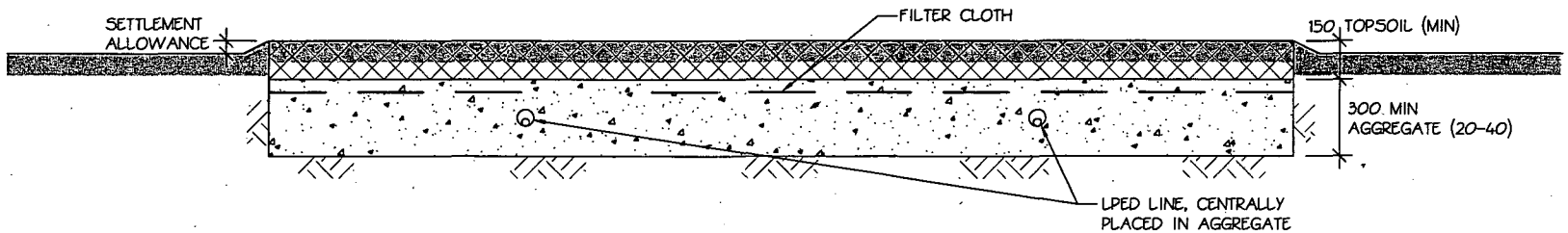
DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
09/06	A3	23630	C1	A

DES LM DRN BH CK CAD

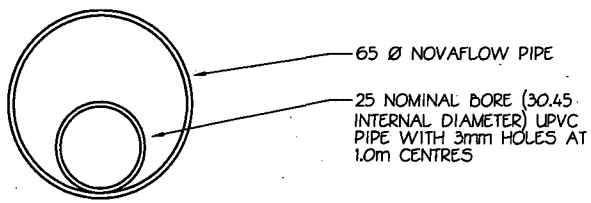
0mm 100mm



DISPOSAL BED PLAN
1:100



SECTION A
1:20



DISTRIBUTION LINE (LPED)
1:2

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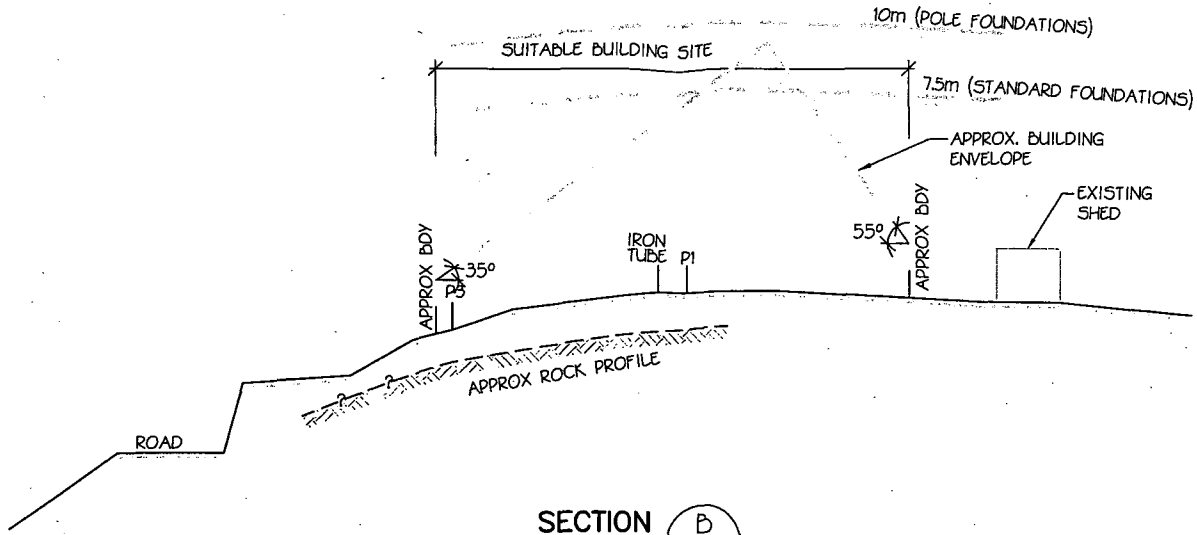
disposal bed plan & section

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
09/06	A3	23630	C2	A

DES LM | DRN BH | CK | CAD

0mm 100mm



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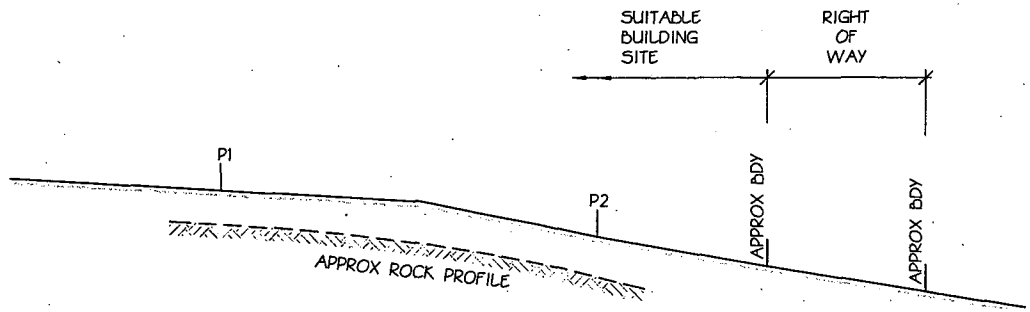

SECTION A / C1
1:200

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sections

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
12/02	A3	22501	C1	A

DES RWD | DRN JC | CK | CAD

RECEIVED
20 SEP 200
MARLBOROUGH DISTRICT COUNCIL

0mm 100mm

23/12/02 02

north

VEHICLE ACCESS ROAD

LOT 1
DP 9766

LOT 9
DP 5635

LOT 8
DP 5635

LOT 10
DP 5635

GARAGE

2m MIN

4m x 18m (OR 2 4m x 9m) GREYWATER BEDS

LOT 1
DP 16687

EXISTING ROW

IRON TUBE

P1

P2

P3

RIGHT OF WAY

PROPOSED HOLIDAY HOUSE

SUITABLE BUILDING SITE

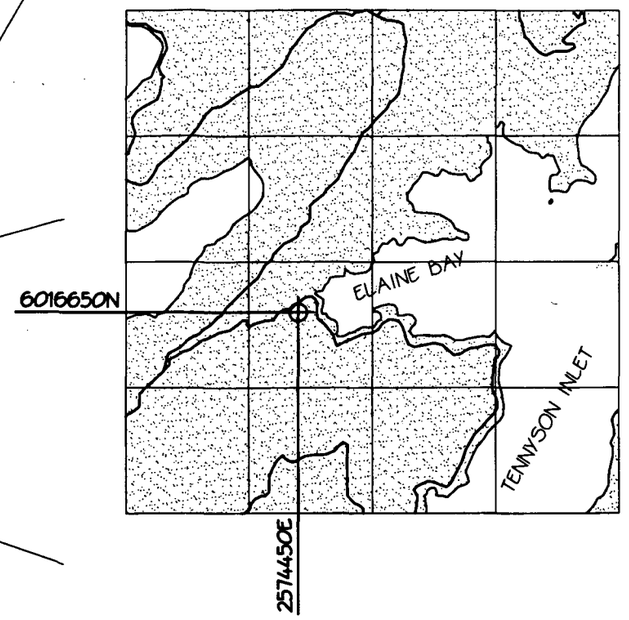
LOT 12
DP 5365

2100 LITRE (MINIMUM) GREYWATER TANK WITH EFFLUENT FILTER

50 Ø MDPE RISING MAIN

600 LITRE (MINIMUM) PUMP CHAMBER & SUBMERSIBLE PUMP (10m HEAD @ 105 L/min)

PLAN
1:500



LOCALITY PLAN (NZMS 260 P26)
1:50000

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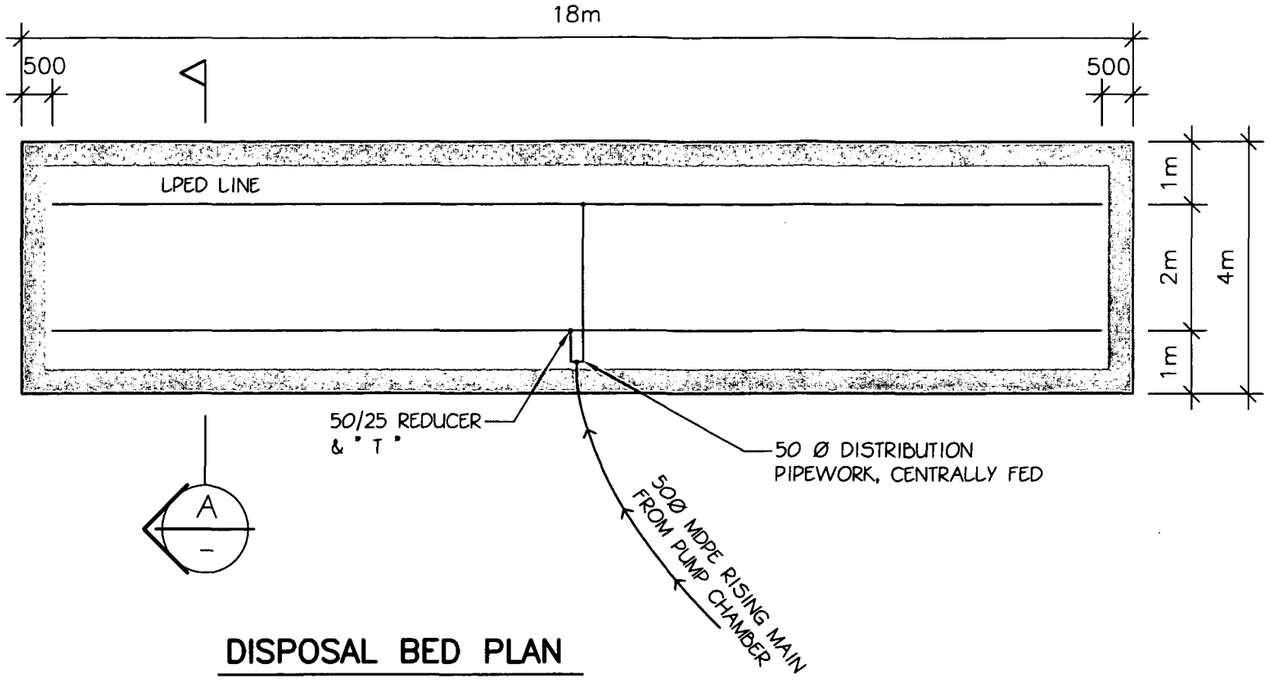
site and locality plan

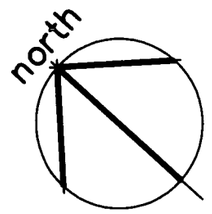
DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
09/06	A3	23630	C1	A

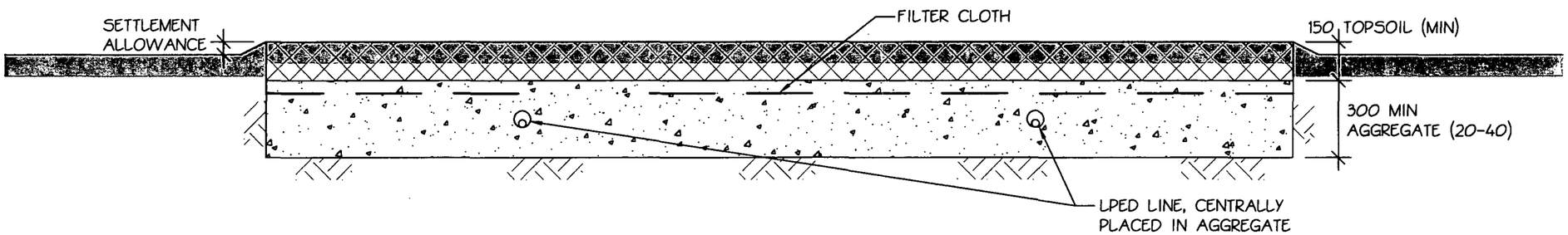
DES	DRN	CK	CAD
LM	BH		

0mm 100mm

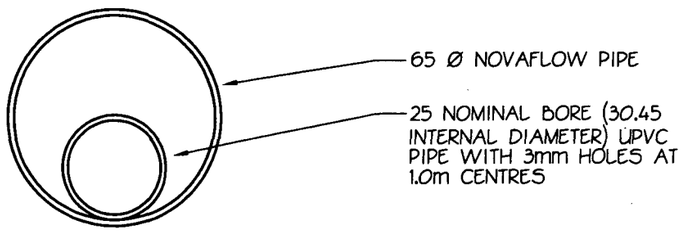


DISPOSAL BED PLAN
1:100





SECTION A
1:20



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1:2

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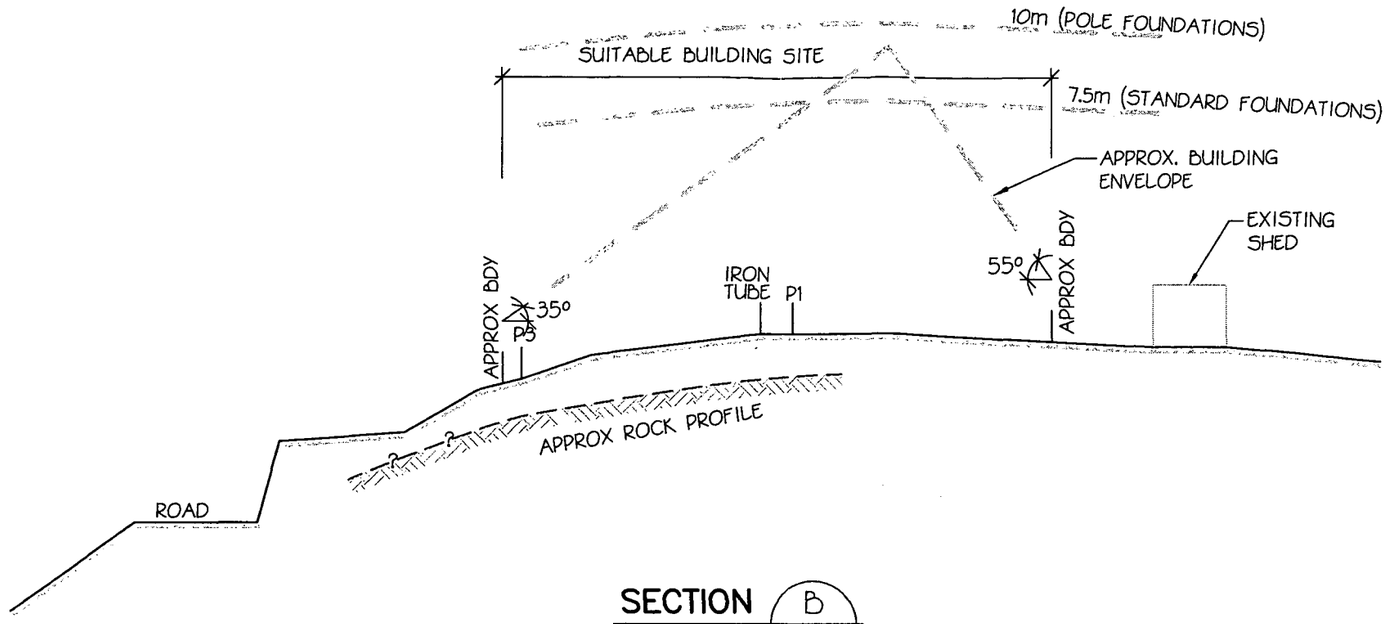
G & L DUBOSSON
LOT 10, DP 5635
ELAINE BAY, TENNYSON INLET

disposal bed plan & section

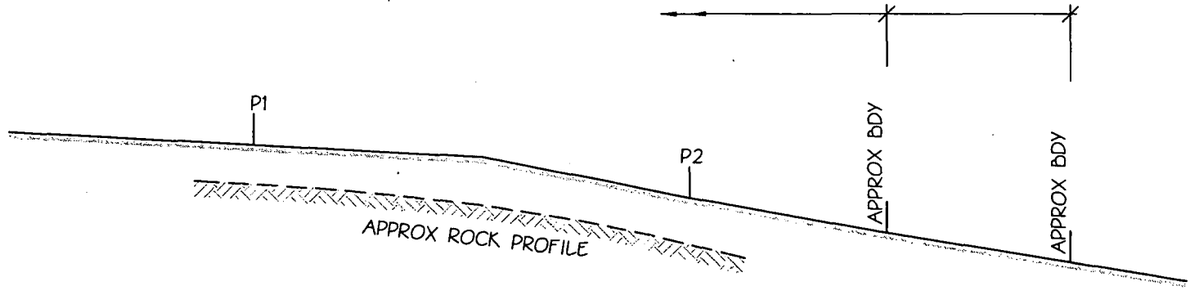
DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
09/06	A3	23630	C2	A

DES LM | DRN BH | CK | CAD

0mm 100mm



SECTION B / C1
1:200



SECTION A / C1
1:200

061028

DavidsonPartnersLtd
Structural Engineering
Civil Engineering
Building Design
Project Management

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S & J HARVEY
LOT 10, DP 5635
ELAINE BAY, TENNYSON INLET

sections

DATE	ORIGINAL SIZE	DRAWING No.	SHEET	ISSUE
12/02	A3	22501	01	A

DES RWD | DRN JC | CK | CAD

0mm 100mm