



Douglas Partners
Geotechnics • Environment • Groundwater

REPORT

on

PRELIMINARY GEOTECHNICAL ASSESSMENT

**WARRIEWOOD VALLEY SECTOR 3 REZONING
MACPHERSON STREET, WARRIEWOOD**

**Prepared for
MIRVAC HOMES (NSW) PTY LTD**

**Project 37274
December 2004**

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SCP:ss

Project 37274

17 December 2004

PRELIMINARY GEOTECHNICAL ASSESSMENT
WARRIEWOOD VALLEY SECTOR 3 REZONING
MACPHERSON STREET, WARRIEWOOD

1. INTRODUCTION

This report details the results of a preliminary geotechnical assessment conducted by Douglas Partners Pty Ltd for the proposed Warriewood Valley Sector 3 Rezoning. The work was commissioned by Mirvac Homes (NSW) Pty Ltd. A preliminary contamination assessment was also undertaken by Douglas Partners, the results of which are presented in a separate report, Project 37273.

It is understood that the proposed development will comprise the construction of medium density, residential dwellings. The development will require the rezoning of the site from the current 1a Rural to 2F Residential and information is required on the general subsurface conditions to identify geotechnical constraints, design and construction considerations for planning of the project.

The geotechnical field work comprised six (6) cone penetration tests (CPTs). Fifteen test bores were drilled as part of the preliminary contamination assessment and details of the subsurface conditions obtained in that assessment have been used in this site evaluation. The results of the geotechnical appraisal are presented in the report together with comments regarding general design and construction practice.

This report was first issued in draft form on 11 November, 2004.

2. SITE DESCRIPTION

The subject site is an approximately trapezoidal shaped area, covering 6.07 ha. The area is bounded by MacPherson Street to the south, Brands Lane to the east and Narrabeen Creek to the north.

At the time of investigation the site was occupied by three commercial nurseries and a private residence. Much of the area was occupied by greenhouses and plant storage areas, with commercial buildings and roads (both paved and unpaved) occupying most of the remaining land. The ground surface is approximately level, with a gentle (average 1°) slope down from the south west to the north east of the property.

A site plan and locality map is shown in Drawing 1, Appendix A.

3. GEOLOGY

Reference to the Sydney 1:100 000 Geological Series Map indicates the site is underlain by Quaternary deposits, consisting of silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places and common shell layers. The geological map indicates that the Quaternary deposits are underlain by the Newport Formation, part of the Narrabeen Group which typically comprise interbedded laminites, shale and quartz to lithic quartz sandstone.

Review of the Hornsby/ Mona vale *Acid Sulphate Soils Risk Map* (Edition 2, DLWC, 1997) indicates that the south western portion of the site, fronting MacPherson Street, has a low probability of Acid Sulphate Soil (ASS) occurring below a depth of 3 m. There is no known occurrence of ASS in the north eastern portion of the site.

4. FIELD WORK METHODS

The field work undertaken as part of the geotechnical assessment comprised six Cone Penetration Tests (CPTs) to an average depth of 11 metres. Fifteen shallow test bores were drilled as part of the preliminary contamination assessment and have been used to assess the near surface soil conditions.

The cone penetrometer involves pushing a 35 mm diameter cone tipped rod into the soil using hydraulic rams on a purpose built test rig. Strain gauges in the cone and the 135 mm long instrumented friction sleeve record cone tip and friction resistance as the cone and rods are pushed into the soil at a constant rate of 1 m per minute. The readings are made at 20 mm depth intervals and are displayed continuously on a computer screen which enables monitoring of the output in real time. On completion of the tests, the results are downloaded to a computer disk for later reproduction of hard copy results. Notes describing the test method and providing information and guidance in interpretation of the results of the tests are enclosed in Appendix A.

The test bores were drilled using a bobcat mounted drilling rig, equipped with spiral flight augers, to a maximum depth of 3 m. Soil samples were collected at nominal depths of 0.5 m, 1.5 m and 3.0 m.

5. FIELD WORK RESULTS

The detailed results of the conditions encountered in the test bores and CPTs are presented in the Test Bore Report Sheets and Cone Penetration Test Results sheets included in Appendix A, together with notes defining classification methods and descriptive terms.

Locations of CPTs and Test Bores are shown in Drawing 1, in Appendix A. The levels indicated on the result sheets were determined by interpolation from the survey plan provided.

The assessment identified variable subsurface conditions, which in summary, comprise a surficial layer of filling (grey, brown and orange sand, clayey sand, silty clay and sandy clayey silt with traces of crushed sandstone, charcoal, gravel and brick and terracotta fragments in some bores) to depths of 0.3 m to 1.5 m underlain by alluvial sediments.

The alluvial sediments by their nature of deposition are highly variable in both strength and composition, between and within bores, and this was confirmed by the CPT tests. The inferred strata ranges from sand through silty sand, silty clay and clay with layer thicknesses from less than 0.5 m to about 2.5 m. Consistency ranges from very loose to dense in the non-cohesive sediments and from soft to hard in the clayey cohesive sediments.

The CPT tests were terminated at depths of between 8.14 m and 12.98 m in materials of variable consistency (loose to very dense).

The drilling and sampling undertaken as part of the preliminary contamination assessment included sampling to a depth of 3 m. Analysis of samples as part of that assessment included screening for Acid Sulphate Soils (ASS) and testing for the presence of asbestos fibres.

Twenty samples from eight bores were screened for potential for Acid Sulphate Soil (ASS) and indicated the possible presence of ASS (indicated by a pH change in excess of 1 pH unit). Reference to the Preliminary Contamination Assessment Report, Project 37273 should be made for the detailed test results. It is noted that pH screening provides a preliminary indication only of the presence or otherwise of ASS. Readings can be influenced by the inclusion of shells and organic matter. If bulk excavation or dewatering is to be conducted at the site, quantitative analysis should be conducted to confirm the presence or absence of ASS.

Fibre cement fragments were noted on the ground surface of 20 MacPherson Street (the ICN property), adjacent to buildings containing fibre cement and three soil/filling samples were sent to the laboratory for asbestos identification. Chrysotile asbestos fibres were identified in one soil sample (Bore 4/0.5 m on the Flower Power site).

Groundwater was encountered in ten of the fifteen test bores as well as in three of the CPT holes upon extraction of the rods. The depth to and the reduced level of groundwater was highly variable and are summarised in Table 1 below.

Table 1 Depth and Level of Groundwater

Test Bore	Depth (m)	Level (AHD)	Test Bore	Depth (m)	Level (AHD)
1	1.4	7.4	12	1.7	3.6
2	Not observed	-	13	Not observed	-
3	2.0	5.4	14	0.5	4.2
4	1.4	8.4	15	Not observed	-
5	1.4	5.8	CPT		
6	0.7	6.7	16	1.0	7.3
7	1.6	4.2	17	2.0	8.5
8	Not observed	-	18	Hole collapse	-
9	0.5 *	5.8	19	Hole collapse	-
10	Not observed	-	20	Hole collapse	-
11	1.3	4.1	21	0.3	5.0

* possibly due to drip irrigation : Not Observed (within the depth of testing, 3 m)

6. PROPOSED DEVELOPMENT

It is understood that the proposed development of the site will comprise the construction of medium density residential dwellings and associated light traffic roads. Detailed plans of the development, layout and proposed site levels were not available at the time of the investigation. It is however anticipated that some filling of the general area may be required to address local flooding issues.

7. DISCUSSION AND COMMENTS

7.1 General

The geotechnical assessment has identified that the subsurface conditions underlying the site are highly variable.

In summary they comprise a surficial layer of filling (to depths of 0.3 m to 1.5 m) underlain by highly variable alluvial sediments to the depth of investigation (1.5 m to 12.98 m). Asbestos cement fragments were identified at surface level adjacent to a number of an existing structures and in one soil sample. These conditions have implications with regard to the proposed development and are discussed in the following sections.

7.2 Contamination Issues

Contamination issues are beyond the scope of the current preliminary geotechnical assessment, however a preliminary contamination assessment was undertaken in conjunction with this geotechnical assessment and reference should be made to the Douglas Partners report for Project 37273 – “Report on Preliminary Contamination Report, Sector 3 MacPherson Street, Warriewood Valley”:

Issues identified include :

- the presence of asbestos,
- the possible presence of ASS (acid sulphate soils), and
- marginal exceedance of the Provisional phytotoxicity-based investigation level (PIL) for zinc in one soil sample.

It should be noted that, if left in place and undisturbed, ASS do not generally result in negative impacts on the surrounding environment or engineered structures. It is recommended that checks of groundwater chemistry be made with respect to impact on buried reinforced concrete structures and in-ground services.

The contamination assessment report recommended additional investigation with respect to asbestos contamination, ASS (should significant dewatering, bulk excavation or deep excavation be proposed), and if the site requires full characterisation in accordance with the sampling density nominated by the Department of Environment and Conservation.

7.3 Settlement

As stated in previous sections, the site is underlain by highly variable alluvial sediments which include significant layers of soft and firm clays. The placement of filling, to address the local site flooding issues, and the proposed construction will induce significant settlement of the soil profile.

To obtain an initial estimation of possible settlement a preliminary settlement calculation was carried out using the soil profile at CPT 21, assumed soil parameters and a load approximately equivalent to 1 m of additional filling plus a two storey residential structure on a raft foundation. The result indicates primary settlement of the order of 265 mm, with a total settlement, after 100 years, of the order of 400 mm. Cumulative settlement after 1, 10 and 50 years were estimated to be of the order of 125 mm, 320 mm and 370 mm respectively.

It is likely that the subsurface conditions could also easily give rise to differential settlement over relatively short distances.

Settlement of such magnitude will have significant consequences for the project including in the following areas ;

- differential settlement between structures and in-ground services (sewer, water, stormwater, power and phone cables),
- possible tilting across individual structures where raft footings span differing subsurface profiles,
- adverse effects on retaining structures, particularly rigid retaining walls,
- negative skin friction on piled foundations, due to ongoing settlement of the sediments through which the piles are installed. These lead to an increase in the effective load on the piles which could result in greater than anticipated settlement for the actual structures.

7.4 Site Preparation

The primary ground treatment measure which would typically be adopted, given the identified ground conditions, is to preload the development area to induce as much settlement as possible prior to construction. The effectiveness of preloading is usually assessed by precise level monitoring during the preload operation with comparison to estimated settlement rates.

Further investigation, comprising the drilling of test bores to enable sampling and laboratory testing to determine the consolidation characteristics of the softer clay sediments is warranted. Additional CPT testing would be necessary to better assess the variability of the soil profile with investigation for specific structures once the layout has been developed. The testing would also provide additional information to estimate possible duration for preloading and the possible usefulness, or otherwise, of wick drains to accelerate the settlement process.

At this stage of the development proposed site levels and the requirement for bulk earthworks/filling of the site are not known to DP. However, it is anticipated that filling will be used on the site to raise the proposed development above the expected zone of flooding.

As stated previously the materials on the site vary widely in their nature and this has the potential to affect their possible use as bulk filling materials. Laboratory testing has not been undertaken to determine specific characteristics or geotechnical properties of the materials identified and relevant testing will be required.

It is probable that materials with a high silt content will be sensitive to variation in moisture content resulting in restrictions on their placement with bulk filling operations or in achieving adequate compaction as bulk filling.

The presence of groundwater at shallow depth has potential impact both with respect to achieving compaction of the existing materials and for the trafficability of the subgrade particularly during construction activities. Further assessment and probably ongoing assessment during the site preparation works are likely to be required.

The extent and nature of the site preparation works will require careful consideration of the existing conditions and levels, the extent of filling to be placed and the nature of structures and development to be build.

Site preparation works are likely to include, but not necessarily be limited to,

- demolition and removal of all existing site improvements/structures, including asbestos contaminated material,
- proof rolling prior to placement of bulk filling,
- removal of soft, compressible or deleterious (oversized) material,
- local excavation then reworking of existing very loose subgrade materials,
- placement and compaction of imported filling.

It is recommended that structure specific investigation be undertaken once the layout of the proposed development has been determined.

7.5 Foundations

Results of the CPTs and test bores indicate that ground conditions are highly variable between test locations and with depth at each test location. The alluvial nature of the underlying sediments means that it is not appropriate to interpolate between the different test locations and more comprehensive testing over the site will be required to obtain information for detailed design.

It is considered that both shallow and deep foundation will be feasible on the site, albeit with consideration as indicated in Section 7.3.

Raft foundation are likely to be feasible however potential differential settlement between the structure and in ground services to and from the building could occur and will require specific design and construction.

Careful preparation of construction pads will be required, with possibly additional investigation across individual structure where preliminary testing indicates highly variable soil profiles.

- Deep foundation systems (i.e. piles) are considered feasible however a number of significant issues arise due to the highly variable profile. These issues include ;
- a laterally persistent and uniform founding strata has not been identified by the preliminary testing carried out to date.
 - the affects of negative skin friction due to settlement of the soil profile will need to be addressed in the pile design and selection of pile type.
 - differential settlement between the structures and services will also need to be addressed.

7.6 Additional Geotechnical Investigation

As indicated in the previous sections the subsurface conditions across the site are highly variable. Given the limited cope of investigation carried out to date it is not considered possible, or appropriate, to interpolate conditions between test locations based on the existing data. Substantial additional investigation comprising a combination of geotechnical test bores (to provide samples for laboratory testing and determination of properties) and CPT testing (to better characterise variability of the subsurface profile) is recommended.

A staged approach, possibly with drilling and laboratory testing at an early stage, followed by CPT testing across the overall site as well as at specific structures is suggested.

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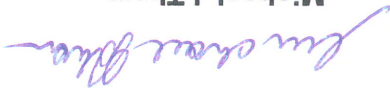
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APPENDIX A
Notes Relating to this Report
Results of Field Work
Drawing 1- Location of Tests



NOTES RELATING TO THIS REPORT

Introduction

These notes have been provided to amplify the geotechnical report in regard to classification methods, specialist field procedures and certain matters relating to the Discussion and Comments section. Not all, of course, are necessarily relevant to all reports.

Geotechnical reports are based on information gained from limited subsurface test boring and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, Geotechnical Site Investigations Code. In general, descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (eg. sandy clay) on the following bases:

Soil Classification	
Clay	less than 0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.06 to 2.00 mm
Gravel	2.00 to 60.00 mm

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The strength terms are defined as follows.

Undrained Shear Strength kPa	
Very soft	less than 12
Soft	12—25
Firm	25—50
Stiff	50—100
Very stiff	100—200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT) as below:

Relative Density	
SPT	CPT
"N" Value (blows/300 mm)	Cone Value (qc — MPa)
Very loose	less than 5
Loose	5—10
Medium dense	10—30
Dense	30—50
Very dense	greater than 50
	greater than 25

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing with a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

Drilling Methods

The following is a brief summary of drilling methods currently adopted by the Company and some comments on their use and application.

Test Pits — these are excavated with a backhoe or a tracked excavator, allowing close examination of the in-situ soils if it is safe to descent into the pit. The depth of penetration is limited to about 3 m for a backhoe and up to 6 m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Large Diameter Auger (eg. Pengo) — the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube sampling.

Continuous Sample Drilling — the hole is advanced by pushing a 100 mm diameter socket into the ground and withdrawing it at intervals to extrude the sample. This is the most reliable method of drilling in soils, since moisture content is unchanged and soil structure, strength, etc. is only marginally affected.

Continuous Spiral Flight Augers — the hole is advanced using 90—15 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in

DESCRIPTION AND CLASSIFICATION OF ROCKS FOR ENGINEERING PURPOSES

DEGREE OF WEATHERING

Term	Symbol	Definition
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining or discolouration of the rock substance usually by limonite has taken place. The colour of the fresh rock is no longer recognisable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh Stained	FS	Rock substance unaffected by weathering, but showing limonite staining along joints.
Fresh	Fr	Rock substance unaffected by weathering.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index ($I_{s(50)}$) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by Australian Standard 4133.4.1 - 1993.

Term	Symbol	Field Guide*	Point Load Index $I_{s(50)}$ MPa	Approx Unconfined Compressive Strength q_u^{**} MPa
Extremely low	EL	Easily remoulded by hand to a material with soil properties	<0.03	< 0.6
Very low	VL	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; too hard to cut a triaxial sample by hand. SPT will refuse. Pieces up to 3 cm thick can be broken by finger pressure.	0.03-0.1	0.6-2
Low	L	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long 40 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.	0.1-0.3	2-6
Medium	M	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.	0.3-1.0	6-20
High	H	Can be slightly scratched with a knife. A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow, rock rings under hammer.	1 - 3	20-60
Very high	VH	Cannot be scratched with a knife. Hand specimen breaks with pick after more than one blow, rock rings under hammer.	3 - 10	60-200
Extremely high	EH	Specimen requires many blows with geological pick to break through intact material, rock rings under hammer.	> 10	> 200

Note that these terms refer to strength of rock material and not to the strength of the rock mass, which may be considerably weaker due to rock defects.

* The field guide assessment of rock strength may be used for preliminary assessment or when point load testing is not able to be done.

** The approximate unconfined compressive strength (q_u) shown in the table is based on an assumed ratio to the point load index of 20:1. This ratio may vary widely.

GRAPHIC SYMBOLS FOR SOIL & ROCK

SEDIMENTARY ROCK

BOULDER CONGLOMERATE

CONGLOMERATE

CONGLOMERATIC SANDSTONE

SANDSTONE FINE GRAINED

SANDSTONE COARSE GRAINED

SILTSTONE

LAMINITE

MUDSTONE, CLAYSTONE, SHALE

COAL

LIMESTONE

METAMORPHIC ROCK

SLATE, PHYLLITE, SCHIST

GNEISS

QUARTZITE

IGNEOUS ROCK

GRANITE

DIORITE, BASALT

TUFF

PORPHYRY

SOIL

BITUMINOUS CONCRETE

CONCRETE

TOPSOIL

FILLING

PEAT

CLAY

SILTY CLAY

SANDY CLAY

GRAVELLY CLAY

SHALY CLAY

SILT

CLAYEY SILT

SANDY SILT

SAND

CLAYEY SAND

SILTY SAND

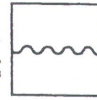
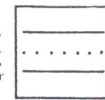
GRAVEL

SANDY GRAVEL

COBBLES/BOULDERS

TALUS

SEAMS



SEAM
<10mm



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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 8.8 **
DIP/AZIMUTH: 90°/-
DATE: 23 Sep 04
PROJECT No: 37273
BORE No: 1
SHEET 1 OF 1

Depth (m)	RL	Description of Strata	Graphic Log	Type	Depth	Sample	Results & Comments	Water	Well Construction Details
0.11		CONCRETE		A	0.5	Z3	PID=1ppm		
0.6		FILLING - dark grey slightly clayey sand filling, with some gravel, brick and ceramic conduit fragments		A	0.9		PID=2ppm		
0.9		FILLING - grey silty sand filling, wet							
1.5		FILLING - medium to dark grey silty sandy clay filling							
		Bore discontinued at 1.5m - target depth reached							

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 1.5m
WATER OBSERVATIONS: Free groundwater observed at 1.4m
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04). * Indicates field replicate sample Z3 taken

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
B	Disturbed sample
D	Bulk sample
U	Tube sample (x mm dia.)
C	Core drilling
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength (50) MPa
V	Shear Vane (kPa)
D	Water seep
±	Water level

CHECKED
Initials:
Date: 25/10



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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 10.6 **
DIP/AZIMUTH: 90°/-
BORE No: 2
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Type	Depth	Sample	Sampling & In Situ Testing		Results & Comments	Water	Well Construction Details
	0.04	BITUMEN		A	0.2			PID=2ppm			
	0.1	BASECOURSE - dark brown grey clayey sand, with some gravel, crushed orange sandstone and trace charcoal		A	0.5			PID=2ppm			
	0.4	FILLING - dark grey sand filling, moist		A	1.0			PID=2ppm			
	0.6	SAND - orange and medium brown sand, with trace clay, moist (possibly filling)		A	1.5			PID=1ppm			
	1.1	SAND - dark brown sand, with trace clay, moist		A							
	2.0	CLAYEY SAND - orange clayey sand, moist to wet		A							
	3.0	- mottled light brown from 2.5m		A	3.0			PID=2ppm			
		Bore discontinued at 3.0m - target depth reached		A							

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 3.0m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04)

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample (x mm dia.)
U	Tube sample
W	Water sample
C	Core drilling
PP	Pocket penetrometer (KPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength ts(50) MPa
V	Shear Vane (KPa)
D	Water seep
W	Water level

CHECKED
Initials:
Date: 25/10



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Geotechnics • Environment • Groundwater

BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 7.4 **
EASTING: NORTHING:
DIP/AZIMUTH: 90°/-
BORE No: 3
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Water	Well Construction Details
				Type	Depth	Sample		
		FILLING - brown clayey sand filling, with some gravel at surface, moist		A	0.5	*Z2	PID=1ppm	
	0.5	SILTY CLAY - grey brown silty clay, with trace sand, moist to wet		A	1.5		PID=2ppm	
	2.0	SILTY CLAYEY SAND - dark grey silty, clayey, fine to medium grained, sand with trace organic matter, saturated		A	2.6		PID=2ppm	
	2.8	SANDY CLAY - light grey sandy clay		A	3.0		PID=2ppm	
	3.0	Bore discontinued at 3.0m - target depth reached		A	3.0		PID=2ppm	
	4.0							
	4.5							
	5.0							
	6.0							
	7.0							
	8.0							
	9.0							
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RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 3.0m
WATER OBSERVATIONS: Free groundwater observed at 2.0m
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04). *Indicates field replicate sample Z2 taken

SAMPLING & IN SITU TESTING LEGEND									
A	Auger sample	pp	Pocket penetrometer (kPa)	PID	Photo ionisation detector	S	Standard penetration test	PL	Point load strength (s(50) MPa)
B	Bulk sample	V	Shear Vane (kPa)	PL	Point load strength (s(50) MPa)	D	Water seep	W	Water level
C	Core drilling								

CHECKED	Initials: <i>RE</i>	Date: 25/10
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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 9.8 **
EASTING: NORTHING: DIPA/ZIMUTH: 90°/-
BORE No: 4
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

Depth (m)	RL	Description of Strata	Graphic Log	Sampling & In Situ Testing			Results & Comments	Water	Well Construction Details
				Type	Depth	Sample			
0.3		FILLING - light brown slightly gravelly clayey sand and filling, with trace brick fragments		A	0.5		PID=2ppm		
0.5		FILLING - dark brown clayey silty sand and filling		A	0.7		PID=3ppm		
0.7		SAND - light grey sand, with trace clay (possibly filling)		A	1.5	*Z1	PID=4ppm		
1.7		CLAYEY SILTY SAND - dark brown clayey silty sand, wet to saturated		A	3.0		PID=4ppm		
3.0		SANDY CLAY/CLAYEY SAND - grey sandy clay/clayey sand, saturated		A					
		Bore discontinued at 3.0m - target depth reached							

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased

TYPE OF BORING: 100mm diameter spiral flight auger to 3.0m
WATER OBSERVATIONS: Free groundwater observed at 1.4m

REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04). *Indicates field replicate sample Z1 taken

SAMPLING & IN SITU TESTING LEGEND

A Auger sample
B Disturbed sample
C Bulk sample (x mm dia.)
U Water sample
C Core drilling
PP Pocket penetrometer (kPa)
PID Photo ionisation detector
S Standard penetration test
PL Point load strength ts(50) MPa
V Shear Vane (kPa)
D Water seep
W Water level

CHECKED
Initials: <i>[Signature]</i>
Date: 28/10



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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 7.2 **
DIP/AZIMUTH: 90°/-
DATE: 23 Sep 04
PROJECT No: 37273
BORE No: 5
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Water	Well Construction Details
				Type	Depth	Sample	Results & Comments	
0.01		GRASS - grass and surficial fragments of ceramic tile		A	0.3	*Z5	PID=2ppm	
0.3		FILLING - grey mottled orange silty sandy clay filling		A	0.3	*Z5	PID=2ppm	
0.5		FILLING - grey clayey silty sand filling		A	0.3	*Z5	PID=2ppm	
1.5		SILTY SAND - grey silty sand, wet to saturated		A	1.5		PID=2ppm	
		Bore discontinued at 1.5m - target depth reached						

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 1.5m
WATER OBSERVATIONS: Free groundwater observed at 1.4m
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04). *Indicates field replicate sample Z5 taken

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample
U	Tube sample (x mm dia.)
W	Water sample
C	Core drilling
PP	Pocket penetrometer (KPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength ls(50) MPa
V	Shear Vane (KPa)
D	Water seep

CHECKED	Initials: 	Date: 25/10
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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 7.4 **
DIP/AZIMUTH: 90°/-
BORE No: 6
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Results & Comments	Water	Well Construction Details
				Type	Depth	Sample			
	0.01	- surficial crushed terracotta, concrete and gravel							
	0.2	FILLING - dark grey sandy silty clay filling							
	0.2	FILLING - grey silty clayey sand filling							
	0.7	SILTY SAND - light grey silty sand		A	0.5		PID=4ppm		
	1.5	Bore discontinued at 1.5m - target depth reached		A	1.5		PID=2ppm		
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RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 1.5m
WATER OBSERVATIONS: Free groundwater observed at 0.7m
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04)

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample
U	Tube sample (x mm dia.)
W	Water sample
C	Core drilling
PP	Pocket penetrometer (kPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength Is(50) MPa
V	Shear Vane (kPa)
D	Water seep
±	Water level

CHECKED
Initials: <i>AE</i>
Date: 25/10



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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood

SURFACE LEVEL: 5.8 **
EASTING: NORTHING:
DIP/AZIMUTH: 90°/-

BORE No: 7
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
0.01		GRASS							
		FILLING - dark grey brown silty sandy clay filling, with trace organic matter		A	0.5		PID=1ppm		
	0.7	- some composted plant matter							
		CLAYEY SAND - grey and light brown clayey sand, moist to wet		A	1.5		PID=1ppm		
	1.6	SILTY SAND - light grey silty sand, with trace clay, saturated							
				A	3.0		PID=1ppm		
	3.0	Bore discontinued at 3.0m - target depth reached							
	4								

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 3.0m
WATER OBSERVATIONS: Free groundwater observed at 1.6m
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04)

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample
U	Tube sample (x mm dia.)
W	Water sample
C	Core drilling
PP	Pocket penetrometer (kPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength (50) MPa
V	Shore Vane (kPa)
D	Water seep
±	Water level

CHECKED	Initials:	Date: 25/10
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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood

SURFACE LEVEL: 6.0 **
EASTING: NORTHING:
DIP/AZIMUTH: 90°/-

BORE No: 8
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Results & Comments	Water	Well Construction Details
				Type	Depth	Sample			
	0.1	FILLING - grey silty sand filling		A	0.3		PID=2ppm		
	0.3	FILLING - mottled grey and orange clayey sand filling, moist to wet		A	0.5		PID=1ppm		
	0.3	SANDY CLAY - mottled grey and orange sandy clay, moist		A	1.5		PID=1ppm		
	1.5	Bore discontinued at 1.5m - target depth reached							
	2								
	3								
	4								

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 1.5m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04)

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
U	Bulk sample
B	Tube sample (x mm dia.)
W	Water sample
C	Core drilling
pp	Pocket penetrometer (KPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength (50) MPa
V	Shear Vane (KPa)
D	Water seep
‡	Water level

CHECKED	Initials: <i>JE</i>	Date: 25/10
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BUCKENHOLE LUG

CLIENT: Milvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood

SURFACE LEVEL: 6.3 **
BORE No: 9
EASTING:
PROJECT No: 37273
DATE: 24 Sep 04
SHEET 1 OF 1

DIP/AZIMUTH: 90°/-

RL	Depth (m)	Description of Strata	Graphic Log	Type	Depth	Sample	Sampling & In Situ Testing Results & Comments	Water	Well Construction Details
0.01	0.1	CRUSHED TERRACOTTA			0.1		PID=1ppm		
	0.5	FILLING - grey gravelly silty clayey sand filling, with crushed terracotta and trace organic matter		A	0.5				
		FILLING - grey sandy silty clay filling, with some mulched organic matter, saturated							
1.5	1.5	Bore discontinued at 1.5m - target depth reached		A	1.5	Z7	PID=2ppm		
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RIG: Bobcat

DRILLER: B Ellis

LOGGED: NLE

CASING: Uncased

TYPE OF BORING: 100mm diameter spiral flight auger to 1.5m

WATER OBSERVATIONS: Free groundwater observed at 0.5m (probably due to drip watering in adjacent house)

REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04). *Indicates field replicate sample Z7 taken

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample
B	Bulk sample
D	Disturbed sample
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength (kPa)
V	Shear Vane (kPa)
D	Water seep
W	Water level

CHECKED

Initials: 

Date: 25/10



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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 5.0 **
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/-
BORE No: 10
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.2	FILLING - brown and grey silty sand filling, with some crushed ceramic tiles, gravel and trace clay		A	0.2		PID=2ppm		
	0.6	FILLING - dark brown sandy clayey silt filling		A	0.5		PID=2ppm		
	1.3	SILTY SAND - dark grey silty sand, with trace clay, moist							
	1.3	- grading into							
	1.5	SILTY SAND - light brown silty sand, moist		A	1.5	Z6	PID=1ppm		
		Bore discontinued at 1.5m - target depth reached							
	2								
	3								
	4								

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased

TYPE OF BORING: 100mm diameter spiral flight auger to 1.5m
WATER OBSERVATIONS: No free groundwater observed

REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04). *Indicates field replicate sample Z6 taken

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample
U	Tube sample (x mm dia.)
C	Core drilling
PP	Pocket penetrometer (kPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength (50) MPa
V	Shear Vane (kPa)
D	Water seep
W	Water level

CHECKED	Initials: <i>AE</i>	Date: 25/10
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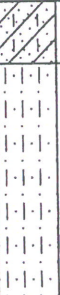


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BUCKEHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood

BORE No: 11
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.5	FILLING - grey silty sand filling, with trace clay		A	0.5		PID=2ppm		
	1.3	SILTY SAND - grey silty sand, moist to wet		A	1.5		PID=4ppm		
	1.5	SANDY SILTY CLAY - grey sandy silty clay		A	1.5				
		Bore discontinued at 1.5m - target depth reached							
	2								
	3								
	4								

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased

TYPE OF BORING: 100mm diameter spiral flight auger to 1.5m

REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample
B	Disturbed sample
D	Bulk sample
U	Tube sample (x mm dia.)
W	Water sample
C	Core drilling
pp	Pocket penetrometer (KPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength (50 MPa)
V	Shear Vane (KPa)
D	Water seep
W	Water level

01/22	Date:
<i>[Signature]</i>	Initials:
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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 5.3 **
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/-
BORE NO: 12
PROJECT NO: 37273
DATE: 24 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Water	Well Construction Details
				Type	Depth	Sample		
	0.11	CONCRETE						
	0.2	FILLING - dark grey silty sandy clay filling, with trace crushed brick						
	0.6	FILLING - grey silty sand, with trace clay, moist to wet, faint sulphur odour		A	0.5	*Z8	PID=2ppm	
	1.7	SILTY SANDY CLAY - grey silty sandy clay, wet, faint sulphur odour		A	1.5		PID=3ppm	
	2.2	SILTY CLAY - dark grey silty clay, with trace sand and faint sulphur odour		A	2.0		PID=2ppm	
	3.0	SILTY CLAY - yellow brown silty clay, some sand		A	3.0		PID=2ppm	
		Bore discontinued at 3.0m - target depth reached						

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 3.0m
WATER OBSERVATIONS: Free groundwater observed at 1.7m
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04). *Indicates field replicate sample Z8 taken

SAMPLING & IN SITU TESTING LEGEND

A Auger sample
B Disturbed sample
C Bulk sample (x mm dia.)
U Tube sample
V Water sample
C Core drilling
PP Pocket penetrometer (kPa)
PID Photo ionisation detector
S Standard penetration test
PL Point load strength test (50) MPa
V Shear Vane (kPa)
D Water seep
Water level

CHECKED
Initials: <i>JS</i>
Date: 25/10



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CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood

SURFACE LEVEL: 4.3
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/-

DIP/AZIMUTH: 90°/-

NORTHING:

EASTING:

SURFACE LEVEL: 4.3

BOOKHOLE LOG

Depth (m)	Description of Strata	Graphic Log	Type	Depth	Sample	Results & Comments	Water	Well Construction Details
0.4	FILLING - light grey and brown clayey sand filling, with some gravel and brick fragments		A	0.4		PID=2ppm		
0.5	FILLING - dark brown silty clay filling, with trace sand and organic matter		A	1.0		PID=2ppm		
1.1	SILTY SANDY CLAY - grey silty sandy clay, with trace organic matter		A	1.5		PID=5ppm		
3.0	SILTY CLAY - grey, orange and brown silty clay, with trace organic matter		A	3.0		PID=1ppm		
	Bore discontinued at 3.0m - target depth reached							

RIG: Bobcat

TYPE OF BORING: 100mm diameter spiral flight auger to 3.0m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04)

pp	Pocket penetrometer (kPa)
PID <td>Photo ionisation detector</td>	Photo ionisation detector
PS <td>Standard penetration test</td>	Standard penetration test
PL <td>Point load strength (50) MPa</td>	Point load strength (50) MPa
V <td>Shear Vane (kPa)</td>	Shear Vane (kPa)
Δ <td>Water seep $\frac{m}{m^2}$</td>	Water seep $\frac{m}{m^2}$
	Water level

01752 Date: 25/10
Initials: *h*
CHECKED

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BOROHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood

SURFACE LEVEL: 4.7 **
EASTING: NORTHING: 90°/-
DIP/AZIMUTH:

BORE No: 14
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.3	FILLING - dark brown grey sand filling, with some clay, moist		A	0.0		PID=1ppm		
		SILTY SAND - grey silty sand, moist (possibly filling) - with some clay from 0.5m							
	1.0	SILTY CLAY - orange and brown silty clay, with trace sand		A	1.5		PID=2ppm		
	1.7	SILTY SANDY CLAY - grey silty sandy clay							
	3.0	Bore discontinued at 3.0m - target depth reached		A	3.0		PID=2ppm		

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased

TYPE OF BORING: 100mm diameter spiral flight auger to 3.0m
WATER OBSERVATIONS: Free groundwater observed at 0.5m

REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04)

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample
U	Tube sample (x mm dia.)
C	Core drilling
W	Water sample
V	Water seep
D	Shear Vane (KPa)
PL	Point load strength (50) MPa
S	Standard penetration test
PID	Photo ionisation detector
pp	Pocket penetrometer (KPa)

CHECKED
Initials: <i>AE</i>
Date: 25/10



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BOREHOLE LOG

CLIENT: Mirvac Homes (NSW) Pty Ltd
PROJECT: Warriewood Valley Sector 3 Rezoning
LOCATION: Macpherson Street, Warriewood
SURFACE LEVEL: 5.5 **
EASTING: NORTHING: DIP/AZIMUTH: 90°/-
BORE No: 15
PROJECT No: 37273
DATE: 23 Sep 04
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Type	Depth	Sample	Sampling & In Situ Testing		Water	Well Construction Details	
								Results & Comments			
	0.8	FILLING - dark brown silty sandy clay, with trace organic matter and material (rags) [stockpile of filling material]		A	0.0			PID=1ppm			
	0.5			A	0.5	*Z4					
	1.3	FILLING - grey silty sandy clay filling, moist to wet		A	1.5				PID=2ppm		
	1.6	SILTY CLAY - orange and brown silty clay, with trace sand									
	3.0	SILTY CLAY - dark grey silty clay, with trace sand, moist									
	3.0	Bore discontinued at 3.0m - target depth reached		A	3.0			PID=1ppm			

RIG: Bobcat
DRILLER: B Ellis
LOGGED: NLE
CASING: Uncased
TYPE OF BORING: 100mm diameter spiral flight auger to 3.0m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: **RL interpolated from survey plan (No: AM9702D - 13/9/04). *Indicates field replicate sample Z4 taken

SAMPLING & IN SITU TESTING LEGEND

A Auger sample
D Disturbed sample
B Bulk sample
U Tube sample (x mm dia.)
C Core drilling
PP Pocket penetrometer (kPa)
PID Photo ionisation detector
S Standard penetration test
PL Point load strength (s(50) MPa)
V Shear Vane (kPa)
D Water seep
W Water level

CHECKED
Initials: *RE*
Date: 25/10



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CONE PENETRATION TEST

CLIENT: MIRVAC HOMES (NSW) PTY LTD

PROJECT: WARRIEWOOD VALLEY SECTOR 3 REZONING

LOCATION: MACPHERSON STREET, WARRIEWOOD

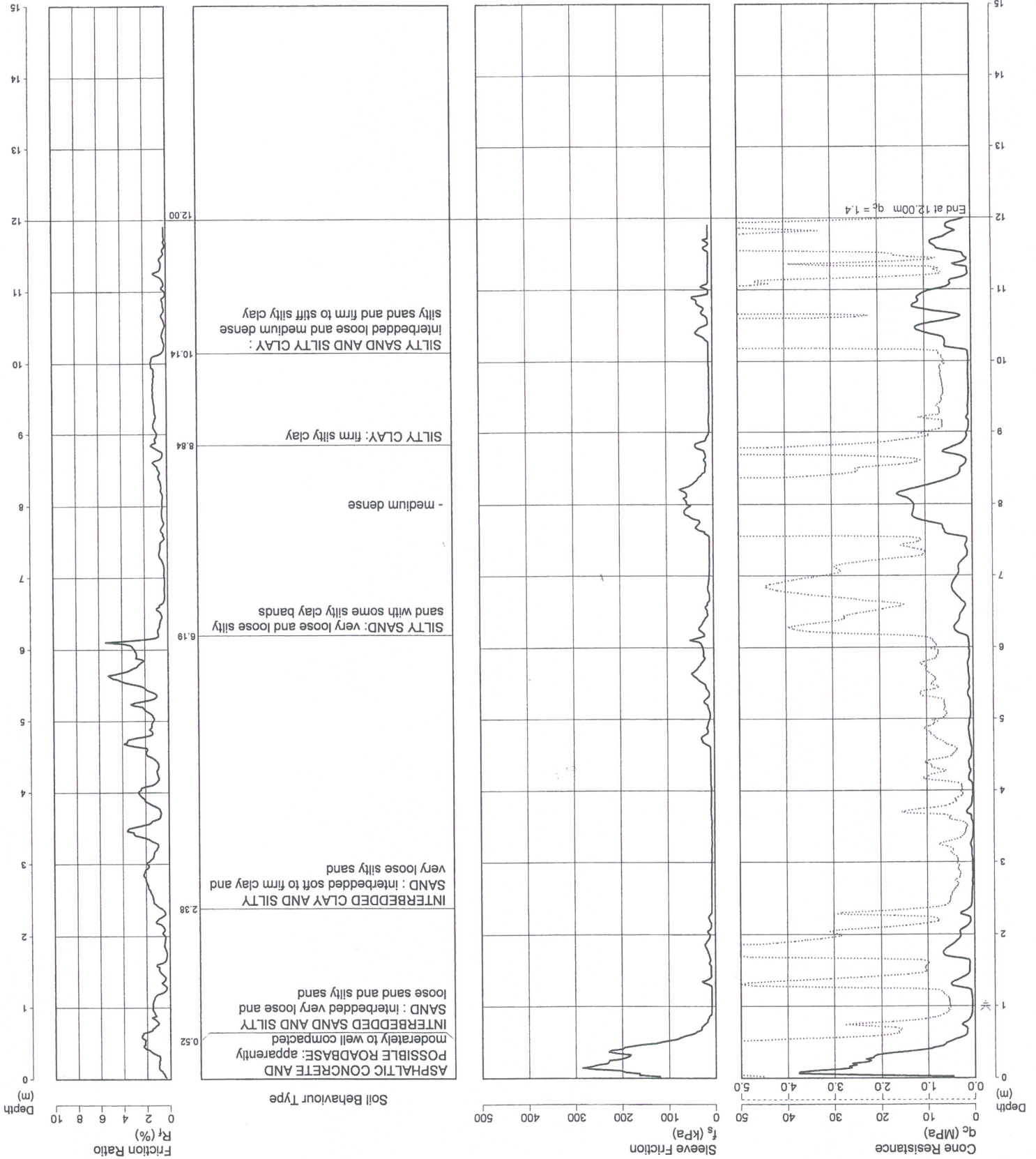
PROJECT No: 37274

CPT 16

Page 1 of 1

DATE 11/10/04

SURFACE RL: 8.3 m



REMARKS: DEPTH TO WATER AT COMPLETION OF TEST : 1.0 m
* RL INTERPOLATED FROM SURVEY PLAN (No. AM 9702 D - 13/9/04)

Date 4/11
Plotted
Checked

File: P:\37274 WARRIEWOOD, Warriewood Valley Sector 3 Rezoning - Geotechnical /
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Field\CPT16a.CPS



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CONE PENETRATION TEST

CLIENT: MIRVAC HOMES (NSW) PTY LTD

PROJECT: WARRIEWOOD VALLEY SECTOR 3 REZONING

LOCATION: MACPHERSON STREET, WARRIEWOOD

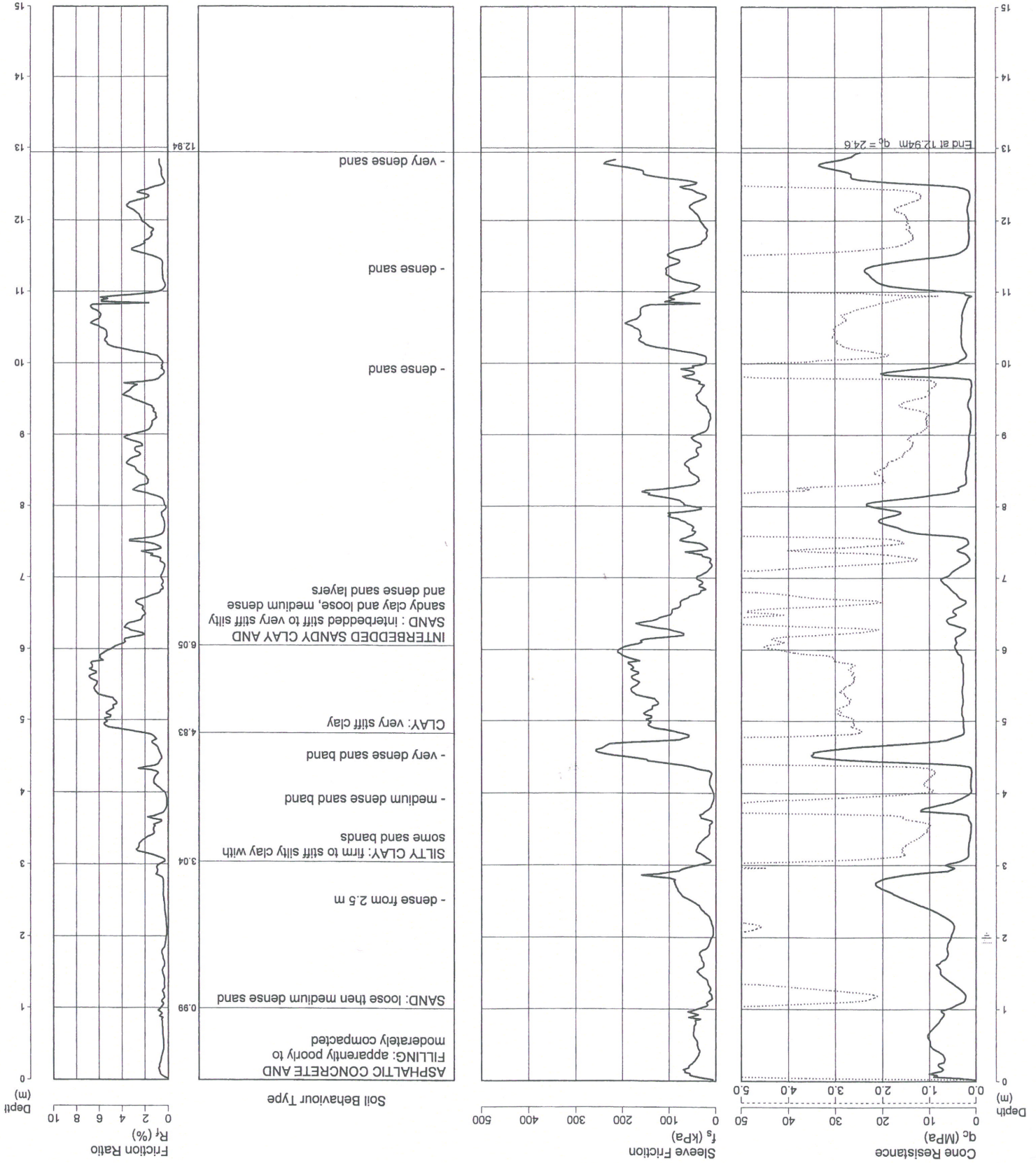
PROJECT No: 37274

CPT 17

Page 1 of 1

DATE 11/10/04

SURFACE RL: 10.5 m



REMARKS: DEPTH TO WATER AT COMPLETION OF TEST : 2.0 m
* RL INTERPOLATED FROM SURVEY PLAN (No. AM 9702 D - 13/9/04)

Date 4/11/04
Plotted
Checked

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CONE PENETRATION TEST

CLIENT: MIRVAC HOMES (NSW) PTY LTD

PROJECT: WARRIEWOOD VALLEY SECTOR 3 REZONING

LOCATION: MACPHERSON STREET, WARRIEWOOD

PROJECT No: 37274

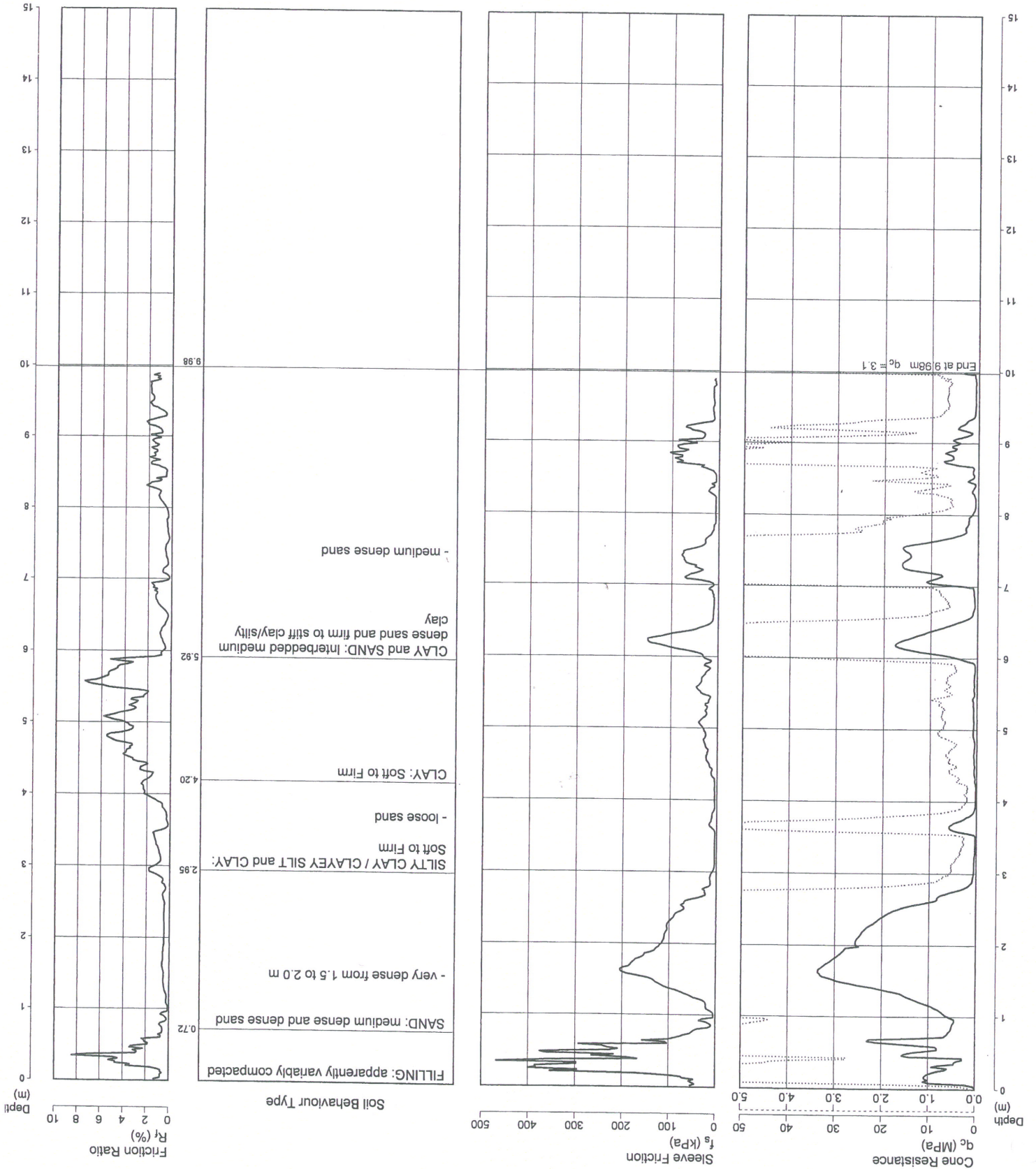
CPT 18

Page 1 of 1

DATE

11/10/04

SURFACE RL: 7.4 m *



REMARKS: HOLE COLLAPSED AFTER COMPLETION OF TEST : 0.0 m
* RL INTERPOLATED FROM SURVEY PLAN (No. AM 9702 D - 13/9/04)

Date
Plotted
Checked
LH

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CONE PENETRATION TEST

CLIENT: MIRVAC HOMES (NSW) PTY LTD

PROJECT: WARRIEWOOD VALLEY SECTOR 3 REZONING

LOCATION: MACPHERSON STREET, WARRIEWOOD

PROJECT No: 37274

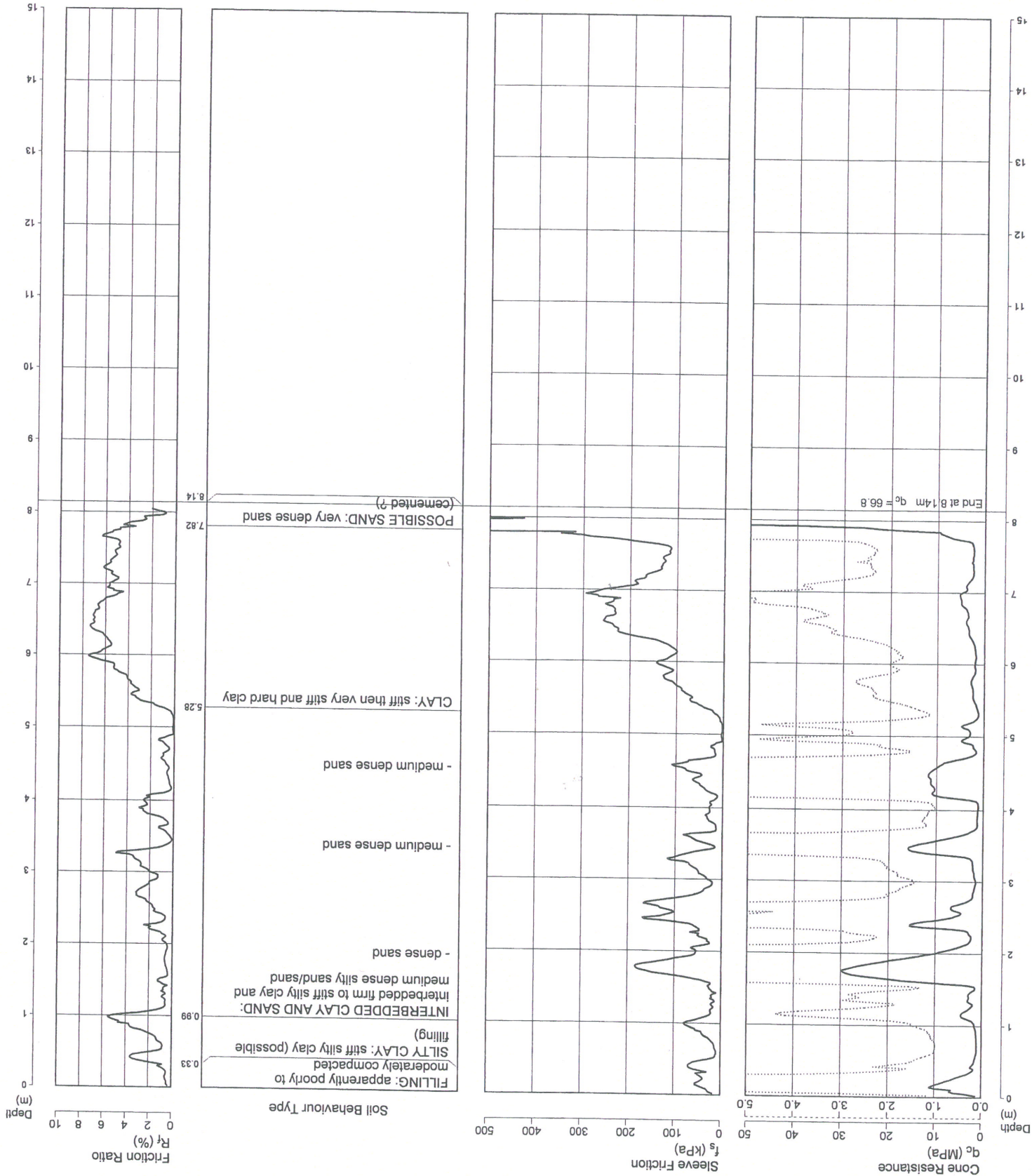
CPT 19

Page 1 of 1

DATE

11/10/04

SURFACE RL: 6.1 m *



REMARKS: HOLE COLLAPSED AFTER COMPLETION OF TEST : 0.4 m. TEST DISCONTINUED DUE TO REFUSAL
* RL INTERPOLATED FROM SURVEY PLAN (No. AM 9702 D - 13/9/04)

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Date
Plotted
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4/11/04

CONE PENETRATION TEST

CLIENT: MIRVAC HOMES (NSW) PTY LTD

PROJECT: WARRIEWOOD VALLEY SECTOR 3 REZONING
LOCATION: MACPHERSON STREET, WARRIEWOOD

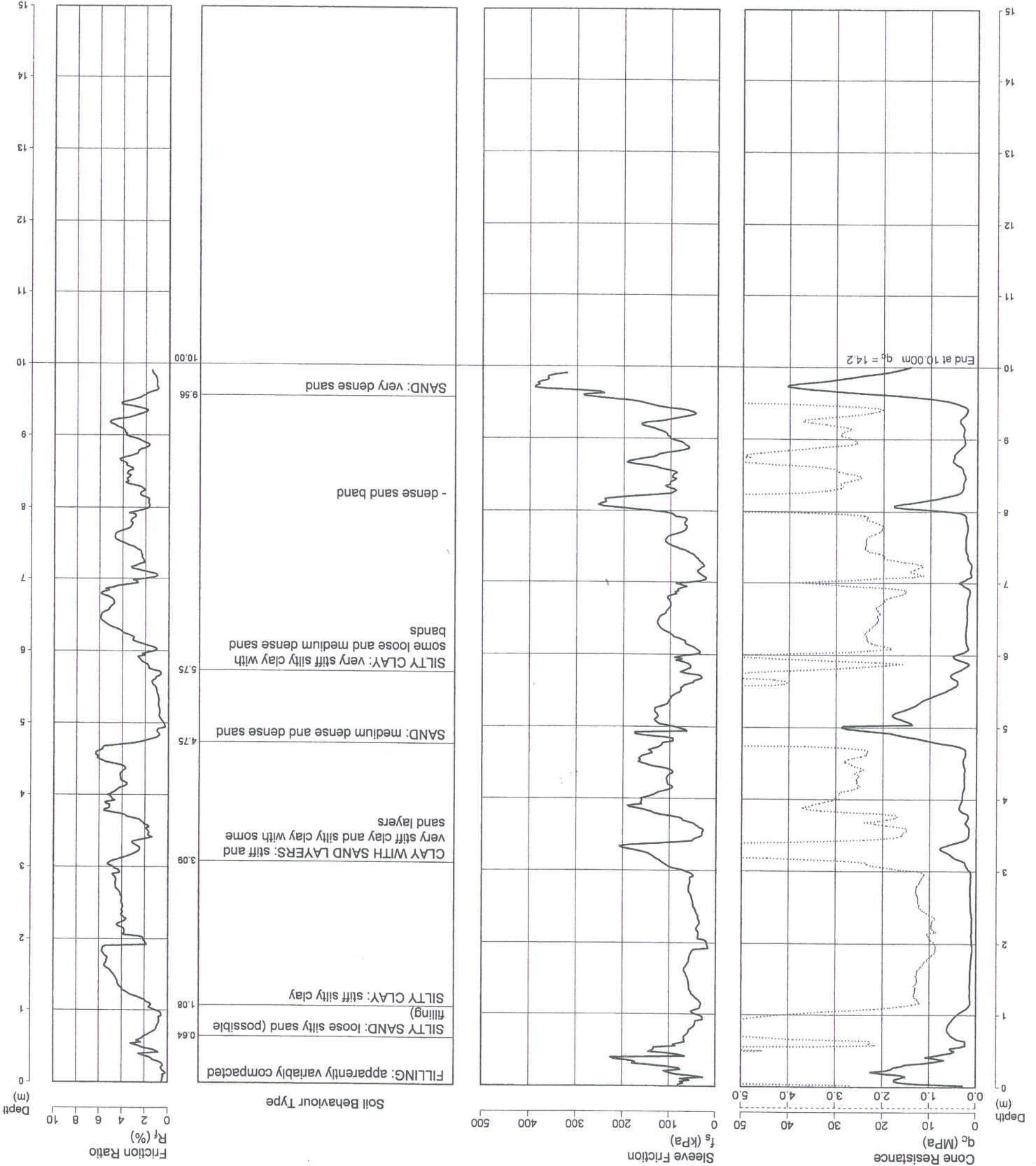
PROJECT No: 37274

CPT 20

Page 1 of 1

DATE 11/10/04

SURFACE RL: 4.7 m



REMARKS: HOLE COLLAPSED AFTER COMPLETION OF TEST : 2.1 m
* RL INTERPOLATED FROM SURVEY PLAN (No. AM 9702 D - 13/9/04)

Date
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RWC

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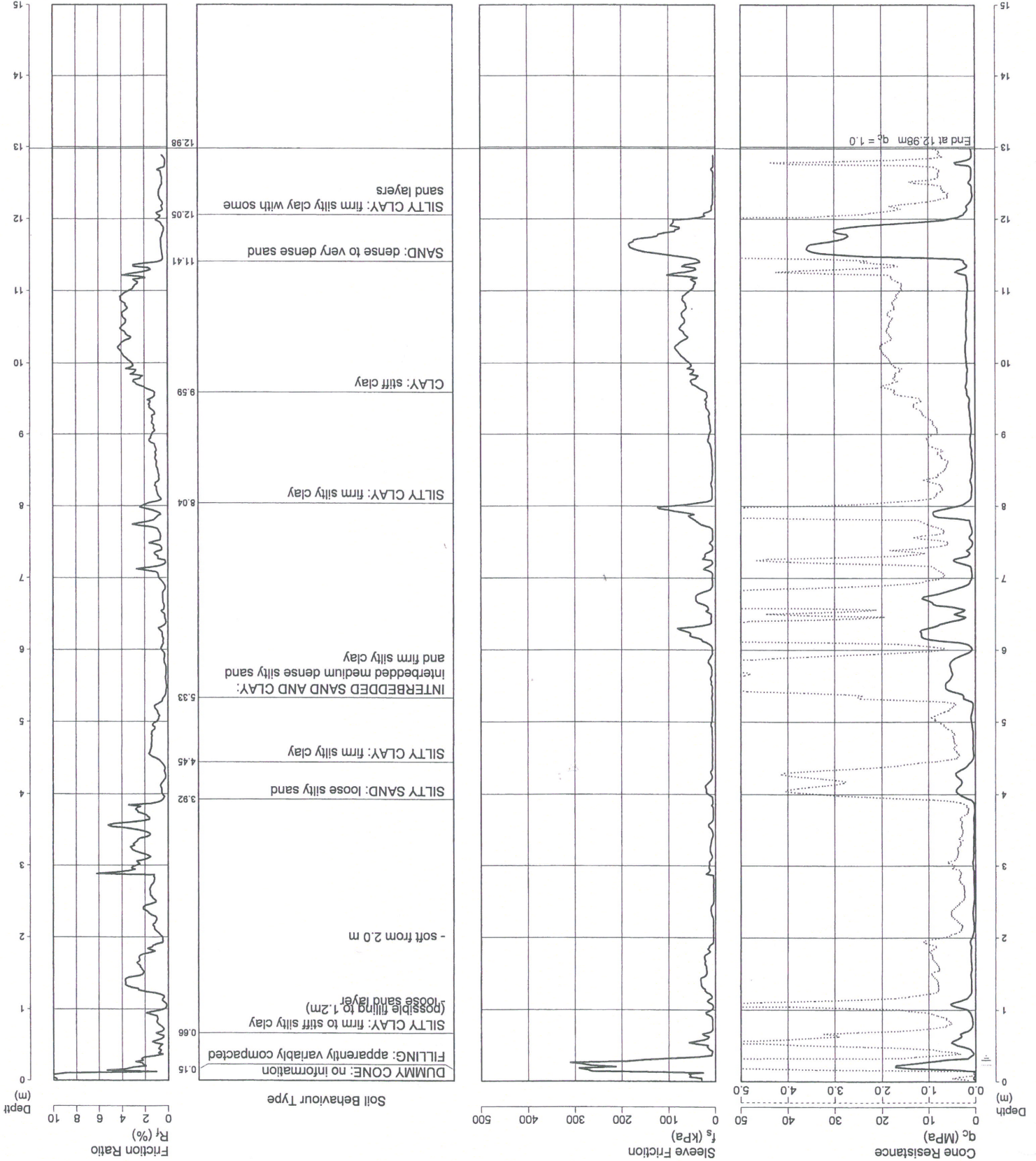
CONE PENETRATION TEST

CLIENT: MIRVAC HOMES (NSW) PTY LTD

PROJECT: WARRIEWOOD VALLEY SECTOR 3 REZONING
LOCATION: MACPHERSON STREET, WARRIEWOOD

PROJECT No: 37274

CPT 21
Page 1 of 1
DATE 11/10/04
SURFACE RL: 5.3 m⁺



REMARKS: DEPTH TO WATER AT COMPLETION OF TEST : 0.3 m; DUMMY CONE USED TO 0.15 m
* RL INTERPOLATED FROM SURVEY PLAN (No. AM 9702 D - 13/9/04)

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4/11/04





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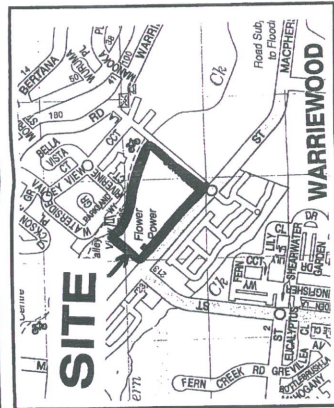
TITLE: Location of Tests

Preliminary Geotechnical Assessment
Warriewood Valley Sector 3 Rezoning
MacPherson Street
WARRIEWOOD

CLIENT: Mirvac Homes (NSW) Pty Ltd	PROJECT No: 37274	OFFICE: SYDNEY
DRAWN BY: PSCH [SCALE: As shown]		
APPROVED BY: <i>PSCH</i>	DATE: 1.11.2004	DRAWING No: 1

LEGEND

- ◆ TEST BORE LOCATION (BH1 to BH15)
- ◆ CONE PENETRATION TEST LOCATION (CPT16 to CPT21)



LOCALITY PLAN

