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Engineering Report

Proposed Residential Subdivision

Lot 2, DP 361004,
Hebberds Road,
Rai Valley

for

D. Partridge

Dave Dravitzki
Engineering Geologist
Smart Associates Ltd
February 2007

Project P06-1875

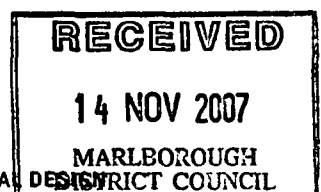
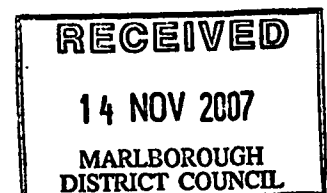


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A SYNOPSIS

1. *Scope of the Investigation*

David Partridge is proposing to subdivide the existing property situated at Hebbberds Road, Rai Valley into two lots. This site investigation engineering report has been prepared to provide an assessment of the development risk in the context of land and foundation stability, foundation requirements, wastewater treatment and land application of effluent, access, stormwater control and water supply at locations selected as house sites on each of the two proposed lots.

2. *Summary and Conclusions*

It is confirmed that the building areas shown on the appended site plan are stable building sites, and that there is sufficient area available for the adequate treatment and discharge of effluent proximal to the building areas on Lots 1 and 2 provided that the conditions and recommendations covered in this report are implemented.

3. *Recommendations*

Site Stability and Building Foundations

It is considered that the building sites on both of the proposed lots are suitable for the proposed subdivision and for residential building construction on conventional shallow foundations designed and constructed in accordance with NZS 3604:1999 with a minimum founding depth of 0.5m below cleared ground level. Structural items outside the scope of NZS 3604:1999 for the construction of any proposed dwelling on the site must be designed by a Chartered Professional Engineer.

Access

Access to House Sites A and B will be able to be achieved from Hebbberds Road and the existing right of way respectively to Council standards of an overall angle no steeper than 1:6.

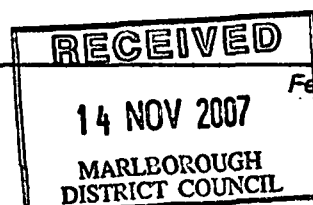
Wastewater

A GR Lawrence Septic Tank Treatment System and dose pumped trench effluent disposal system is recommended for proposed new Lots 1 and 2. Installation is to be in accordance with requirements and recommendations of AS/NZS1547:2000.

Water Supply

It is recommended that water storage tanks be installed to collect the stormwater from roofed areas to supply the proposed dwellings, which may be augmented by a stream water supply from the existing stream within the site. It is recommended that tanks giving a total storage capacity for domestic use of not less than 30,000 litres be installed at Lots 2, 3, and 4 to allow for dry weather periods. Tanks are to be connected in series.

Water for fire-fighting purposes should satisfy the New Zealand Fire Service Code of Practice for Fire Fighting Water Supplies. A domestic sprinkler system incorporated into the design of any new structure, connected to the 30,000 litre tank necessary for domestic use, is recommended.



Stormwater

It is important that an effective storm-water management system is designed for the proposed building sites and any associated access.

It is recommended that all stormwater from paved areas be collected in a controlled manner and be directed to discharge into soak pits constructed at the site to service the proposed residential dwellings. Soak pits should not be located on slopes steeper than 1:3.

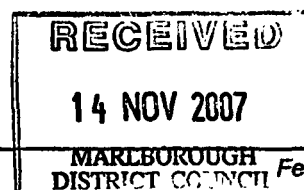
4. Limitations

This report is valid for two years from the date of issue and covers the inspection of the building areas shown on the appended site plan in order to assess the development risk in the context of land and foundation stability, house site location, foundation requirements, access, stormwater control, water supply and wastewater treatment and management only, on behalf of D. Partridge.

Any other areas are outside the scope of this report.

The reliance by other parties on the information or opinions in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

The conclusions and recommendations expressed herein have been prepared with respect to the proposed development at the site, and should not be taken out of context from the proposed development discussed herein or the remainder of this report.



B REPORT

1. Introduction

- 1.1 It is understood that the proposed development involves the creation of two new lots from the existing property. Details of the proposed development are shown on the site plan presented in Appendix A of this report.
- 1.2 The legal description of the land covered by this report is Lot 2 DP 361004.
- 1.3 The purpose of this report is to describe the house sites that have been identified at the site and provide an assessment of the development risk in the context of land stability, building foundation requirements, access, water supply, stormwater control and sewage treatment and management.
- 1.4 The site assessment was carried out on 8 December 2006 by Mr Dave Dravitzki of this office.
- 1.5 Relative locations have been established using compass, tape, laser rangefinder and handheld GPS and are not intended to convey a high level of accuracy.
- 1.6 The subject site is zoned as 'Rural 2' and is not identified as being on unstable ground according to the Marlborough District Council Sounds Resource Management Plan.

2. General Description

- 2.1 The proposed subdivision is located to the north of Hebbards Road in Rai Valley within an area of rural residential properties.
- 2.2 The land comprising the proposed development generally consists of a flat valley floor with terrace deposits located in the northwestern part of the site. The slopes leading down from the terrace surface to the valley floor are generally slightly to moderately sloping (11°-17°).
- 2.3 The site is vegetated in open paddock grasses. A stream enters along the southern boundary of the site and exits the site along the eastern boundary, as shown on the appended site plan.
- 2.4 The brief for this report was to identify two building sites for the purposes of the proposed residential subdivision. Site photographs are presented in Appendix B of this report.

3. Geotechnical Assessment

- 3.1 Two potential building sites (Site A and Site B) have been investigated in order to determine the geotechnical conditions underlying the site for the purposes of the proposed residential subdivision. The locations of Site A and Site B are shown on the appended site plan.
- 3.2 The New Zealand Geological Map (Rattenbury et al. 1998) indicates that the subject site is underlain by clay bound gravel Pleistocene age terrace deposits. The results of the subsurface investigations generally confirms the stratigraphy as indicated on the geological map.

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5. Water Supply

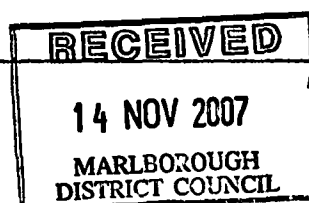
- 5.1 It is understood that water storage tanks will collect the stormwater from roofed areas to supply the proposed dwellings, which may be augmented by a stream water supply from the existing stream within the site.
- 5.2 In this part of the Marlborough Sounds the average rainfall is approximately 2200mm/year, which is generally sufficient to provide water supply to residential dwellings.
- 5.3 However, in order to allow for significant dry weather periods, it is recommended that tanks giving a total minimum storage capacity for domestic use of 30,000 litres be installed at the site. Tanks are to be connected in series.
- 5.4 Water for fire-fighting purposes should satisfy the New Zealand Fire Service Code of Practice for Fire Fighting Water Supplies. There are a range of options for such supply including:
- a large water storage tank or swimming pool, provided it meets NZFS requirements including connection specification. This is likely to be an onerous requirement.
 - a domestic sprinkler system incorporated into the design of any new structure, connected to the 30,000 litre tank necessary for domestic use. This is regarded as probably the most economic option, as it would be relatively inexpensive if included in the house design.
- 5.5 Actual requirements would be most appropriately addressed at the Building Consent stage.

6. Stormwater Control

- 6.1 Although the site has moderate to good natural drainage it is important that an effective stormwater management system is designed.
- 6.2 It is recommended that all stormwater from paved areas be collected in a controlled manner and be directed to discharge into soak pits constructed at the site to service the proposed residential dwellings. Soak pits should not be located on slopes steeper than 1:3.

7. Wastewater Treatment and Management

- 7.1 The site investigations identified suitable wastewater land application areas proximal to the proposed building sites, as indicated on the site plan.
- 7.2 The proposed land application areas are located on essentially flat terrace landforms. The depth to the water table is expected to be over 1m. There is sufficient land area available in Lots 1 and 2 to position the land application areas to be a minimum distance of 30m from the existing stream at the site.
- 7.3 Three test pits were dug on each proposed lot in the proposed effluent land application areas and their locations are shown on the site plan. Based on the soil assessment carried out, an average drainage category of 4 has been adopted for proposed House Sites A and B.



7.4 Three test pits were dug at proposed new Lot 1 in the proposed effluent land application area and their locations are shown on the site plan. The representative soil properties are:

W1

(m)	Horizon or Layer and boundary	Genesis	Description							Drainage Category
			Colour	Field Texture	% + 2mm Fragments	Compactness	Consistency	Structure	Moisture condition	
0.15	A	Topsoil	Brown	Silt loam	None	Loose	Firm	Strong	Moist	3
0.6	B	Alluvial	Orange-brown	Silty clay loam	5%	Loose	Stiff	Weak	Moist	4

W2

(m)	Horizon or Layer and boundary	Genesis	Description							Drainage Category
			Colour	Field Texture	% + 2mm Fragments	Compactness	Consistency	Structure	Moisture condition	
0.15	A	Topsoil	Brown	Silt loam	None	Loose	Firm	Strong	Moist	3
0.6	B	Alluvial	Orange-brown	Silty clay loam	5%	Loose	Stiff	Weak	Moist	4

W3

(m)	Horizon or Layer and boundary	Genesis	Description							Drainage Category
			Colour	Field Texture	% + 2mm Fragments	Compactness	Consistency	Structure	Moisture condition	
0.15	A	Topsoil	Brown	Silt loam	None	Loose	Firm	Strong	Moist	3
0.5	B	Alluvial	Orange-brown	Silty clay loam	10%	Loose	Stiff	Weak	Moist	4

7.5 Three test pits were dug at Lot 2 in the potential effluent land application area and their locations are shown on the site plan. The representative soil properties are:

W4

(m)	Horizon or Layer and boundary	Genesis	Description							Drainage Category
			Colour	Field Texture	% + 2mm Fragments	Compactness	Consistency	Structure	Moisture condition	
0.15	A	Topsoil	Brown	Silt loam	None	Loose	Firm	Strong	Moist	3
0.6	B	Alluvial	Orange-brown	Silty clay loam	5%	Loose	Stiff	Weak	Moist	4

W5

(m)	Horizon or Layer and boundary	Genesis	Description							Drainage Category
			Colour	Field Texture	% + 2mm Fragments	Compactness	Consistency	Structure	Moisture condition	
0.15	A	Topsoil	Brown	Silt loam	None	Loose	Firm	Strong	Moist	3
0.4	B	Alluvial	Orange-brown	Silty clay loam	5%	Loose	Stiff	Weak	Moist	4

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W6

(m)	Horizon or Layer and boundary	Genesis	Description							Drainage Category
			Colour	Field Texture	% + 2mm Fragments	Compactness	Consistency	Structure	Moisture condition	
0.15	A	Topsoil	Brown	Silt loam	None	Loose	Firm	Strong	Moist	3
0.4	B	Alluvial	Orange-brown	Silty clay loam	5%	Loose	Stiff	Weak	Moist	4

7.6 It is considered that, providing appropriate care is undertaken in the placement of the trenches during their construction to maintain a minimum setback of 30m from the existing stream at the site, an assessment of the best practical option in accordance with Plan Change 7 Rule 27.2.4.5.5 has determined that primary treatment and dose pumped trench wastewater disposal is appropriate and the most practical option for this property.

7.7 A GR Lawrence Septic Tank Treatment System and dose pumped trench effluent disposal system is recommended for each house site.

A primary treatment system such the system proposed will normally produce average effluent quality equal to or better than:

BOD after 5 days < 100 g/m³
Suspended solids < 100 g/m³

7.8 A wastewater flow design allowance of 180 litres/person/day has been used in the design of the system. This allowance is in accordance with appendix 4.2D of AS/NZS 1547:2000 and is based on a stream water source for the dwelling. Based on a permanent occupancy of 8 people (as per MDC Guidelines For New On-Site Wastewater Management Systems) the design flow is 1440 litres per day. A minimum wastewater storage capacity of 4,500 litres is required.

7.9 The total length of 600mm wide trench required is 240m (refer wastewater design sheets Appendix C). It is recommended that this length of trench be constructed as 8 trenches of 30m, split into two blocks of 4 trenches that are alternatively dosed via a sequencing valve. A typical effluent trench detail is provided on drawing 002 in Appendix A.

7.10 Prior to the proposed system becoming operational the system designer must inspect and certify that the system has been installed according to the design. This certification must then be forwarded to Council.

7.11 Vehicular access to the system for desludging will be available.

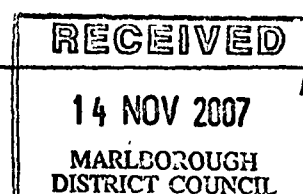
8. Power

8.1 A reticulated power supply exists in the area. A connection to the reticulation for the proposed lots will have to be sought through Marlborough Lines.

9. Conclusion

9.1 It is confirmed that the proposed Lots 1 and 2 each have a stable building site, and that the property is considered to be suitable for the proposed residential subdivision.

9.2 It is confirmed that there is sufficient area available for the adequate treatment and discharge of effluent proximal to the proposed building sites on Lots 1 and 2.



10. References

1. Rattenbury, M.S., Cooper, R.A., and Johnston, M.R. (compilers) 1998. New Zealand Geological Map 9: Geology of the Nelson area, 1:250,000, Institute of Geological and Nuclear Sciences.
2. AS/NZS 1547:2000 On-site Domestic Wastewater Management

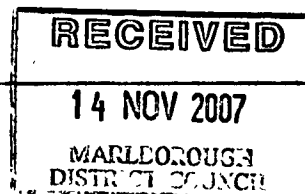
Report prepared by:

Report reviewed by:

Dave Dravitzki, Engineering Geologist
27 February 2007



Jan Dimmendaal, Chartered Engineer



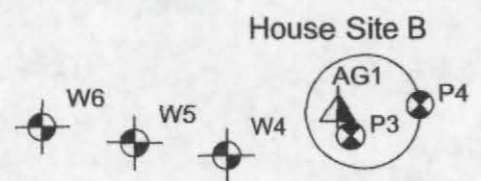
Appendix A

Site Plan
Drainage Field Specification

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FIRE DEPARTMENT

305.06

86.72



LOT 1

108.69

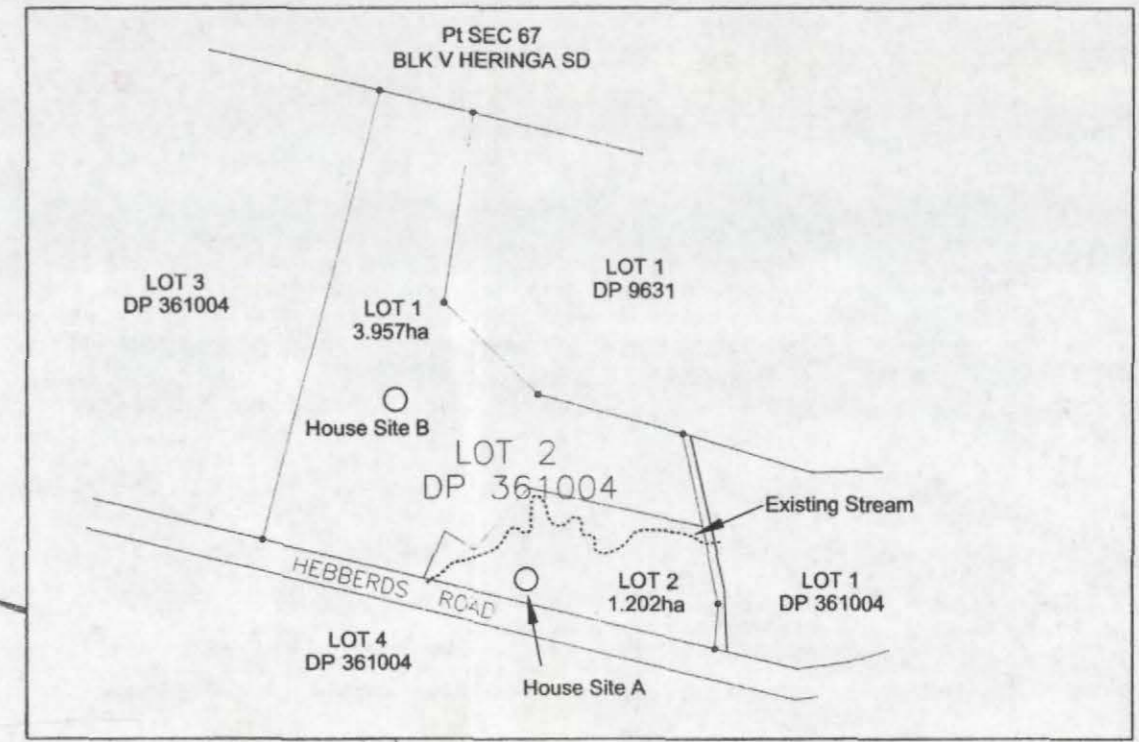
HEBBERDS ROAD

54.30

25.80



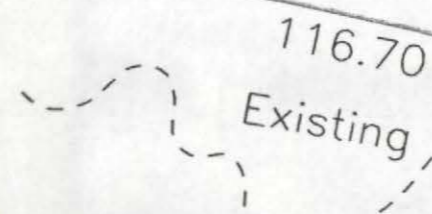
2 SITE PLAN B
1:1000



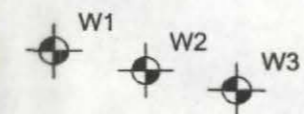
1 SITE PLAN A
1:5000

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Note: This drawing adopted from Gilbert Haymes drawing 7687, dated 2 February 2007



House Site A



LOT 2

196.40
ROAD

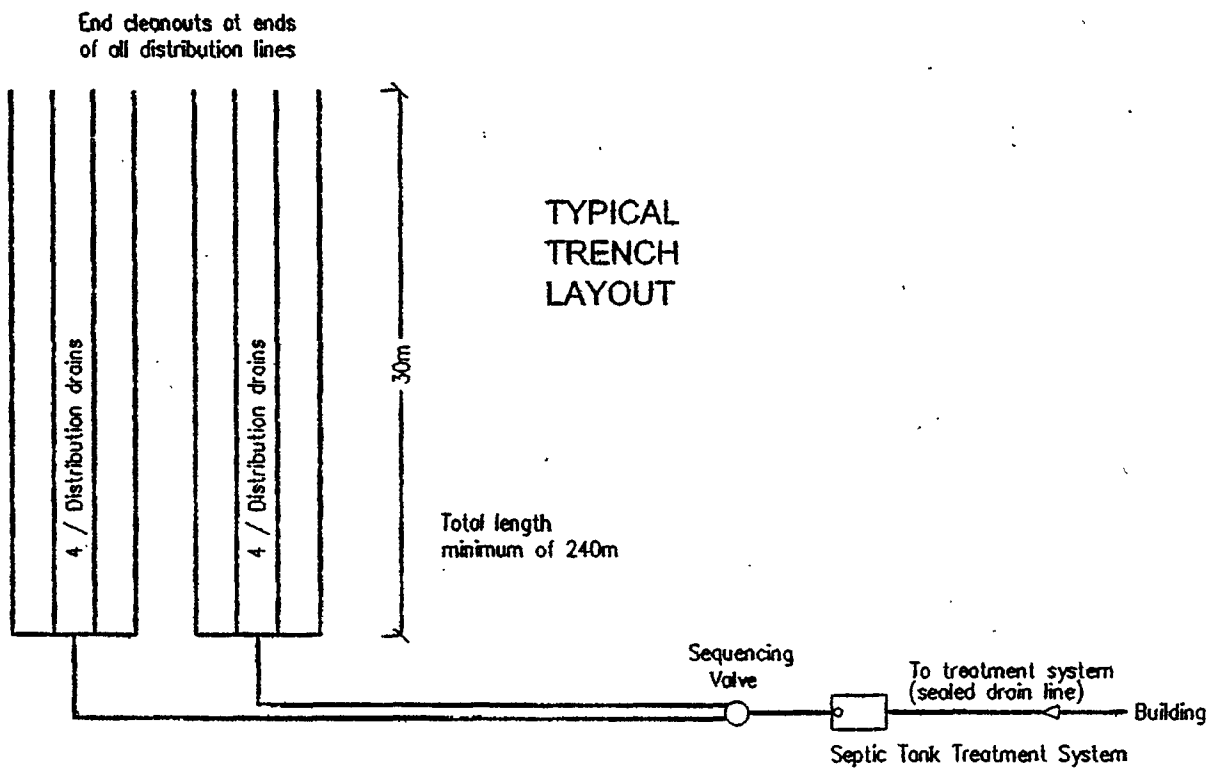
52.07

29.98

LEGEND	
	P1 Penetrometer Test Site
	AG1 Hand Auger Test Site
	W1 Wastewater Test Site

SITE PLAN			DRAWING No. 001
DRAWN DD	CHECKED JD	SCALE (A3) As Shown	DATE 23.02.07
COMPUTER FILE: COMP_FILE			REVISION /

NOTES
 Do not state that this drawing, any special dimensions are to be taken from this drawing. The contractor shall verify all dimensions on site before commencing any work, and if any discrepancy is found, the contractor must report any discrepancy to the Engineer before commencing work. If this drawing contains the quantities of materials, the contractor is to be informed before the work is started. This drawing is Copyright and must not be reproduced without the consent of Smart Associates Ltd. The Engineer is to be given at least 2 weeks notice of the beginning of construction work, and at least 48 hours notice of critical items (eg concrete pours, painting etc). The Engineer reserves the right to alter the design in light of the circumstances having priority over the design intent.



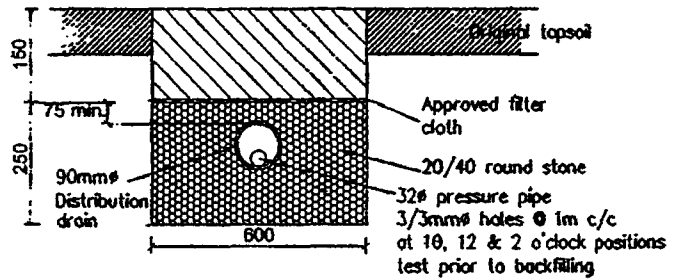
SYSTEM USE & MAINTENANCE

- The 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 de-sludging of the system 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 system or the soil absorption system.
- Prohibited discharge to the system
 - * Oil/grease from a deep fryer (for example).
 - * Stormwater or any drainage other than sewerage generated in the house.
 - * Petrol, oil or other flammable/explosive substances
 - * Garden, garage, and workshop chemicals (e.g. pesticides, paint cleaners, photographic chemicals, motor oil or trade waste).
 - * Disposable nappies & sanitary napkins.
- It is an MDC requirement that any wastewater treatment system be regularly serviced and maintained by a contractor experienced in this field.

NOTE - TRENCHES

- Trench spacing 1m. minimum between edges
- Distribution drains to be U-PVC 90mm ϕ perforated pipe with perforations comprising at least 2% of surface area. (20mm ϕ holes at 100mm centres at 4 & 8 o'clock positions).
- Distribution pipes to be laid flat or at a gradient not greater than 1 in 200.
- Sides & base of trench to be carefully scratched with a pointed tool before laying filter media.



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TYPICAL TRENCH CONSTRUCTION

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PROPOSED WASTEWATER DISPOSAL
 HEBBERDS ROAD, RAU VALLEY
 for D. PARTIDGE
 PROJECT No. P06-1875

REVISIONS			DRAWING No.
			002
DRAWN DD	CHECKED JD	SCALE	DATE 01.02.07
		1:0	REVISION 1
		NTS	

Appendix B
Site Photographs

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Photo 1: View of site from House Site B (by auger) looking towards House Site A.



Photo 2: Exposure of site soils - gravel boulders in clay matrix.

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Appendix C

**Hand Auger Logs and
Penetrometer Test Results**

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Auger Borehole AG1

Project: D. Partridge
Date: 08.12.06 **Project No:** P06-1875
Bore Ø: 50mm **Drilled by:** D. Dravitzki

Horizon	Description	Depth (m)	Comments
A	Silt loam, brown, friable, very soft, moist	0.1	Topsoil
B	Silty clay loam, orange-brown, loose, stiff, 20% gravels, slightly plastic, moist		Alluvial
	Borehole Terminated - Refusal	0.5	

Notes: 1. Groundwater not encountered 08.12.06

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Auger Borehole AG2

Project:	D. Partridge		
Date:	08.12.06	Project No:	P06-1875
Bore Ø:	50mm	Drilled by:	D. Dravitzki

Horizon	Description	Depth (m)	Comments
A	Silt loam, brown, friable, very soft, moist	0.15	Topsoil
B	Silty clay loam, orange-brown, loose, stiff, 20% gravels, slightly plastic, moist		Alluvial
	Borehole Terminated - Refusal	0.6	

Notes: 1. Groundwater not encountered 08.12.06

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**PENETROMETER
 TEST
 RESULTS**

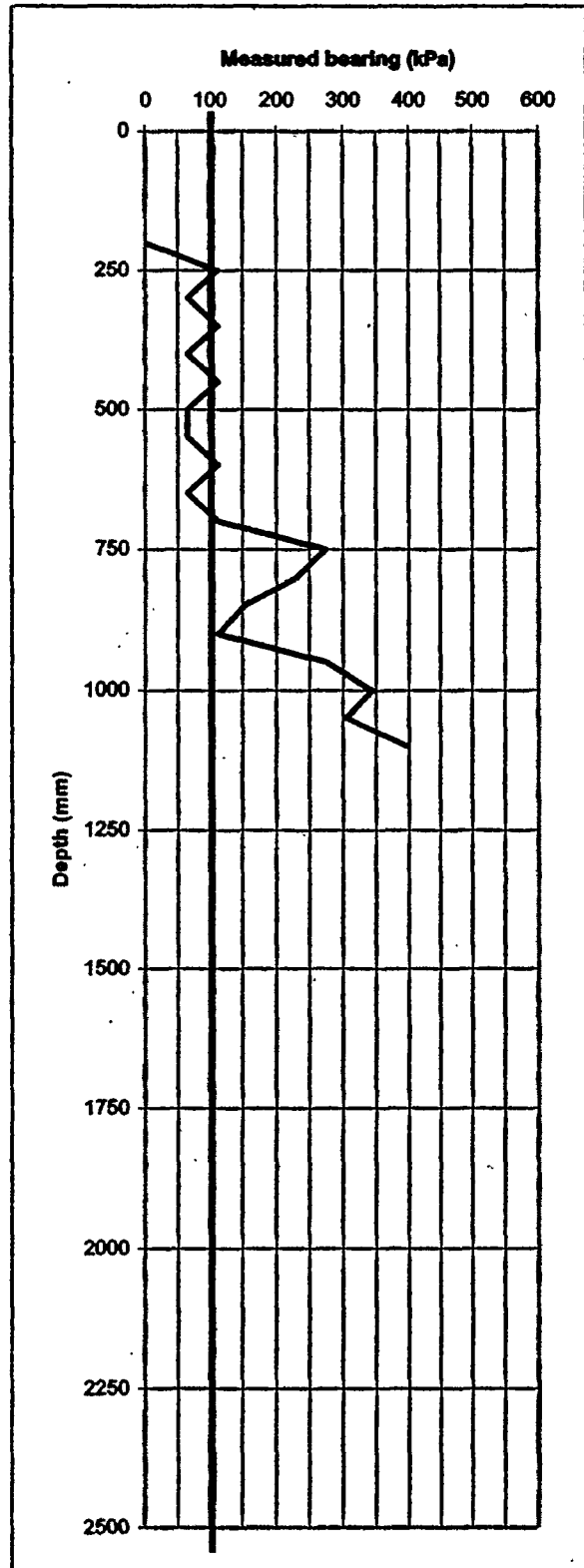
Client: D. Partridge
Project: Proposed Residential Subdivision
Site: Heberds Road
 Rai Valley

Date: 08.12.06
Investigator: D. Dravitzki
Project No: P06-1875

Notes: Test locations refer to drawing.

Test No P1

No. of Blows	s (mm/blow)	Soil bearing resistance (kPa)	Depth (mm)
	0	0	200
2	25	113	250
1	50	66	300
2	25	113	350
1	50	66	400
2	25	113	450
1	50	66	500
1	50	66	550
2	25	113	600
1	50	66	650
2	25	113	700
6	8	275	750
5	10	231	800
3	17	153	850
2	25	113	900
6	8	275	950
9	6	344	1000
7	7	305	1050
11	5	396	1100



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PENETROMETER TEST RESULTS

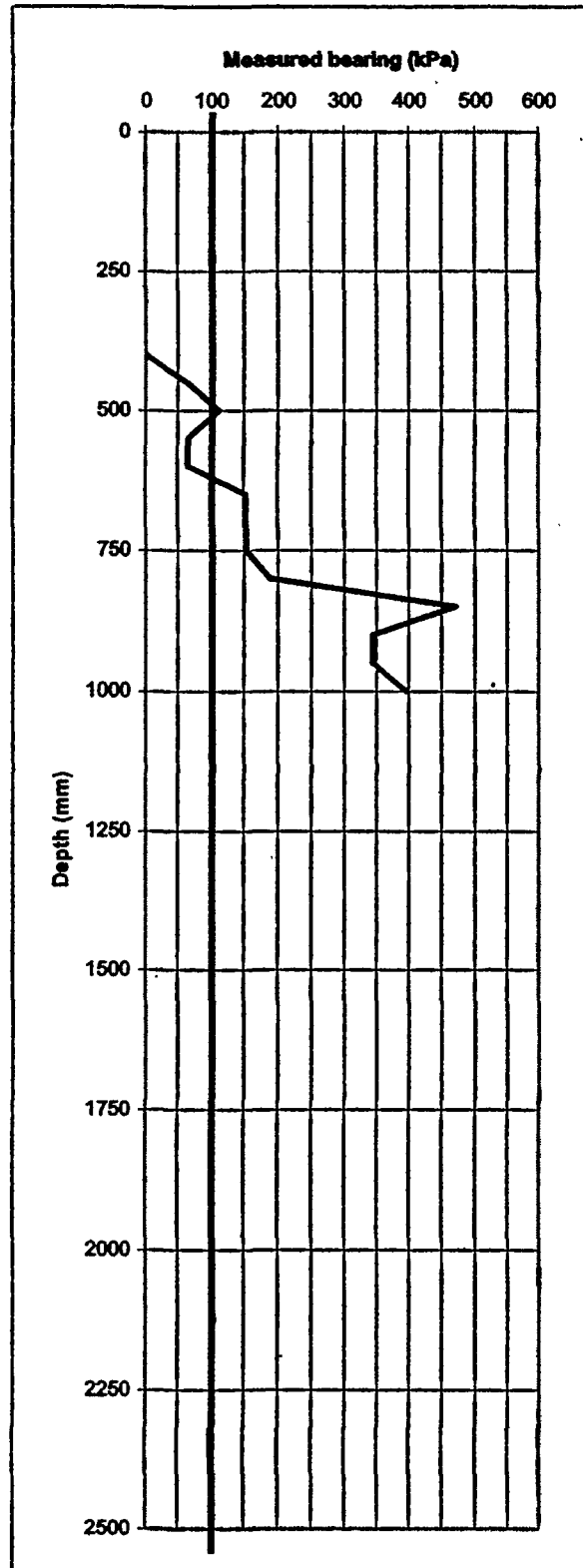
Client: D. Partridge
Project: Proposed Residential Subdivision
Site: Heberds Road
Rai Valley

Date: 08.12.06
Investigator: D. Dravitzki
Project No: P06-1875

Notes: Test locations refer to drawing.

Test No P2

No. of Blows	e (mm/blow)	Soil bearing resistance (kPa)	Depth (mm)
	0	0	400
1	50	66	450
2	25	113	500
1	50	66	550
1	50	66	600
3	17	153	650
3	17	153	700
3	17	153	750
4	13	188	800
12	4	471	850
9	6	344	900
8	6	344	950
11	5	396	1000



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PENETROMETER TEST RESULTS

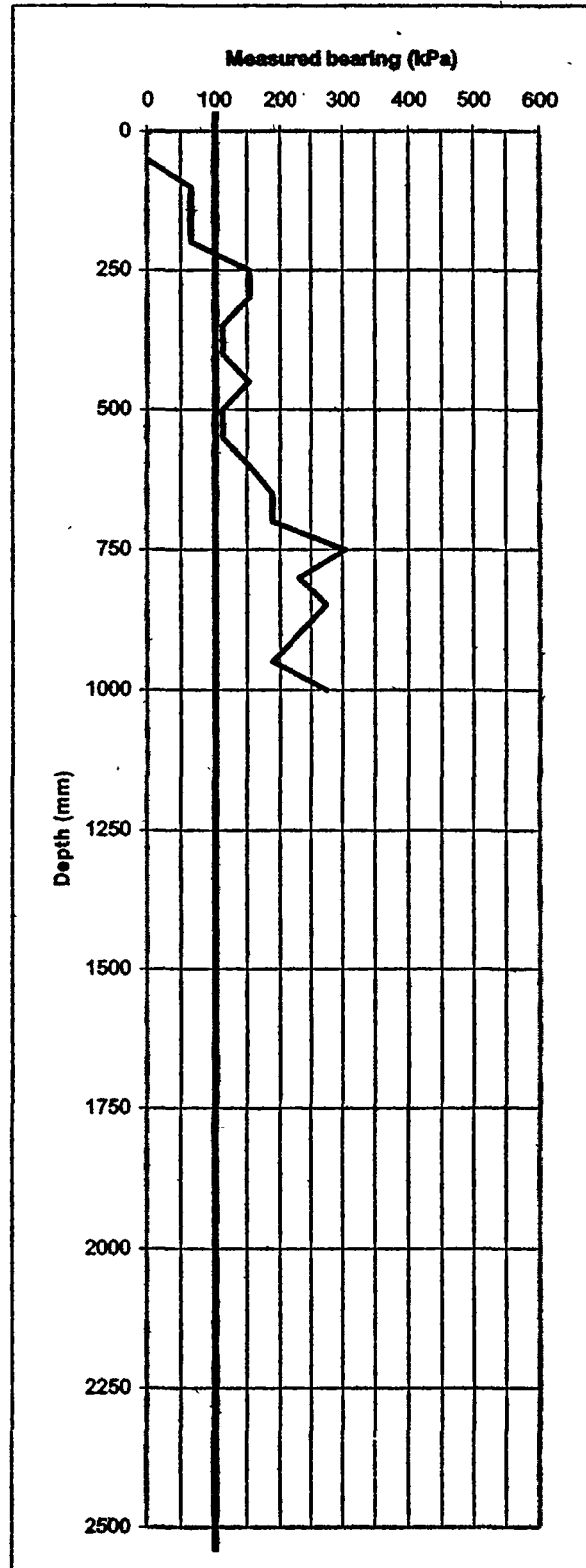
Client: D. Partridge
Project: Proposed Residential Subdivision
Site: Heberds Road
Rai Valley

Date: 08.12.06
Investigator: D. Dravitzki
Project No: P06-1875

Notes: Test locations refer to drawing.

Test No P3

No. of Blows	e (mm/blow)	Soil bearing resistance (kPa)	Depth (mm)
	0	0	50
1	50	66	100
1	50	66	150
1	50	66	200
3	17	153	250
3	17	153	300
2	25	113	350
2	25	113	400
3	17	153	450
2	25	113	500
2	25	113	550
3	17	153	600
4	13	188	650
4	13	188	700
7	7	305	750
5	10	231	800
6	8	275	850
5	10	231	900
4	13	188	950
6	8	275	1000



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PENETROMETER TEST RESULTS

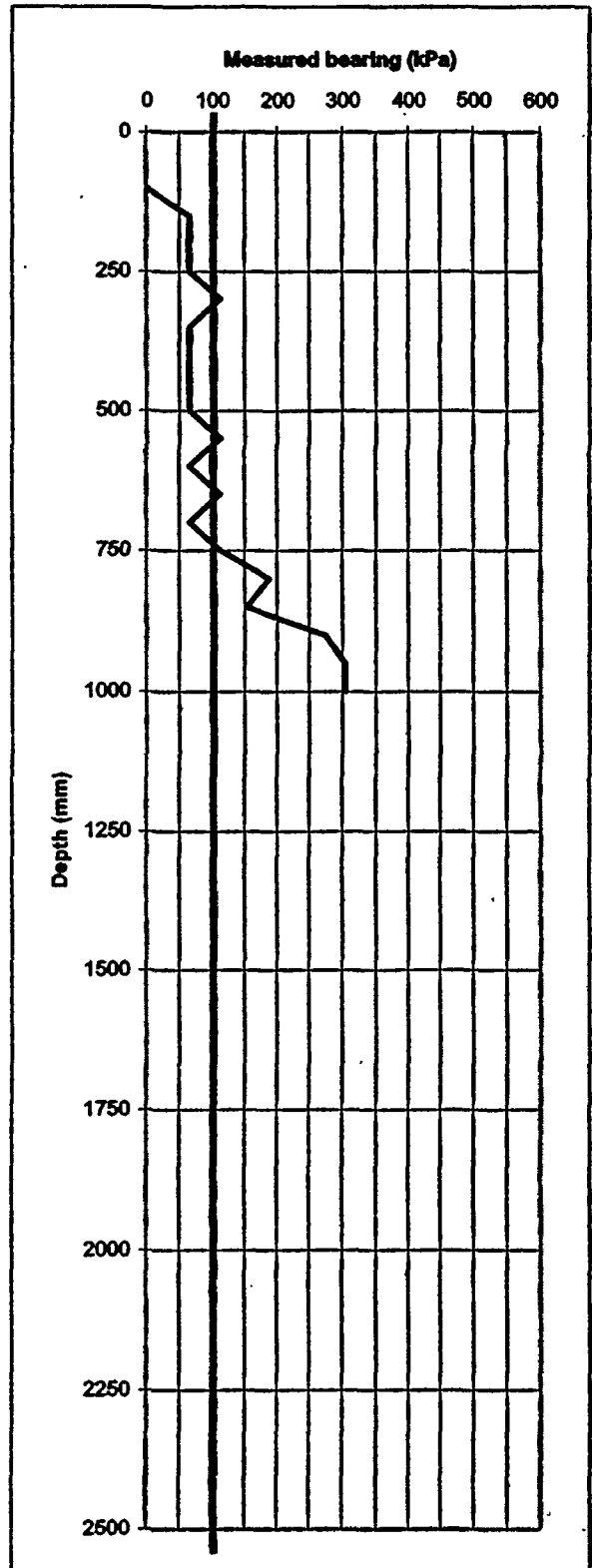
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Rai Valley

Date: 08.12.06
Investigator: D. Dravitzki
Project No: P06-1875

Notes: Test locations refer to drawing.

Test No P4

No. of Blows	e (mm/blow)	Soil bearing resistance (kPa)	Depth (mm)
	0	0	100
1	50	66	150
1	50	66	200
1	50	66	250
2	25	113	300
1	50	66	350
1	50	66	400
1	50	66	450
1	50	66	500
2	25	113	550
1	50	66	600
2	25	113	650
1	50	66	700
2	25	113	750
4	13	188	800
3	17	153	850
6	8	275	900
7	7	305	950
7	7	305	1000



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Appendix D

Wastewater Design Sheets

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SOIL PERMEABILITY ASSESSMENT / EFFLUENT DESIGN SHEET
 To AS/NZS 1547:2000

Site Evaluation: D. Partridge, Heberds Road, Rai Valley Job No: P06-1875

Intended water Supply:

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

Local experience with existing on-site systems:

Septic Tank or similar (Primary treatment):

OK when installed properly with a correctly sized drainage area and maintained.

Secondary treatment:

Work very well in domestic situation producing a relatively high quality effluent.

Recommendation for this site: *GR Lawrence Septic Tank with dose pumped effluent disposal trenches.*

DRAINAGE CONTROLS:

Need for surface water collector / cut-off drains?

AVAILABILITY OR RESERVE / SETBACK AREAS

Reserve area available for extensions, % of design area:

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

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

Design

RECOMMENDED D.L.R. 10 mm/day

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

Permanent People At 180L/person/day: 1440 L/day from Appendix 4.2D AS/NZS 1547:2000

DESIGN DAILY FLOW: 1440 L/day

Septic tank size (min): 4,500 (Table 4.3A1)

AREA REQUIRED: 144.0 m²

LENGTH REQUIRED: 240.0 m with 600 wide trench

RESERVE AREA REQUIRED: 100% of specified drainage area

RECOMMENDATION :

GR Lawrence 4,500 litre septic tank and dose pumped effluent disposal trenches to be a minimum total length of 240m (Lines to be laid at 1.6m centres, Pump sized by manufacturer).

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