



LIR NUMBER:

60854

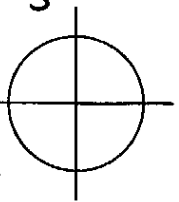
DME:

Consent Number		LIR-RPT						LIR-CON	
		No Analysis	Geotechnical	Flooding	Effluent	Stormwater Neutrality	Contamination	Consent Notice	Restriction
ABA									
RMA	51830.								

LIR NUMBER:

DME:

[illegible]



LIR	60854
LIVE	
RMA	RS1830
ABA	
Original	Copy

6th October 2006

GEOTECHNICAL INVESTIGATION & REPORT
at
PROPOSED LOT 1 BEING A SUBDIVISION OF LOT 3 DP
104590, SHEFFIELD ROAD, KAUKAPAKAPA
for
CARL JACKSON

Our Job Number: 7619/06/CR



Site investigation at Proposed Lot 1 a Sdv. of Lot 3 DP 104590. Sheffield Road, Kaukapakapa



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REPORT SUMMARY

The report summary should not be read in isolation, read in conjunction with the full report.

Stability and Suitability of the Lot for residential dwellings.

In general, stability can be an issue for this site due to the slope steeper than 1:4. For details, see paragraph **7.0**.

Foundation recommendations.

Foundations supported on piles located downslope of the proposed development is recommended, but for details see paragraph **12.2**.

Earthworks recommendations.

Within the proposed development, creating an access driveway is expected to be executed, but for details see paragraph **12.1**.

Inspections during construction.

During construction, pile depths and the cleared flat platform should be examined by Geotech Professionals 2006 Ltd. or a Chartered Engineering Geologist/Geotechnical Engineer to confirm the nature and strength of the subsoil, as well as to provide advice on any other geotechnical issues which may become apparent during execution of work.

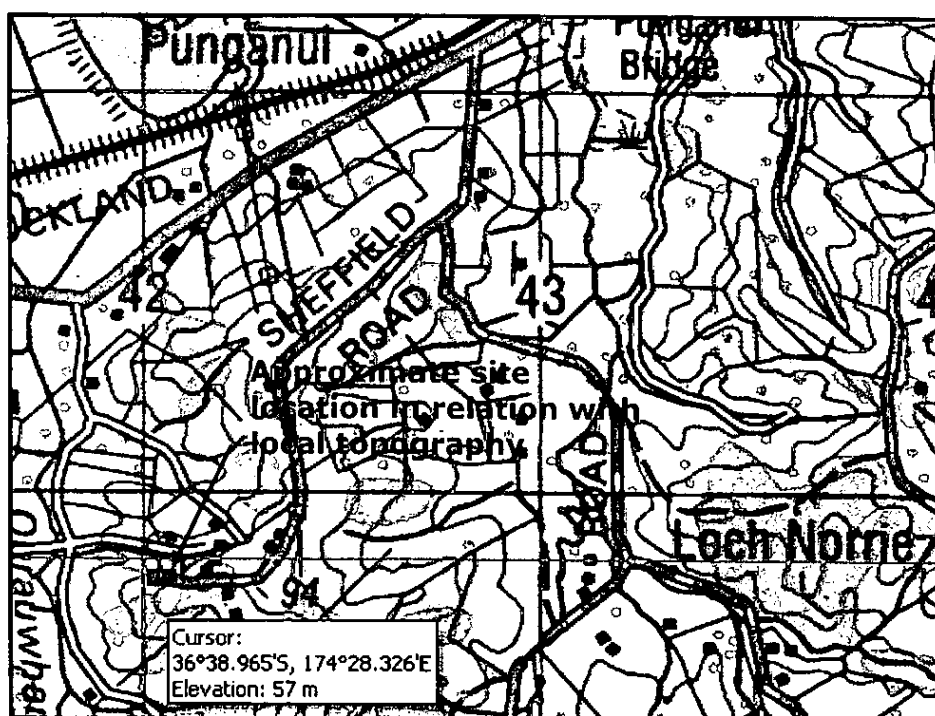


1.0 INTRODUCTION

As discussed with the client we have carried out a geotechnical investigation at the above site, for a proposed location of a single storey timber framed house. This report was prepared to assess the stability and foundation requirements for the proposed development.

2.0 SITE DESCRIPTIONS

The proposed house will be located close to the top of the slope to the West of Sheffield Road. The legal description of the site is Lot 1 being a Subdivision of Lot 3 DP 104590. The whole of the lot generally slopes from East to West with angles up to 18° towards West. The approximate location of the site is Q10 421048 (260 map series). The site is covered with grass and scattered mature trees, as shown in the above photograph.



3.0 PREVIOUS REPORTS

Hutchinson Consultants Limited, prepared a report in the area, named Geotechnical Report for proposed building site at Lot 3 DP 104590 Sheffield Road, Helensville, dated 24 July, 1997 ref. no. LM5300.



We have read and understood the findings of this report.

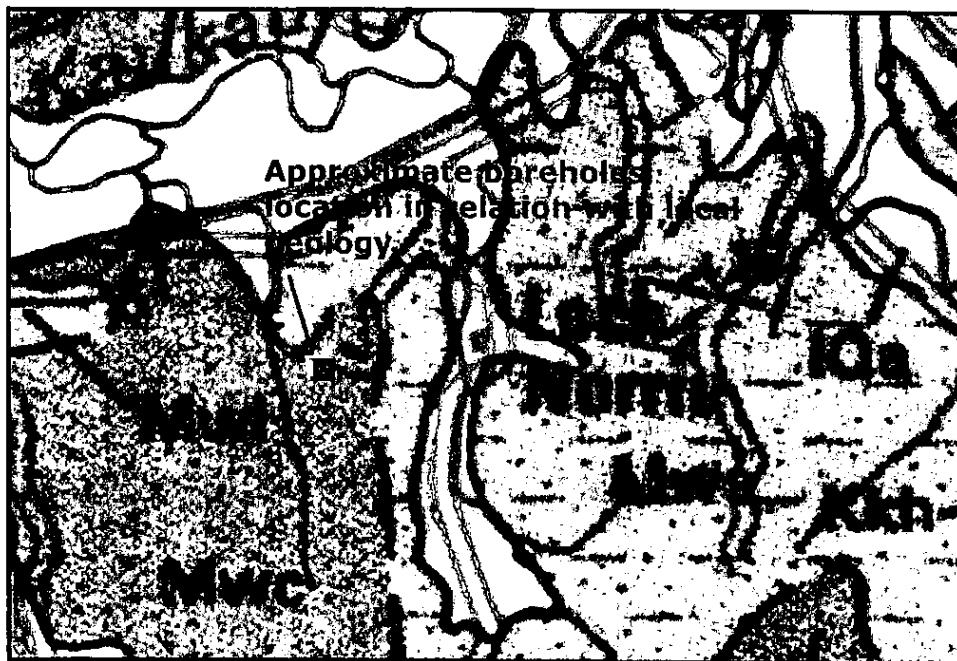
4.0 PROPOSED DEVELOPMENT

It is understood that the proposed development of the site is residential, comprising a three bedroom single storey timber framed structure with lightweight roofing and cladding house of 80m².

5.0 GEOLOGY OF THE AREA

The following geological map references have been referred to;

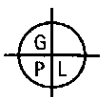
- The Geological Map of New Zealand Sheet 3, 1:250,000, indicates, the geology of the site consists of Cornwallis Formation (Mwc) of Miocene Age, being of "*Thick-bedded, graded, volcaniclastic sandstone and thin-bedded fine-grained sandstone and siltstone (volcanogenic flysch).*"



6.0 SUBSOIL INVESTIGATIONS

The site investigation was carried out on 5th October 2006 and included a walk-over of the terrain and inspection of the preferred house location along with 2 hand augered boreholes labelled HA1, and HA2 for subsoil investigation. Both boreholes were drilled down to refusal and continued with Scala Penetrometer Tests. The boreholes logs are appended and contain the results of shear strength measurements obtained using a field shear vane. The approximate boreholes location is shown in the attached plan.

Site investigation at Proposed Lot 1 a Sdv. of Lot 3 DP 104590. Sheffield Road, Kaukapakapa



TOPSOIL: was encountered down to a depth of 0.3m and within both boreholes. It is not unreasonable that topsoil depth may vary at other locations away from or around the boreholes.

SILT: was encountered in both boreholes and was generally described as being sandy fine grained, micaceous, occasionally with dark brown volcanic ash pockets up to 20mm diameter and pumice clasts up to 1mm, very stiff to hard in consistency, brown with light grey mottles in colour and moist in water content. The shear strengths range between 113kPa and 139kPa. Remoulded values range between 38kPa and 61kPa.

No groundwater (water seepage) was encountered in the boreholes during the drilling process.

7.0 STABILITY

We have not been provided with a contour site plan and therefore the field data was encountered using the tape and clinometer's method.

During the site visit we could not find visible sign of active instability. However, the slopes of 18° towards the western side of the lot, guides us to proceed with slope stability analysis. We analysed the stability of those slopes in the cross section A-A' attached to this report. The cross section location is shown in the attached site plan.

The method used in modelling of the slopes is **Bishop Multiple, circular surface, multiple stability analysis**.

CROSS SECTION A-A'-not retained

Layer	Cohesion (kPa)	Angle of Internal Friction
1. Silt	3	35°
2. Hard layer	10	40°

Stability analysis used in modelling of the slope is the latest version of the computer program "**GALENA Version 4.02**" and the results are provided in the appended drawings.

The factor of safety for the above condition is as follows:

Ground Water	F.O.S.
-1.0m	1.38



It is unlikely for the water to reach such levels in that area, but the **Factor of Safety of 1.38** is not satisfactory for the proposed development.

In order to achieve a satisfactory Factor of Safety of minimum 1.5 we have modelled the slope using a retaining structure located at some 5m to the West of the house, as shown in the attached cross section. The results are as follows:

CROSS SECTION A-A'- retained

Layer	Cohesion (kPa)	Angle of Internal Friction
1. Silt	3	35°
2. Hard layer	10	40°

Stability analysis used in modelling of the slope is the latest version of the computer program "**GALENA Version 4.02**" and the results are provided in the appended drawings.

The factor of safety for the above condition is as follows:

Ground Water	F.O.S.
-1.0m	1.56

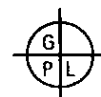
It is unlikely for the water to reach such levels in that area and therefore a **Factor of Safety of 1.56** is satisfactory for the proposed development.

In conclusion, we recommend an in-ground retaining wall to be located at some 5.0m to the West of the proposed house location.

The in-ground retaining wall should be designed to resist to lateral loads acting over the top 1.0m of soil. The minimum depth of the piles should be 2.5m where the expected bearing pressure can be considered 200kPa. The length of the retaining structure should cover the width of the lot and is expected to protect the house and the future access way to the house.

8.0 SENSITIVITY

Sensitivity is defined as the ratio of the undisturbed undrained shear strength of a cohesive soil to the remoulded undrained shear strength at the same moisture content, which is an indication of the soil's sensitivity to disturbance.



The sensitivities of exploratory boreholes results with depth are shown in the following table:

Depth [m]	HA1 sensitivity	HA2 sensitivity
0.5	2.3	2.3
1.0	N/A	2.2
1.5	N/A	3.2
2.0	N/A	N/A
Average	2.3	2.6

NA-Not Applicable

The sensitivity has been calculated at each shear vane test (where practicable) as shown above. Sensitivity calculations are not applicable where the remoulded strength was unable to be measured due to the peak shear strength being higher than the measurement of limit of the equipment.

The average sensitivity for the soils at the site is **2.45**, resulting in a sensitivity classification of the silt being "**Moderately Sensitive**" to disturbance as shown in **Table 2.10: Sensitivity of Soil from "NZ Geotechnical Society INC" December 2005 guidelines**.

9.0 EXPANSION

Rodney District Council soil map show that the site is located within category "B" of soils.

Considering our experience with soils the site has been classified to as CLASS S, Slightly Expansive in AS2870:1996.

Definition of expansive soils; Soils which have a liquid limit of greater than 50% and a linear shrinkage of greater than 15% (NZS 3604:1999).

Definition of Class S Site: moderately reactive clay or silt sites which can experience moderate ground movement from moisture changes, with surface movements between 0mm and 21mm.

Hence the soils lie outside the definition of "Good Ground" in NZS 3604:1999. Therefore foundations on the proposed site require either specific design or to be designed in accordance with AS 2870:1996.

Factors which can influence ground shrinking and swelling are:

- Site drainage
- Watering of gardens close to house footings



- Planting trees near the house foundation
- Leaks in plumbing

It should be noted that these measures apply mainly to masonry houses and masonry veneer houses. For frame houses clad with timber or sheeting lesser precautions may be appropriate.

The standard of maintenance expected by AS 2870 is outlined in the CSIRO Information Sheet No10-91. This information is available on the website of the CSIRO, www.publish.csiro.au/nid/22/pid/3612.htm.

A wide range of tree and shrub species have high groundwater demands during summer months. The effects of such demands on expansive soils can be substantial and can lead to differential building settlements. Accordingly it is good housekeeping measure to ensure that high water demand species (such as gum, willow, cypress etc) are not planted close to buildings.

10.0 SEWAGE DISPOSAL

The proposed lot is not connected to a public sewage reticulation and hence an on-site wastewater disposal system will be required.

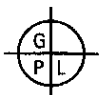
The Auckland Regional Council general authorisation grants authority to the local authority to issue building consent for on-site wastewater treatment systems where less than two cubic metres per day is discharged.

The soil type has been assessed as category 5 in terms of Table 5.1 of the Auckland Regional Council's TP58 (2004).

Either the site would be suitable for disposal of effluent by way of a secondary system with RAAM dripper lines having a recommended loading rate of 3mm/m²/day (taken from TP58, Table 9.2).

Or suitable for disposal of effluent by way of a two chamber septic tank system with filter and dosing siphon with gravity fed LPED dripper lines having a recommended loading rate of 4mm/m²/day. A 3m head between the top of a tank and the highest dripper line is obtainable within the contours of the property.

The detailed design of the onsite waste system should be dealt with, in a separate report.



11.0 STORMWATER

All stormwater from roofs, run-off from paved areas should be collected in sealed pipes and discharged into the existing bush area located to the North of the site.

The stormwater design and run-off should be dealt with in a separate report.

12.0 RECOMMENDATIONS

12.1 Earthworks

Within the house perimeter topsoil should be scraped to clear the ground in order to create a clean suitable area for building a platform.

If a cut/fill exercise is to be performed, then the recommended batter angles for cut and fill up to 1.0m, are as follows:

- Cut 1V:2H (26°)
- Fill 1V:2.5 (22°)

Any proposals for substantial fill of more than 1.0m in height in relation to the building development should be light fill such as "polyrock".

All fill should be compacted to NZS 4431:1989 "Code of practice for earthfill for residential development" and NZS 4404:2004 "Land development and subdivision engineering".

12.2 Foundations

- This site has been classified as CLASS S (Slightly Expansive) to AS2870:1996. Therefore the soil falls outside the definition of good ground according to NZS 3604.
- Foundations on the western side of the house (downslope) should be suspended on bored piles founded in natural ground. Minimum piling depth should be 2.5m. The rest of the foundation (in the cut area) can be NZS 3604:1999 type.
- For general design purposes the following soil parameters should be considered:

Insitu shear strength

$$\tau_{\max} = 113\text{kPa}$$

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(For design purposes normally use lowest maximum shear strength reading recorded in the borehole)

Apparent Cohesion (in terms of effective stress)	$c' = 3 \text{ kPa}$
Apparent Internal Angle of Friction	$\phi' = 35^\circ$
Bulk Density (weight density)	$\gamma = 18 \text{ kN/m}^3$
Ultimate Bearing Capacity	$q_u = 300 \text{ kPa}$
Allowable Bearing Capacity	$q_a = 100 \text{ kPa}$

Allowable Bearing Capacity at 2.5m depth to be considered as being 200kPa.

Safe Pile Skin Friction (ignoring top 0.4m)	$\tau_{sf} = 10 \text{ kPa}$
---	------------------------------

12.3 Retaining Walls

Construction of temporary steep cut batters to allow construction of retaining walls is a common practice. We are unable to make any recommendation with regard to how long a cut face will remain stable, due to the large number of variable parameters involved that can not be readily assessed. Consideration should be given to temporary support of excavations where practicable.

The selection of a safe temporary cut slopes is therefore at the discretion of the contractor based on the soils encountered in the excavated face, surcharges, prevalent weather conditions, season time of year and their previous experience with these types of soils.

Wet weather may cause an increase in soil pressure and potentially cause instability in the cut slope. It is with that in mind that we make the following recommendations:

- Protection of the cut slopes against infiltration and flow shall be incorporated while un-retained during construction.
- All excavations of the cut slopes to be completed in stages. It is suggested that retaining walls are completed during these stages in order to protect the exposed slope from collapse.

Rankine active and passive earth pressures may be used for retaining wall design where deflections of up to 1% of the wall

Site investigation at Proposed Lot 1 a Sdv. of Lot 3 DP 104590. Sheffield Road, Kaukapakapa



height are tolerable. Where zero deflection is required, then the earth pressures will need to be assessed based on At-Rest Conditions, on the following soil parameters:

$$c' = 0 \text{ kPa} \quad \phi = 35^{\circ} \quad \gamma = 18 \text{ kN/m}^3$$

For timber pole retaining walls, undrained shear strength of 60kPa can be assumed.

12.4 Site Inspections during Construction.

- During construction, pile depths and/or the cleared platform should be examined by Geotech Professionals 2006 Ltd. or a Chartered Geotechnical Engineer (Engineering Geologist) to confirm the nature and strength of the subsoil, as well as to provide advice on any other geotechnical issues which may become apparent during execution of work.

12.5 General

- Our parent Company, **The Consulting Group 2006 Ltd.** (same contact details) can carry out the foundation and structural design work for this job. **The Consulting Group 2006 Ltd.** have a competitive **Architectural Design and Structural Division**, which can cater for all your design requirements, preparing plans from concept design, through to Building Consent ready documents.

13.0 LIMITATIONS

The conclusions and recommendations made in this report were based on our observations and limited data from the hand augered borehole. The actual ground conditions may vary over the building site. Should there be any variations in subsoil conditions from those described in this report, as found to exist during excavation, then it is essential that Geotech Professionals 2006 Ltd. be contacted as it may affect the design parameters recommended above.

This report has been prepared for the sole use of Carl Jackson, at Lot 1 being a Subdivision of Lot 3 DP 104590, Sheffield Road, Kaukapakapa, as our client with respect to the brief to assess the subsoil conditions on the building site and to provide geotechnical

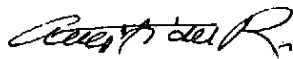
Site investigation at Proposed Lot 1 a Sdv. of Lot 3 DP 104590. Sheffield Road, Kaukapakapa



advice regarding foundation design, and Geotech Professionals 2006 Ltd. accepts no liability to any other party in relation to this report. The reliance by other parties on the information or opinions contained in this report shall, without our prior review and agreement in writing, be at such party's sole risk.

Please do not hesitate to direct any further queries to the undersigns.

PREPARED BY

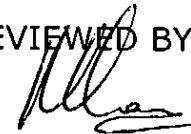


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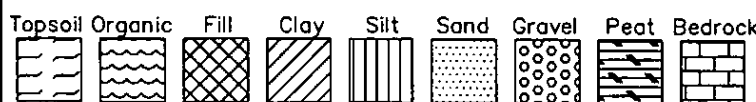
SITE: Proposed Lot 1, Sheffield Road, Kaukapakapa

Datum:

Sheet 1 of 1

GEOLOGICAL INTERPRETATION	SOIL GRAPHIC	DESCRIPTION OF SOIL	DEPTH(m)	SAMPLE TYPE	GROUND WATER	CORRECTED VANE SHEAR STRENGTH (kPa) (Corrected to BS 1377) ● Field Vane (Peak) ○ Remoulded Field Vane					SCALA PENETROMETER (BLOWS/100mm)				
						0	50	100	150	200	0	5	10	15	20
Cornwallis Formation (Mwc), Miocene Age		TOPSOIL, sandy (fg)													
		SILT, slightly sandy (fg), micaceous, with pumice clasts up to 1mm, very stiff, brown, moist					48		113						
		with dark brown volcanic ash up to 20mm diameter	1	HAND AUGER	Dry 5/10/06										
		becomes sandy (fg), with light grey mottles													
		E.O.B @ 2.0m (Too hard to drill)	2												
			3												
			4												
			5												

NOTE:



DRILLED/LOG BY: CR

DATE DRILLED: 05/10/2006

DRILL METHOD: 50 mm Hand Auger

SHEAR VANE NO. 233

SITE: Proposed Lot 1, Sheffield Road, Kaukapakapa

Datum:

Sheet 1 of 1

GEOLOGICAL INTERPRETATION	SOIL GRAPHIC	DESCRIPTION OF SOIL	DEPTH(m)	SAMPLE TYPE	GROUND WATER	CORRECTED VANE SHEAR STRENGTH (kPa) (Corrected to BS 1377) ● Field Vane (Peak) ○ Remoulded Field Vane					SCALA PENETROMETER (BLOWS/100mm)				
						0	50	100	150	200	0	5	10	15	20
Cornwallis Formation (Mwc), Miocene Age		TOPSOIL, sandy (fg)													
		SILT, slightly sandy (fg), micaceous, with pumice clasts up to 1mm, very stiff, brown, moist													
		becomes sandy (fg), with light grey mottles with dark brown volcanic ash up to 20mm diameter	1	HAND AUGER	Dry 5/10/06		53		116						
			2												
		E.O.B @ 2.2m (Too hard to drill)													
			3												
			4												
			5												

End of SC2 @ 2.8m depth

NOTE:



DRILLED/LOG BY: CR

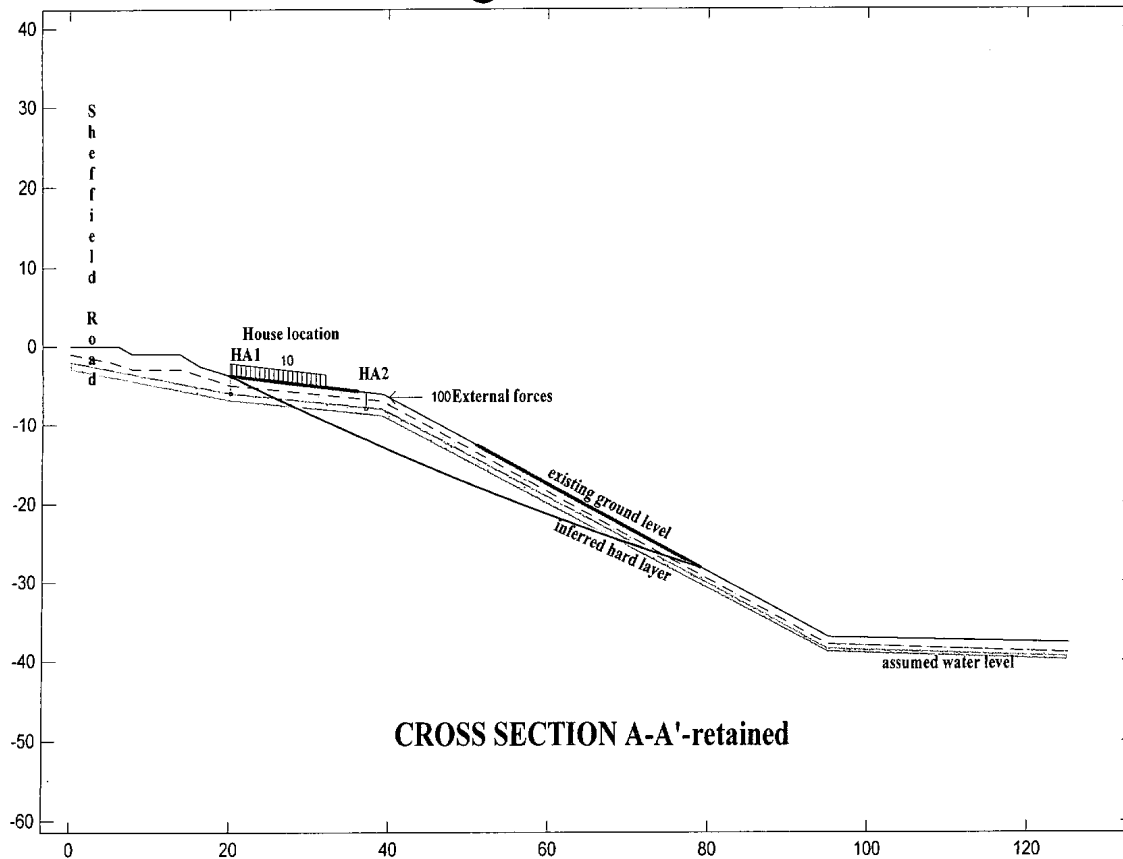
DATE DRILLED: 05/10/2006

DRILL METHOD: 50 mm Hand Auger

SHEAR VANE NO. 233

STABILITY PROFESSIONALS 100% L.L.C.

STABILITY



Analysis: 1
Multiple Stability Analysis
 Method: Bishop Simplified
 Surface: Circular

Results
 Critical (minimum)
 Factor of Safety: 1.56

Project: Sheffield Road, Kaukapakapa
 Cross Section A-A'

File: AA\w1.0mr420circRet.gmf

Geotech Professionals Ltd

Project: Sheffield Road, Kaukapakapa

File: C:\Documents and Settings\Wei\Desktop\AA'wll.0mr420circRet.gmf

Processed: 14:15:47 12 Oct 2006

DATA: Analysis 1 - Cross Section A-A'

Material and Water Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Silt, sandy

Cohesion	Phi	UnitWeight	Ru
3.00	35.0	18.00	1.10

Material: 2 (Mohr-Coulomb Isotropic) - Hard Layer

Cohesion	Phi	UnitWeight	Ru
10.00	40.0	22.00	1.10

Unit weight of water: 9.810

Unit weight of water/medium above ground: 0.000

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Silt, sandy

X	Y
0.00	20.00
130.00	20.00

Profile: 2 (5 points) Material beneath: 2 - Hard Layer

X	Y	X	Y	X	Y	X	Y	X	Y
0.00	-2.00	20.00	-6.00	39.00	-8.00	95.00	-38.00	125.00	-39.00

Slope Surface (10 points)

X	Y	X	Y	X	Y	X	Y	X	Y
0.00	0.00	5.00	0.00	6.00	0.00	7.70	-1.00	13.70	-1.00
16.20	-2.58	20.00	-3.81	39.20	-6.18	95.10	-37.08	125.10	-37.80

Phreatic Surface (8 points)

X	Y	X	Y	X	Y	X	Y	X	Y
0.00	-1.00	5.00	-2.00	8.00	-3.00	14.00	-3.00	20.00	-5.00
39.00	-7.00	95.00	-38.00	125.00	-39.00				

Distributed Loads (1 load)

Load	X-Left	Pressure	X-Right	Pressure
1	20.00	10.0	32.00	10.0

External Forces (1 force)

Force	Value	X-Pos'n	Angle
1	100.0	40.00	180.0

Failure Surface

Initial circular surface for critical search defined by: XL, XR, R

Circle centre: XC:	YC:	Circle radius: R:
208.61	369.22	418.00

Intersections: XL:	YL:	XR:	YR:
20.00	-3.81	79.00	-28.18

Generated failure surface (20 points)

X	Y	X	Y	X	Y	X	Y	X	Y
20.00	-3.81	23.01	-5.32	26.03	-6.80	29.06	-8.25	32.10	-9.69
35.15	-11.09	38.22	-12.48	41.30	-13.84	44.38	-15.17	47.48	-16.48
50.59	-17.76	53.71	-19.02	56.84	-20.25	59.97	-21.46	63.12	-22.65
66.28	-23.80	69.45	-24.94	72.62	-26.04	75.81	-27.12	79.00	-28.18

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	16.00	28.00	4.00
Trial positions within range:	9	9	9

RESULTS: Analysis 1 - Cross Section A-A'

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 2.09

There were: 725 successful analyses from a total of 729 trial circles
4 analyses aborted due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.56

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Centre	Y-Centre	X-Left	Y-Left	X-Right	Y-Right	Radius	FoS
1	208.61	369.22	20.00	-3.81	79.00	-28.18	418.00	1.558
2	208.81	369.68	20.00	-3.81	79.00	-28.18	418.50	1.558
3	209.00	370.14	20.00	-3.81	79.00	-28.18	419.00	1.559
4	209.19	370.61	20.00	-3.81	79.00	-28.18	419.50	1.559
5	209.38	371.07	20.00	-3.81	79.00	-28.18	420.00	1.559
6	209.57	371.53	20.00	-3.81	79.00	-28.18	420.50	1.559
7	212.97	367.77	22.00	-4.06	79.00	-28.18	418.00	1.559
8	209.76	372.00	20.00	-3.81	79.00	-28.18	421.00	1.560
9	213.16	368.23	22.00	-4.06	79.00	-28.18	418.50	1.560
10	209.95	372.46	20.00	-3.81	79.00	-28.18	421.50	1.560

11	213.36	368.69	22.00	-4.06	79.00	-28.18	419.00	1.560
12	210.15	372.92	20.00	-3.81	79.00	-28.18	422.00	1.560
13	213.56	369.15	22.00	-4.06	79.00	-28.18	419.50	1.560
14	213.75	369.62	22.00	-4.06	79.00	-28.18	420.00	1.560
15	213.95	370.08	22.00	-4.06	79.00	-28.18	420.50	1.560
16	214.14	370.54	22.00	-4.06	79.00	-28.18	421.00	1.561
17	214.34	371.00	22.00	-4.06	79.00	-28.18	421.50	1.561
18	214.53	371.46	22.00	-4.06	79.00	-28.18	422.00	1.561
19	217.53	366.20	24.00	-4.30	79.00	-28.18	418.00	1.568
20	217.72	366.66	24.00	-4.30	79.00	-28.18	418.50	1.568
21	217.92	367.12	24.00	-4.30	79.00	-28.18	419.00	1.568
22	218.12	367.58	24.00	-4.30	79.00	-28.18	419.50	1.568
23	218.32	368.04	24.00	-4.30	79.00	-28.18	420.00	1.569
24	218.52	368.50	24.00	-4.30	79.00	-28.18	420.50	1.569
25	218.72	368.96	24.00	-4.30	79.00	-28.18	421.00	1.569
26	218.92	369.42	24.00	-4.30	79.00	-28.18	421.50	1.569
27	219.12	369.88	24.00	-4.30	79.00	-28.18	422.00	1.569
28	222.30	364.49	26.00	-4.55	79.00	-28.18	418.00	1.588
29	222.51	364.95	26.00	-4.55	79.00	-28.18	418.50	1.588
30	222.71	365.40	26.00	-4.55	79.00	-28.18	419.00	1.589
31	222.91	365.86	26.00	-4.55	79.00	-28.18	419.50	1.589
32	223.12	366.32	26.00	-4.55	79.00	-28.18	420.00	1.589
33	223.32	366.78	26.00	-4.55	79.00	-28.18	420.50	1.589
34	223.53	367.23	26.00	-4.55	79.00	-28.18	421.00	1.590
35	223.73	367.69	26.00	-4.55	79.00	-28.18	421.50	1.590
36	223.93	368.15	26.00	-4.55	79.00	-28.18	422.00	1.590
37	227.32	362.62	28.00	-4.80	79.00	-28.18	418.00	1.628
38	227.53	363.08	28.00	-4.80	79.00	-28.18	418.50	1.628
39	227.73	363.53	28.00	-4.80	79.00	-28.18	419.00	1.628
40	227.94	363.99	28.00	-4.80	79.00	-28.18	419.50	1.629
41	228.15	364.44	28.00	-4.80	79.00	-28.18	420.00	1.629
42	228.36	364.90	28.00	-4.80	79.00	-28.18	420.50	1.629
43	228.57	365.35	28.00	-4.80	79.00	-28.18	421.00	1.629
44	228.78	365.81	28.00	-4.80	79.00	-28.18	421.50	1.630
45	228.99	366.27	28.00	-4.80	79.00	-28.18	422.00	1.630
46	208.50	370.03	22.00	-4.06	75.50	-26.25	418.00	1.640
47	208.69	370.49	22.00	-4.06	75.50	-26.25	418.50	1.640
48	208.89	370.96	22.00	-4.06	75.50	-26.25	419.00	1.640
49	209.08	371.42	22.00	-4.06	75.50	-26.25	419.50	1.641
50	204.01	371.51	20.00	-3.81	75.50	-26.25	418.00	1.641
51	209.27	371.88	22.00	-4.06	75.50	-26.25	420.00	1.641
52	204.19	371.98	20.00	-3.81	75.50	-26.25	418.50	1.641
53	209.46	372.35	22.00	-4.06	75.50	-26.25	420.50	1.641
54	204.38	372.44	20.00	-3.81	75.50	-26.25	419.00	1.641
55	209.65	372.81	22.00	-4.06	75.50	-26.25	421.00	1.641
56	204.57	372.90	20.00	-3.81	75.50	-26.25	419.50	1.641
57	209.85	373.27	22.00	-4.06	75.50	-26.25	421.50	1.641
58	204.76	373.37	20.00	-3.81	75.50	-26.25	420.00	1.642
59	210.04	373.73	22.00	-4.06	75.50	-26.25	422.00	1.642
60	204.95	373.83	20.00	-3.81	75.50	-26.25	420.50	1.642
61	205.13	374.30	20.00	-3.81	75.50	-26.25	421.00	1.642
62	205.32	374.76	20.00	-3.81	75.50	-26.25	421.50	1.642
63	205.51	375.23	20.00	-3.81	75.50	-26.25	422.00	1.642
64	213.22	368.41	24.00	-4.30	75.50	-26.25	418.00	1.648
65	213.42	368.88	24.00	-4.30	75.50	-26.25	418.50	1.648
66	213.62	369.34	24.00	-4.30	75.50	-26.25	419.00	1.648
67	213.81	369.80	24.00	-4.30	75.50	-26.25	419.50	1.649
68	214.01	370.26	24.00	-4.30	75.50	-26.25	420.00	1.649
69	214.21	370.72	24.00	-4.30	75.50	-26.25	420.50	1.649
70	214.40	371.18	24.00	-4.30	75.50	-26.25	421.00	1.649
71	214.60	371.64	24.00	-4.30	75.50	-26.25	421.50	1.649
72	214.79	372.10	24.00	-4.30	75.50	-26.25	422.00	1.650
73	218.19	366.64	26.00	-4.55	75.50	-26.25	418.00	1.669
74	218.39	367.10	26.00	-4.55	75.50	-26.25	418.50	1.669
75	218.60	367.56	26.00	-4.55	75.50	-26.25	419.00	1.669
76	218.80	368.02	26.00	-4.55	75.50	-26.25	419.50	1.670
77	219.00	368.48	26.00	-4.55	75.50	-26.25	420.00	1.670
78	219.20	368.94	26.00	-4.55	75.50	-26.25	420.50	1.670
79	219.40	369.40	26.00	-4.55	75.50	-26.25	421.00	1.670
80	219.60	369.86	26.00	-4.55	75.50	-26.25	421.50	1.671
81	219.80	370.32	26.00	-4.55	75.50	-26.25	422.00	1.671
82	232.60	360.58	30.00	-5.04	79.00	-28.18	418.00	1.698
83	232.81	361.03	30.00	-5.04	79.00	-28.18	418.50	1.699
84	233.02	361.48	30.00	-5.04	79.00	-28.18	419.00	1.699
85	233.24	361.94	30.00	-5.04	79.00	-28.18	419.50	1.699
86	233.45	362.39	30.00	-5.04	79.00	-28.18	420.00	1.700
87	233.66	362.84	30.00	-5.04	79.00	-28.18	420.50	1.700
88	233.88	363.30	30.00	-5.04	79.00	-28.18	421.00	1.700
89	234.09	363.75	30.00	-5.04	79.00	-28.18	421.50	1.701
90	234.31	364.20	30.00	-5.04	79.00	-28.18	422.00	1.701
91	223.44	364.70	28.00	-4.80	75.50	-26.25	418.00	1.710
92	223.64	365.16	28.00	-4.80	75.50	-26.25	418.50	1.711
93	223.85	365.61	28.00	-4.80	75.50	-26.25	419.00	1.711
94	224.05	366.07	28.00	-4.80	75.50	-26.25	419.50	1.711
95	224.26	366.53	28.00	-4.80	75.50	-26.25	420.00	1.711
96	224.47	366.98	28.00	-4.80	75.50	-26.25	420.50	1.712
97	224.67	367.44	28.00	-4.80	75.50	-26.25	421.00	1.712
98	224.88	367.90	28.00	-4.80	75.50	-26.25	421.50	1.712
99	225.08	368.35	28.00	-4.80	75.50	-26.25	422.00	1.712

Critical Failure Circle

Circle centre: XC: 208.61 YC: 369.22
 Intersections: XL: 20.00 YL: -3.81
 Generated failure surface: (20 points)

Circle radius: R: 418.00
 XR: 79.00 YR: -28.18

20.00	-3.81	23.01	-5.32	26.03	-6.80	29.06	-8.25	32.10	-9.69
35.15	-11.09	38.22	-12.48	41.30	-13.84	44.38	-15.17	47.48	-16.48
50.59	-17.76	53.71	-19.02	56.84	-20.25	59.97	-21.46	63.12	-22.65
66.28	-23.80	69.45	-24.94	72.62	-26.04	75.81	-27.12	79.00	-28.18

Slice Geometry and Properties (41 slices)

Slice	X-Left	Width	Y-Top	Y-Base	Base Angle	Base Matl	Base Cohesion	Total Weight	PoreWater Force	Normal Stress	Test Factor
1	20.00	1.50	-3.90	-4.19	26.6	1	3.00	7.67	0.00	11.54	0.91
2	21.50	1.50	-4.09	-4.94	26.6	1	3.00	23.02	0.00	19.88	0.91
3	23.01	1.30	-4.26	-5.63	26.1	1	3.00	32.10	3.54	28.11	0.91
4	24.31	1.30	-4.42	-6.27	26.1	1	3.00	43.25	10.64	36.03	0.91
5	25.61	0.42	-4.53	-6.69	26.1	2	10.00	16.55	4.97	38.73	0.88
6	26.03	1.52	-4.65	-7.16	25.7	2	10.00	71.27	23.86	45.77	0.88
7	27.54	1.52	-4.83	-7.89	25.7	2	10.00	89.48	33.25	56.46	0.88
8	29.06	1.52	-5.02	-8.61	25.2	2	10.00	107.90	42.53	67.26	0.88
9	30.58	1.52	-5.21	-9.33	25.2	2	10.00	125.76	51.70	77.20	0.88
10	32.10	1.53	-5.40	-10.04	24.7	2	10.00	143.94	60.77	80.33	0.88
11	33.63	1.53	-5.59	-10.74	24.7	2	10.00	161.42	69.73	90.56	0.88
12	35.15	1.53	-5.78	-11.44	24.3	2	10.00	179.33	78.58	100.94	0.88
13	36.69	1.53	-5.96	-12.13	24.3	2	10.00	196.45	87.32	110.94	0.88
14	38.22	0.78	-6.11	-12.65	23.8	2	10.00	106.50	47.60	118.72	0.88
15	39.00	1.15	-6.39	-13.07	23.8	2	10.00	160.12	70.89	121.22	0.88
16	40.15	1.15	-7.02	-13.58	23.8	2	10.00	156.99	69.31	118.78	0.88
17	41.30	1.54	-7.77	-14.17	23.4	2	10.00	205.85	90.24	116.07	0.88
18	42.84	1.54	-8.62	-14.84	23.4	2	10.00	199.69	87.14	112.48	0.88
19	44.38	1.55	-9.47	-15.50	22.9	2	10.00	193.94	83.92	109.04	0.88
20	45.93	1.55	-10.33	-16.15	22.9	2	10.00	187.22	80.57	105.14	0.88
21	47.48	1.55	-11.19	-16.80	22.4	2	10.00	180.86	77.10	101.37	0.89
22	49.04	1.55	-12.05	-17.44	22.4	2	10.00	173.60	73.50	97.16	0.89
23	50.59	1.56	-12.91	-18.08	22.0	2	10.00	166.62	69.76	93.06	0.89
24	52.15	1.56	-13.77	-18.71	22.0	2	10.00	158.80	65.91	88.53	0.89
25	53.71	1.56	-14.63	-19.33	21.5	2	10.00	151.23	61.93	84.10	0.89
26	55.27	1.56	-15.50	-19.95	21.5	2	10.00	142.87	57.82	79.27	0.89
27	56.84	1.57	-16.36	-20.56	21.1	2	10.00	134.65	53.58	74.50	0.89
28	58.41	1.57	-17.23	-21.16	21.1	2	10.00	125.74	49.22	69.35	0.89
29	59.97	1.57	-18.10	-21.76	20.6	2	10.00	116.92	44.74	64.25	0.89
30	61.55	1.57	-18.97	-22.35	20.6	2	10.00	107.45	40.12	58.78	0.89
31	63.12	1.58	-19.84	-22.94	20.1	2	10.00	98.00	35.38	53.34	0.89
32	64.70	1.58	-20.71	-23.51	20.1	2	10.00	87.97	30.52	47.56	0.89
33	66.28	1.58	-21.59	-24.09	19.7	2	10.00	77.89	25.52	41.78	0.89
34	67.86	1.58	-22.46	-24.65	19.7	2	10.00	67.30	20.40	35.68	0.89
35	69.45	1.59	-23.34	-25.21	19.2	2	10.00	56.61	15.16	29.56	0.89
36	71.03	1.59	-24.22	-25.77	19.2	2	10.00	45.45	9.79	23.14	0.89
37	72.62	1.01	-24.93	-26.21	18.8	1	3.00	23.21	3.37	19.86	0.92
38	73.63	1.01	-25.49	-26.56	18.8	1	3.00	19.32	1.12	16.23	0.92
39	74.64	1.17	-26.09	-26.93	18.8	1	3.00	17.58	0.00	12.46	0.92
40	75.81	1.60	-26.86	-27.39	18.3	1	3.00	15.29	0.00	7.78	0.92
41	77.40	1.60	-27.74	-27.92	18.3	1	3.00	5.10	0.00	2.22	0.92

Project: Sheffield Road, Kaukapakapa

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Analysis 1 - Cross Section A-A'

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

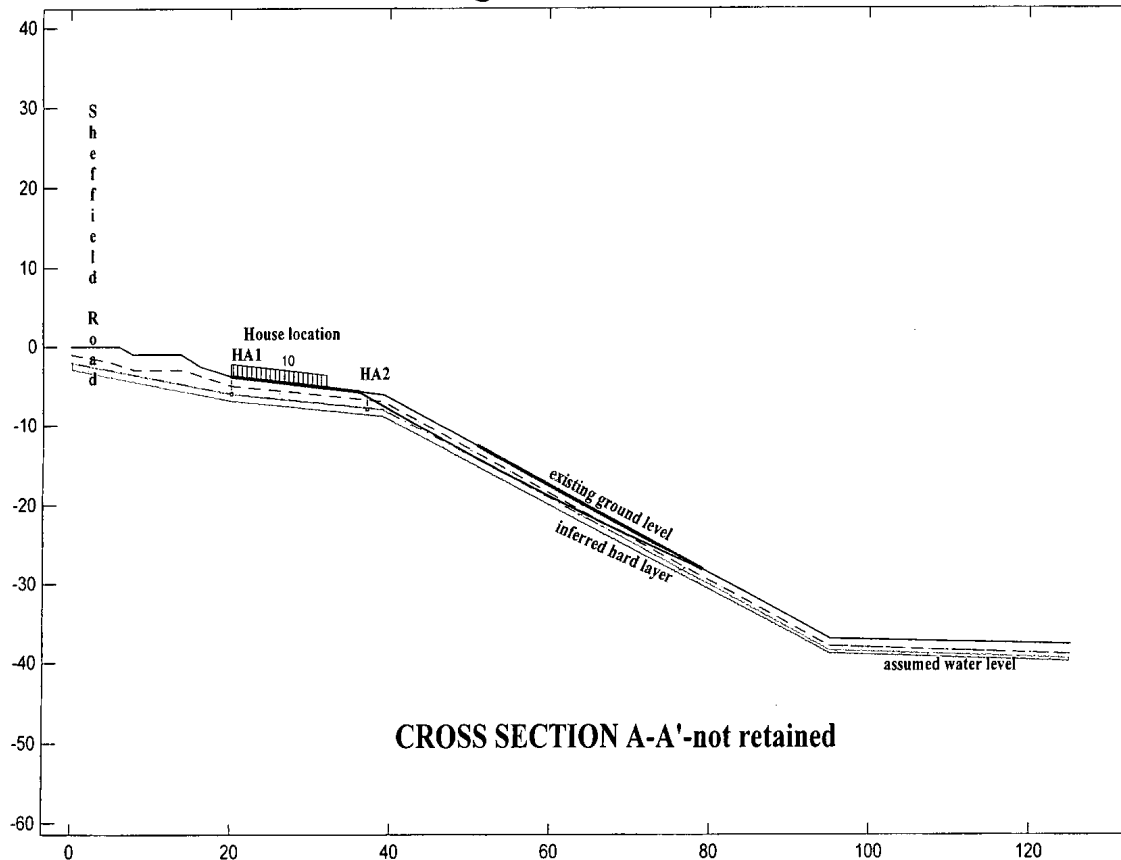
Factor of Safety for initial failure circle approximation: 2.09

There were: 725 successful analyses from a total of 729 trial circles
4 analyses aborted due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.56

Circle and Results Summary (Lowest 20 Factor of Safety circles)

Circle	X-Centre	Y-Centre	X-Left	X-Right	Radius	FoS
1	208.61	369.22	20.00	79.00	418.00	1.558
2	208.81	369.68	20.00	79.00	418.50	1.558
3	209.00	370.14	20.00	79.00	419.00	1.559
4	209.19	370.61	20.00	79.00	419.50	1.559
5	209.38	371.07	20.00	79.00	420.00	1.559
6	209.57	371.53	20.00	79.00	420.50	1.559
7	212.97	367.77	22.00	79.00	418.00	1.559
8	209.76	372.00	20.00	79.00	421.00	1.560
9	213.16	368.23	22.00	79.00	418.50	1.560
10	209.95	372.46	20.00	79.00	421.50	1.560
11	213.36	368.69	22.00	79.00	419.00	1.560
12	210.15	372.92	20.00	79.00	422.00	1.560
13	213.56	369.15	22.00	79.00	419.50	1.560
14	213.75	369.62	22.00	79.00	420.00	1.560
15	213.95	370.08	22.00	79.00	420.50	1.560
16	214.14	370.54	22.00	79.00	421.00	1.561
17	214.34	371.00	22.00	79.00	421.50	1.561
18	214.53	371.46	22.00	79.00	422.00	1.561
19	217.53	366.20	24.00	79.00	418.00	1.568
20	217.72	366.66	24.00	79.00	418.50	1.568



Analysis: 1
Multiple Stability Analysis
 Method: Bishop Simplified
 Surface: Circular

Results
 Critical (minimum)
 Factor of Safety: 1.38

Project: Sheffield Road, Kaukapakapa
 Cross Section A-A'

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Project: Sheffield Road, Kaukapakapa

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DATA: Analysis 1 - Cross Section A-A'

Material and Water Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Silt, sandy

Cohesion	Phi	UnitWeight	Ru
3.00	35.0	18.00	1.10

Material: 2 (Mohr-Coulomb Isotropic) - Hard Layer

Cohesion	Phi	UnitWeight	Ru
10.00	40.0	22.00	1.10

Unit weight of water: 9.810

Unit weight of water/medium above ground: 0.000

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Silt, sandy

X	Y
0.00	20.00
130.00	20.00

Profile: 2 (5 points) Material beneath: 2 - Hard Layer

X	Y	Material
0.00	-2.00	20.00
20.00	-6.00	39.00
39.00	-8.00	95.00
95.00	-38.00	125.00
125.00	-39.00	

Slope Surface (10 points)

X	Y	Material
0.00	0.00	5.00
16.20	-2.58	20.00
20.00	-3.81	39.20
39.20	-6.18	95.10
95.10	-37.08	125.10
125.10	-37.80	

Phreatic Surface (8 points)

X	Y	Material
0.00	-1.00	5.00
39.00	-7.00	95.00
95.00	-38.00	125.00
125.00	-39.00	

Distributed Loads (1 load)

Load	X-Left	Pressure	X-Right	Pressure
1	20.00	10.0	32.00	10.0

Failure Surface

Initial circular surface for critical search defined by: XL, XR, R

Circle centre: XC: 250.26 YC: 353.13 Circle radius: R: 418.00

Intersections: XL: 36.00 YL: -5.78 XR: 79.00 YR: -28.18

Generated failure surface (20 points)

X	Y	Material
36.00	-5.78	38.20
47.06	-12.16	49.29
58.31	-18.19	60.58
69.74	-23.88	72.04
79.00	-28.18	95.00
95.00	-38.00	125.00
125.00	-39.00	

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	16.00	28.00	4.00
Trial positions within range:	9	9	9

RESULTS: Analysis 1 - Cross Section A-A'

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 1.71

There were: 725 successful analyses from a total of 729 trial circles
4 analyses aborted due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.38

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Centre	Y-Centre	X-Left	Y-Left	X-Right	Y-Right	Radius	FoS
1	250.26	353.13	36.00	-5.78	79.00	-28.18	418.00	1.381
2	250.49	353.57	36.00	-5.78	79.00	-28.18	418.50	1.381
3	250.72	354.01	36.00	-5.78	79.00	-28.18	419.00	1.382
4	250.95	354.46	36.00	-5.78	79.00	-28.18	419.50	1.382
5	251.19	354.90	36.00	-5.78	79.00	-28.18	420.00	1.383
6	251.42	355.35	36.00	-5.78	79.00	-28.18	420.50	1.383
7	251.65	355.79	36.00	-5.78	79.00	-28.18	421.00	1.384
8	251.88	356.23	36.00	-5.78	79.00	-28.18	421.50	1.384
9	252.11	356.68	36.00	-5.78	79.00	-28.18	422.00	1.385
10	217.53	366.20	24.00	-4.30	79.00	-28.18	418.00	1.448
11	217.72	366.66	24.00	-4.30	79.00	-28.18	418.50	1.448
12	217.92	367.12	24.00	-4.30	79.00	-28.18	419.00	1.448
13	218.12	367.58	24.00	-4.30	79.00	-28.18	419.50	1.449
14	218.32	368.04	24.00	-4.30	79.00	-28.18	420.00	1.449
15	218.52	368.50	24.00	-4.30	79.00	-28.18	420.50	1.449

16	218.72	368.96	24.00	-4.30	79.00	-28.18	421.00	1.449
17	218.92	369.42	24.00	-4.30	79.00	-28.18	421.50	1.449
18	219.12	369.88	24.00	-4.30	79.00	-28.18	422.00	1.449
19	212.97	367.77	22.00	-4.06	79.00	-28.18	418.00	1.452
20	222.30	364.49	26.00	-4.55	79.00	-28.18	418.00	1.452
21	213.16	368.23	22.00	-4.06	79.00	-28.18	418.50	1.452
22	222.51	364.95	26.00	-4.55	79.00	-28.18	418.50	1.452
23	213.36	368.69	22.00	-4.06	79.00	-28.18	419.00	1.452
24	222.71	365.40	26.00	-4.55	79.00	-28.18	419.00	1.452
25	213.56	369.15	22.00	-4.06	79.00	-28.18	419.50	1.452
26	222.91	365.86	26.00	-4.55	79.00	-28.18	419.50	1.452
27	213.75	369.62	22.00	-4.06	79.00	-28.18	420.00	1.452
28	213.95	370.08	22.00	-4.06	79.00	-28.18	420.50	1.453
29	223.12	366.32	26.00	-4.55	79.00	-28.18	420.00	1.453
30	214.14	370.54	22.00	-4.06	79.00	-28.18	421.00	1.453
31	223.32	366.78	26.00	-4.55	79.00	-28.18	420.50	1.453
32	214.34	371.00	22.00	-4.06	79.00	-28.18	421.50	1.453
33	223.53	367.23	26.00	-4.55	79.00	-28.18	421.00	1.453
34	214.53	371.46	22.00	-4.06	79.00	-28.18	422.00	1.453
35	223.73	367.69	26.00	-4.55	79.00	-28.18	421.50	1.453
36	223.93	368.15	26.00	-4.55	79.00	-28.18	422.00	1.453
37	247.74	354.62	36.00	-5.78	75.50	-26.25	418.00	1.454
38	247.97	355.06	36.00	-5.78	75.50	-26.25	418.50	1.454
39	248.20	355.51	36.00	-5.78	75.50	-26.25	419.00	1.455
40	248.43	355.95	36.00	-5.78	75.50	-26.25	419.50	1.455
41	248.66	356.40	36.00	-5.78	75.50	-26.25	420.00	1.456
42	248.89	356.84	36.00	-5.78	75.50	-26.25	420.50	1.456
43	249.12	357.29	36.00	-5.78	75.50	-26.25	421.00	1.457
44	249.35	357.73	36.00	-5.78	75.50	-26.25	421.50	1.457
45	249.58	358.18	36.00	-5.78	75.50	-26.25	422.00	1.457
46	208.61	369.22	20.00	-3.81	79.00	-28.18	418.00	1.460
47	208.81	369.68	20.00	-3.81	79.00	-28.18	418.50	1.460
48	209.00	370.14	20.00	-3.81	79.00	-28.18	419.00	1.461
49	209.19	370.61	20.00	-3.81	79.00	-28.18	419.50	1.461
50	209.38	371.07	20.00	-3.81	79.00	-28.18	420.00	1.461
51	209.57	371.53	20.00	-3.81	79.00	-28.18	420.50	1.461
52	209.76	372.00	20.00	-3.81	79.00	-28.18	421.00	1.461
53	209.95	372.46	20.00	-3.81	79.00	-28.18	421.50	1.461
54	210.15	372.92	20.00	-3.81	79.00	-28.18	422.00	1.462
55	227.32	362.62	28.00	-4.80	79.00	-28.18	418.00	1.468
56	227.53	363.08	28.00	-4.80	79.00	-28.18	418.50	1.468
57	227.73	363.53	28.00	-4.80	79.00	-28.18	419.00	1.469
58	227.94	363.99	28.00	-4.80	79.00	-28.18	419.50	1.469
59	228.15	364.44	28.00	-4.80	79.00	-28.18	420.00	1.469
60	228.36	364.90	28.00	-4.80	79.00	-28.18	420.50	1.469
61	228.57	365.35	28.00	-4.80	79.00	-28.18	421.00	1.469
62	228.78	365.81	28.00	-4.80	79.00	-28.18	421.50	1.470
63	228.99	366.27	28.00	-4.80	79.00	-28.18	422.00	1.470
64	232.60	360.58	30.00	-5.04	79.00	-28.18	418.00	1.503
65	232.81	361.03	30.00	-5.04	79.00	-28.18	418.50	1.503
66	233.02	361.48	30.00	-5.04	79.00	-28.18	419.00	1.504
67	233.24	361.94	30.00	-5.04	79.00	-28.18	419.50	1.504
68	233.45	362.39	30.00	-5.04	79.00	-28.18	420.00	1.504
69	213.22	368.41	24.00	-4.30	75.50	-26.25	418.00	1.504
70	233.66	362.84	30.00	-5.04	79.00	-28.18	420.50	1.504
71	213.42	368.88	24.00	-4.30	75.50	-26.25	418.50	1.504
72	233.88	363.30	30.00	-5.04	79.00	-28.18	421.00	1.505
73	213.62	369.34	24.00	-4.30	75.50	-26.25	419.00	1.505
74	234.09	363.75	30.00	-5.04	79.00	-28.18	421.50	1.505
75	213.81	369.80	24.00	-4.30	75.50	-26.25	419.50	1.505
76	214.01	370.26	24.00	-4.30	75.50	-26.25	420.00	1.505
77	234.31	364.20	30.00	-5.04	79.00	-28.18	422.00	1.505
78	214.21	370.72	24.00	-4.30	75.50	-26.25	420.50	1.505
79	218.19	366.64	26.00	-4.55	75.50	-26.25	418.00	1.505
80	214.40	371.18	24.00	-4.30	75.50	-26.25	421.00	1.505
81	218.39	367.10	26.00	-4.55	75.50	-26.25	418.50	1.505
82	214.60	371.64	24.00	-4.30	75.50	-26.25	421.50	1.505
83	218.60	367.56	26.00	-4.55	75.50	-26.25	419.00	1.506
84	214.79	372.10	24.00	-4.30	75.50	-26.25	422.00	1.506
85	218.80	368.02	26.00	-4.55	75.50	-26.25	419.50	1.506
86	219.00	368.48	26.00	-4.55	75.50	-26.25	420.00	1.506
87	219.20	368.94	26.00	-4.55	75.50	-26.25	420.50	1.506
88	219.40	369.40	26.00	-4.55	75.50	-26.25	421.00	1.506
89	219.60	369.86	26.00	-4.55	75.50	-26.25	421.50	1.506
90	219.80	370.32	26.00	-4.55	75.50	-26.25	422.00	1.507
91	208.50	370.03	22.00	-4.06	75.50	-26.25	418.00	1.511
92	208.69	370.49	22.00	-4.06	75.50	-26.25	418.50	1.511
93	208.89	370.96	22.00	-4.06	75.50	-26.25	419.00	1.511
94	209.08	371.42	22.00	-4.06	75.50	-26.25	419.50	1.512
95	209.27	371.88	22.00	-4.06	75.50	-26.25	420.00	1.512
96	209.46	372.35	22.00	-4.06	75.50	-26.25	420.50	1.512
97	209.65	372.81	22.00	-4.06	75.50	-26.25	421.00	1.512
98	209.85	373.27	22.00	-4.06	75.50	-26.25	421.50	1.512
99	210.04	373.73	22.00	-4.06	75.50	-26.25	422.00	1.512

Critical Failure Circle

Circle centre: XC: 250.26 YC: 353.13 Circle radius: R: 418.00
Intersections: XL: 36.00 YL: -5.78 XR: 79.00 YR: -28.18
Generated failure surface: (20 points)

36.00	-5.78	38.20	-7.09	40.40	-8.38	42.61	-9.65	44.83	-10.91
47.06	-12.16	49.29	-13.39	51.54	-14.62	53.79	-15.82	56.04	-17.02
58.31	-18.19	60.58	-19.36	62.86	-20.51	65.14	-21.65	67.44	-22.77
69.74	-23.88	72.04	-24.98	74.35	-26.06	76.67	-27.13	79.00	-28.18

Slice Geometry and Properties (41 slices)

Slice	X-Left	Width	Y-Top	Y-Base	Base Angle	Base Matl	Base Cohesion	Total Weight	PoreWater Force	Normal Stress	Test Factor
1	36.00	0.92	-5.84	-6.06	30.7	1	3.00	3.59	0.00	2.00	0.89
2	36.92	0.92	-5.96	-6.61	30.7	1	3.00	10.78	0.00	8.00	0.89
3	37.84	0.35	-6.03	-6.98	30.7	1	3.00	6.01	0.34	12.33	0.89
4	38.20	0.80	-6.11	-7.32	30.3	1	3.00	17.59	3.33	16.72	0.89
5	39.00	0.20	-6.17	-7.62	30.3	1	3.00	5.21	1.27	20.38	0.89
6	39.20	1.20	-6.51	-8.02	30.3	1	3.00	32.69	7.94	21.33	0.89
7	40.40	1.11	-7.15	-8.69	30.0	1	3.00	30.76	7.68	21.91	0.89
8	41.51	1.11	-7.76	-9.33	30.0	1	3.00	31.28	7.99	22.33	0.89
9	42.61	1.11	-8.37	-9.97	29.6	1	3.00	31.82	8.25	22.75	0.89
10	43.72	1.11	-8.99	-10.60	29.6	1	3.00	32.17	8.46	23.03	0.89
11	44.83	1.11	-9.60	-11.22	29.3	1	3.00	32.54	8.61	23.30	0.89
12	45.95	1.11	-10.22	-11.85	29.3	1	3.00	32.71	8.70	23.43	0.89
13	47.06	1.12	-10.83	-12.47	28.9	1	3.00	32.90	8.74	23.56	0.89
14	48.18	1.12	-11.45	-13.09	28.9	1	3.00	32.89	8.72	23.55	0.89
15	49.29	1.12	-12.07	-13.70	28.6	1	3.00	32.89	8.65	23.53	0.89
16	50.42	1.12	-12.69	-14.31	28.6	1	3.00	32.70	8.52	23.38	0.89
17	51.54	1.12	-13.31	-14.92	28.2	1	3.00	32.53	8.33	23.21	0.89
18	52.66	1.12	-13.93	-15.52	28.2	1	3.00	32.16	8.09	22.91	0.89
19	53.79	1.13	-14.56	-16.12	27.9	1	3.00	31.80	7.80	22.61	0.89
20	54.92	1.13	-15.18	-16.72	27.9	1	3.00	31.25	7.44	22.16	0.89
21	56.04	1.13	-15.80	-17.31	27.5	1	3.00	30.70	7.03	21.71	0.89
22	57.18	1.13	-16.43	-17.90	27.5	1	3.00	29.96	6.57	21.12	0.89
23	58.31	1.14	-17.06	-18.49	27.2	1	3.00	29.23	6.05	20.51	0.89
24	59.44	1.14	-17.68	-19.07	27.2	1	3.00	28.31	5.47	19.78	0.89
25	60.58	1.14	-18.31	-19.65	26.8	1	3.00	27.38	4.84	19.03	0.89
26	61.72	1.14	-18.94	-20.22	26.8	1	3.00	26.27	4.16	18.14	0.89
27	62.86	1.14	-19.57	-20.80	26.5	1	3.00	25.15	3.41	17.25	0.89
28	64.00	1.14	-20.21	-21.37	26.5	1	3.00	23.86	2.61	16.22	0.89
29	65.14	1.15	-20.84	-21.93	26.1	1	3.00	22.54	1.76	15.17	0.89
30	66.29	1.15	-21.47	-22.49	26.1	1	3.00	21.06	0.85	13.99	0.89
31	67.44	0.44	-21.91	-22.88	25.8	1	3.00	7.71	0.08	13.20	0.89
32	67.88	0.93	-22.29	-23.21	25.8	1	3.00	15.39	0.00	12.48	0.89
33	68.81	0.93	-22.80	-23.66	25.8	1	3.00	14.31	0.00	11.53	0.89
34	69.74	1.15	-23.38	-24.16	25.4	1	3.00	16.16	0.00	10.46	0.89
35	70.89	1.15	-24.02	-24.70	25.4	1	3.00	14.30	0.00	9.16	0.89
36	72.04	1.16	-24.65	-25.25	25.1	1	3.00	12.38	0.00	7.83	0.89
37	73.20	1.16	-25.29	-25.79	25.1	1	3.00	10.33	0.00	6.40	0.89
38	74.35	1.16	-25.93	-26.33	24.7	1	3.00	8.21	0.00	4.93	0.89
39	75.51	1.16	-26.57	-26.86	24.7	1	3.00	5.97	0.00	3.37	0.89
40	76.67	1.16	-27.22	-27.39	24.4	1	3.00	3.65	0.00	1.75	0.89
41	77.84	1.16	-27.86	-27.92	24.4	1	3.00	1.22	0.00	0.05	0.89

Project: Sheffield Road, Kaukapakapa

File: C:\DOCUME~1\Wei\Desktop\Roty\2006\O...\AA'w11.0mr420circ.gmf

Processed: 14:10:20 12 Oct 2006

Analysis 1 - Cross Section A-A'

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 1.71

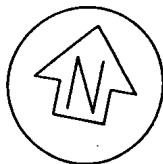
There were: 725 successful analyses from a total of 729 trial circles
4 analyses aborted due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.38

Circle and Results Summary (Lowest 20 Factor of Safety circles)

Circle	X-Centre	Y-Centre	X-Left	X-Right	Radius	FoS
1	250.26	353.13	36.00	79.00	418.00	1.381
2	250.49	353.57	36.00	79.00	418.50	1.381
3	250.72	354.01	36.00	79.00	419.00	1.382
4	250.95	354.46	36.00	79.00	419.50	1.382
5	251.19	354.90	36.00	79.00	420.00	1.383
6	251.42	355.35	36.00	79.00	420.50	1.383
7	251.65	355.79	36.00	79.00	421.00	1.384
8	251.88	356.23	36.00	79.00	421.50	1.384
9	252.11	356.68	36.00	79.00	422.00	1.385
10	217.53	366.20	24.00	79.00	418.00	1.448
11	217.72	366.66	24.00	79.00	418.50	1.448
12	217.92	367.12	24.00	79.00	419.00	1.448
13	218.12	367.58	24.00	79.00	419.50	1.449
14	218.32	368.04	24.00	79.00	420.00	1.449
15	218.52	368.50	24.00	79.00	420.50	1.449
16	218.72	368.96	24.00	79.00	421.00	1.449
17	218.92	369.42	24.00	79.00	421.50	1.449
18	219.12	369.88	24.00	79.00	422.00	1.449
19	212.97	367.77	22.00	79.00	418.00	1.452
20	222.30	364.49	26.00	79.00	418.00	1.452

DRAWINGS



MEMORANDUM OF EASEMENTS			
PURPOSE	SHOWN	DOM TEN	SERV TEN
RIGHT OF WAY	(B)	LOT 2	LOT 1
PROPOSED EASEMENTS			
PURPOSE	SHOWN	DOM TEN	SERV TEN
POWER	(A)	LOT 1	LOT 2
WATER	(A)	LOT 1	LOT 2
TELECOMMUNICATIONS	(B)	LOT 2	LOT 1
GAS SUPPLY	(A)	LOT 1	LOT 2
RIGHT OF WAY	(A)	LOT 1	LOT 2

EXISTING EASEMENTS	
PURPOSE	SHOWN CREATED BY
RIGHT OF WAY	(A) & (B) B. 311540.1 B. 311540.3

SURVEY BLK & DIST X KAIPARA
NORTH AUCKLAND LAND DISTRICT
RDC PLANNING MAP R12 & Q12

RDC SCHEME PLAN NUMBER

2
DP. 101147

2
DP. 136325

PROPOSED SUBDIVISION OF LOT 3 DP.104590

SHEFFIELD ROAD
RD2 HELENSVILLE

PREPARED BY:
LAMB AND ASSOCIATES LTD,
REGISTERED SURVEYORS,
234 UNIT D BUSH ROAD
P.O. BOX 302 104
NORTH HARBOUR MAIL CENTRE
Ph 415 5919 Fax 415 5918
NORTH HARBOUR

PREPARED FOR :
W BARNETT
SHEFFIELD ROAD
RD 2 HELENSVILLE

NOTE :
(1) LEVELS ARE IN TERMS
OF AN ASSUMED DATUM
(2) AREAS AND MEASUREMENTS ARE
SUBJECT TO A FULL LAND
TRANSFER SURVEY.

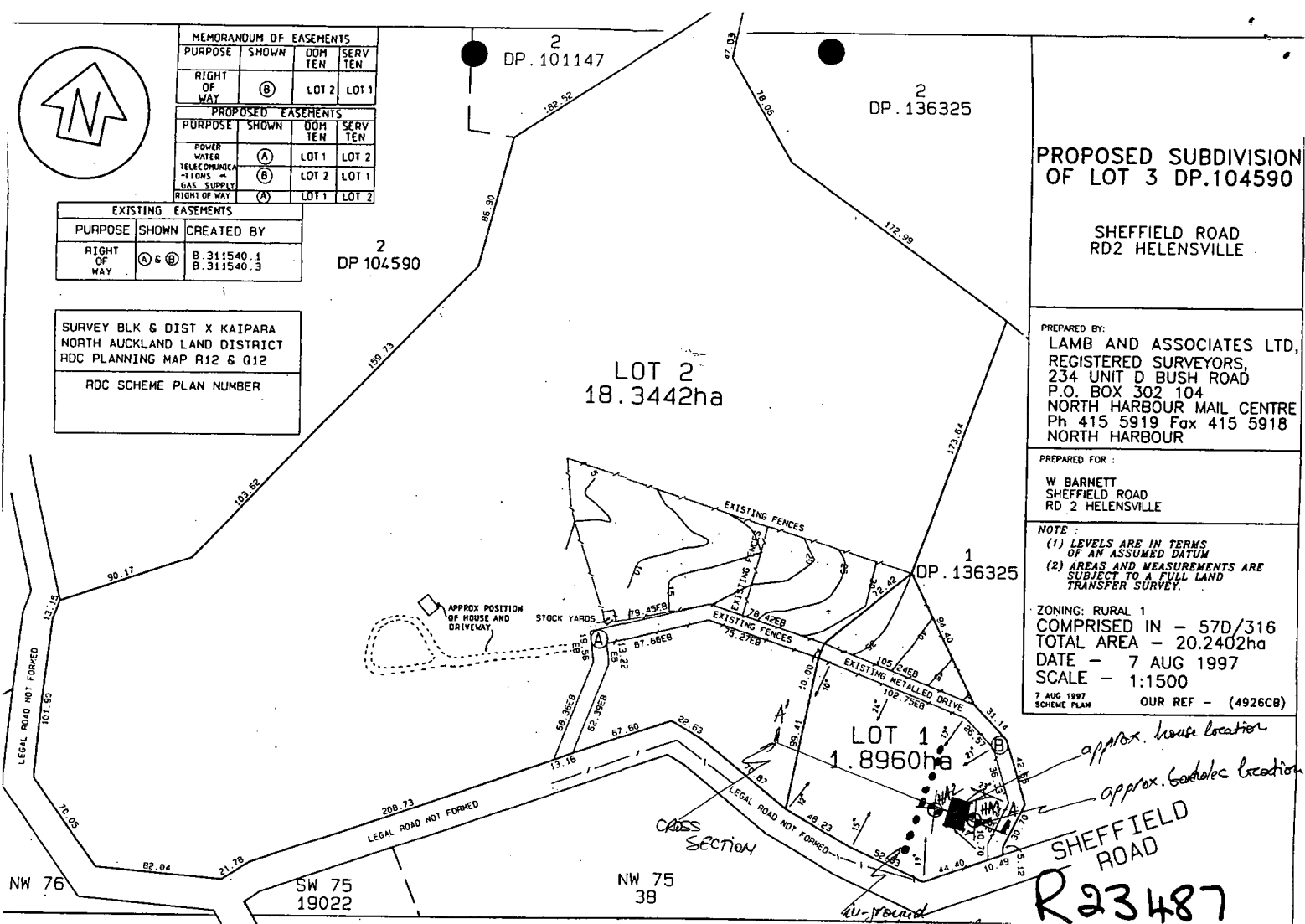
ZONING: RURAL 1
COMPRISED IN - 57D/316
TOTAL AREA - 20.2402ha
DATE - 7 AUG 1997
SCALE - 1:1500
7 AUG 1997
SCHEME PLAN

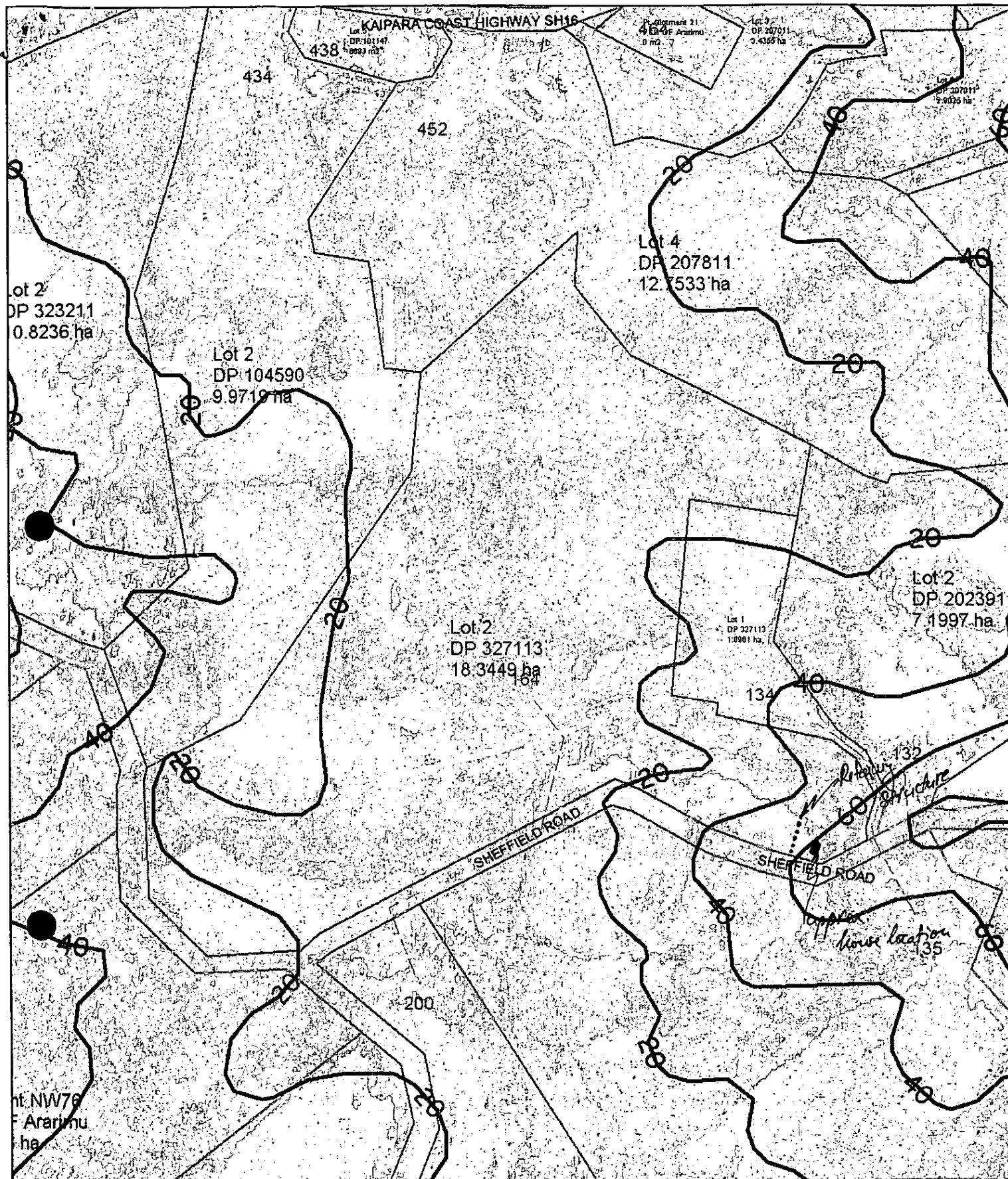
OUR REF - (4926CB)

LOT 2
18.3442ha

LOT 1
1.8960ha

approx. house location
approx. garden location
SHEFFIELD ROAD
R23487





Contour Map

with Cadastral & Aerial

A contour height

contour

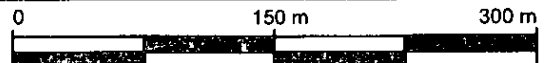
reserves

parcel

A address number



Head Office: 50 Centreway Road, Orewa.
Private Bag 500, Orewa, New Zealand
Tel: (09)426 5169, Fax: (09)426 7280
Email: info@rodneynz.govt.nz



This plan is for information purposes only, and best produced in colour. Its content is NOT to be considered of survey grade, and should be verified prior to design or construction. While Council endeavors to provide accurate data, no guarantee as to the completeness and accuracy of the data shown can be given.

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