APPENDIX M: SPOIL MANAGEMENT PLAN by BONACCI GROUP 11 April 2005 (Refer to separate document)

APPENDIX N: GEOTECHNICAL REPORT by JEFFERY & KATSAUKAS Pty Ltd

REPORT

TO

BREAKFAST POINT PTY LTD

ON

PRELIMINARY GEOTECHNICAL INVESTIGATION

FOR

PROPOSED RESIDENTIAL DEVELOPMENT

AT

LOT 7D SEASHORE, BREAKFAST POINT, NSW

15 September 2008

Ref: 22371SB_7Drpt

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Postal Address: PO Box 976, North Ryde BC NSW 1670

Tel: 02 9888 5000 • Fax: 02 9888 5001 • Email: engineers@jkgroup.net.au • ABN 17 003 550 801

TABLE OF CONTENTS

1	INTRODUCTION		1
2	INVESTIGATION PROCEDURE		1
3	RESULTS OF INVESTIGATION		3
	3.1	Site Description	3
	3.2	Subsurface Conditions	3
	3.3	Laboratory Test Results	5
4	COMMENTS AND RECOMMENDATIONS		5
	4.1	Excavations	6
	4.2	Retention	7
	4.3	Footings	9
	4.4	Basement Slabs	9
5	GENERAL COMMENTS		10

TABLE A: SUMMARY OF POINT LOAD STRENGTH INDEX TEST RESULTS

BOREHOLE LOGS 1 AND 2 INCLUDING CORE PHOTOGRAPHS

FIGURE 1: TEST LOCATION PLAN

FIGURE 2: GRAPHICAL BOREHOLE SUMMARY

VIBRATION EMISSION DESIGN GOALS

REPORT EXPLANATION NOTES

1 INTRODUCTION

This report presents the results of a geotechnical investigation for the proposed residential development at the eastern portion of Lot 7D, Seashore Precinct, at Breakfast Point, NSW. The investigation was commissioned by Mr Ray Kearns of Rose Management Services Pty Ltd, on behalf of Breakfast Point Pty Ltd, by Variation Approval dated 18 August 2008. The approval was based upon the proposal by Jeffery and Katauskas Pty Ltd (Ref. P15932S) dated 12 August 2008.

Architectural drawings for the proposed development have not been finalised at this stage, though from the supplied coordination plan by Giles Tribe Architects the proposed development within the Seashore Precinct will comprise four buildings (7D3, 7D4, 7D5 and 7D6) of two to five stories with up to two basement levels. The basement levels have not been supplied, but we assume that excavations to depths of the order of 6m will be required for the basements.

The purpose of the investigation was to obtain preliminary geotechnical information on the subsurface conditions to enable concept structural designs of the proposed buildings to be established and provide preliminary information for tenderers for the works.

The investigation at Lot 7D was carried out concurrently with an investigation for Lot 7B, the Woodlands North Precinct, for which a separate report will be provided.

2 INVESTIGATION PROCEDURE

Boreholes BH1 and BH2 were drilled towards each end of the eastern portion of Lot 7D, as shown on the attached Figure 1. The locations of the boreholes were dictated by access constraints for our track mounted JK300 rig that drilled the boreholes. The locations were set out by taped measurements from the inferred site boundaries and hence are approximate. The surface levels of the boreholes were

interpolated from levels shown on the Breakfast Point Spoil Management Plan (Drawing No. 7509C-C1, Rev P1), which was based on the site aerial survey plan dated July 2005. As a large part of the site was covered by water in the aerial survey, interpolation of the levels is quite approximate and the levels should only be used for indicative purposes. The levels should be checked by survey if any issues of significance are to be attached to them.

The boreholes were initially auger drilled to depths of 3.08m (BH1) and 2.96m (BH2), with Standard Penetration Tests (SPT) at regular intervals in soil materials to assess the apparent fill compaction. The strength of the upper zone of the underlying bedrock was assessed from the auger penetration resistance of a Tungsten Carbide (TC) bit attached to the augers, together with examination of the recovered rock cuttings.

Below depths of 3.08m (BH1) and 2.96m (BH2) the boreholes were drilled by diamond coring techniques using a NMLC core barrel and water flush to the termination depths of 8.98m (BH1) and 10.93m (BH2). The strength of the cored rock was assessed from examination of the recovered core, augmented by reference to Point Load Strength Index Tests completed in a NATA registered laboratory, Soil Test Services Pty Ltd (STS). The results of the point load strength index tests are summarised in the attached Table A and on the cored borehole logs.

Groundwater observations were made during auger drilling. The use of water for core drilling limited further meaningful measurements of groundwater levels.

Our geotechnical engineer, Mr Jose Canovas, set out the borehole locations, nominated the sampling and testing locations, and prepared logs of the strata encountered. The borehole logs, which include field test results and groundwater observations, are attached to this report, together with colour photographs of the

rock core and a set of explanatory notes, which describe the investigation techniques, and their limitations, and define the logging terms and symbols used.

3 RESULTS OF INVESTIGATION

3.1 Site Description

Lot 7D is located within in the central part of The Breakfast Point Peninsula. The portion covered by this investigation is the eastern part of Lot 7D, which is roughly rectangular in shape, being about 160m from north to south and 80m from east to west. The site is bounded to the north, east and south by roadways and to the west by the remainder of Lot 7D. The site can be divided into two distinct areas, at the northern and southern ends, separated by a vertical sandstone cut face running in an east to west direction of about 5m to 6m high. The sandstone within the cut face generally appeared to be of good quality and was visually assessed to be slightly weathered and of medium strength, with some weaker bands.

The northern portion of the site was located at the base of the cut and slopes gently from all sides to a pond that dominates this portion of the site. A three storey brick building (Plumbers Workshop) was located on the western boundary and at the base of the cut. The building appeared to be in a fair to good condition. The southern portion was located at the top of the cut and sloped down towards the north-east at about 4° to 5°.

3.2 Subsurface Conditions

The Sydney 1:100,000 Geological Series Sheet shows that the area is underlain by Hawkesbury Sandstone. In common with most of the Breakfast Point area, the site has been shown to be underlain by fill materials which generally directly overlie the sandstone bedrock. It is probable, based on the recent history of the site, that all soil materials were stripped from the surface as part of the remediation works carried

out following the previous site use as a gasworks. The fill materials which were replaced, should have been compacted to good engineering standards, but experience elsewhere has shown that this is not always the case, and documentation is entirely lacking.

A summary of the subsurface conditions encountered within the boreholes is presented below. Reference should be made to then attached borehole logs for detailed descriptions of the subsurface conditions encountered.

Fill

Fill was encountered to depths of 2.5m (BH1) and 2.2m (BH2). The fill comprised silty sandy clay with sandstone and igneous gravel, brick fragments and sandstone pieces estimated to be up to boulder size. The SPT 'N' values range from 7 through 22 to refusal, indicating that, for the most part, the soils are probably moderately compacted, but contain layers of lesser compaction and large sandstone inclusions. The sandstone inclusions can give rise to artificially elevated SPT 'N' values, giving an over estimate of the compaction of the fill.

Sandstone

Sandstone was encountered in both boreholes at the base of the fill at depths of 2.5m and 2.2m. On first contact the sandstone was of variable quality, being distinctly weathered, and of low to medium strength in BH1 and extremely to distinctly weathered, and of very low strength in BH2. Coring of the sandstone was carried out shortly after it was encountered and again variable conditions were encountered. Large zones of core loss were initially encountered in BH2 to a depth of 6.1m. These core loss zones are likely to be extremely weathered sandstone bands or clay bands. Below a depth of 6.1m, the sandstone was assessed to be slightly weathered and of medium to high strength.

In BH1, the cored sandstone initially varied from distinctly weathered to slightly weathered and of low or medium strength until a shale layer was encountered at a depth of 6.29m. The shale was assessed to be extremely to distinctly weathered and of extremely low to very low strength to a depth of 7.1m, where sandstone was again encountered. This lower sandstone was assessed to be fresh and of high strength.

Defects within the sandstone were generally widely spaced and comprised extremely weathered and clay seams of up to 40mm thickness, sub horizontal bedding partings and joints inclined at 50° to 70°.

Groundwater

No groundwater was observed in either borehole during auger drilling. The use of water for core drilling limited further meaningful groundwater measurements within the boreholes.

3.3 Laboratory Test Results

The laboratory point load strength index test results showed reasonably good correlation with our field assessment of the rock strength. The estimated Unconfined Compressive Strength (UCS) of the shale in BH1 was less than 1MPa, but the results for the sandstone ranged from 4MPa to 28MPa, with one higher result of 42MPa.

4 COMMENTS AND RECOMMENDATIONS

The proposed developments are current at the concept design stage and the proposed excavation/basement levels have not been determined. For the purpose of this report we have assumed that the buildings will be of a similar nature to the previous developments within Breakfast Point, and will contain two basement levels

with the above ground levels within the same footprint as the basements. Excavations for the expected two basement levels have been assumed to be to depths of about 6m.

Given below are general comments based on the above assumed development and on the limited subsurface information available to date from the two completed boreholes at each end of the site. Once the exact details of the proposed developments have been determined additional boreholes must be drilled to provide a more detailed site coverage, especially considering the variation in rock quality. Given the size of the proposed buildings, these boreholes should be cored within the sandstone bedrock to optimise the bearing pressures that may be used, and provide more detailed information on the excavation and retention requirements. The comments and recommendations provided herein must be reviewed and amplified following the additional geotechnical investigations taking into account the results of all boreholes drilled within Lot 7D.

4.1 Excavations

Excavation of the fill will be readily achievable using conventional earthmoving equipment, such as hydraulic excavators and dozers. The sandstone is generally of medium and high strength and hard rock excavation techniques will be required. Hydraulic rock hammers may be used, but the extent of their use will depend on the adjacent buildings present at the time of excavation. If buildings are located close to the excavations the transmitted vibrations generated by rock hammers must be monitored. Reference should be made to the attached Vibration Emission Design Goals sheet for acceptable vibration levels.

Where the transmitted vibrations are excessive, it would be necessary to change to alternate excavation equipment, such as smaller rock hammers, ripping tynes, rotary grinders or rock saws. Consideration could be given to using a rock saw to cut a

slot around the perimeter of the excavation prior to removal of the rock from within the saw cuts using a rock hammer, but the effectiveness of such an approach should be confirmed by vibration monitoring. Dilapidation surveys of the adjacent buildings may also be required.

Groundwater seepage into the excavation should be expected and would tend to occur along the soil/rock interface and through bedding partings and joints within the sandstone. Such seepage would increase during and following rainfall periods. We expect that the seepage into the excavation would be able to be adequately controlled using conventional sump and pump techniques.

4.2 Retention

From the supplied concept plan, the buildings and their associated basements will be offset from the adjacent roadways and space will be available for temporary batters within the fill, with vertical excavations within the sandstone. However, significant core loss zones were encountered in BH2 and retention systems may be required to support these weaker materials. Boreholes should be drilled in the vicinity of BH2 during the detailed geotechnical investigations to assess the extent of these weak zones and the final retention requirements.

Temporary batters within the fill should be no steeper than 1 Vertical in 1 Horizontal (1V:1H) for batters of no more than 3m in height. Such batters should remain stable in the short term provided all surcharge loads, including construction loads, are kept well clear of the crest of the batters.

Vertical excavations within the sandstone appear feasible, following further investigation in the vicinity of BH2. If vertical unsupported sandstone excavations are carried out, regular geotechnical inspections of the cut faces must be carried out at depth intervals of no more than 1.5m. The purpose of the geotechnical

inspections is to check for the presence of inclined joints or weak zones that require additional support. The additional support may comprise rock bolts, shotcrete and mesh and/or 'dental' treatment of any thin weak bands by cleaning out the weak material and packing with grout.

Inclined joints were encountered within the cored sandstone and regular detailed geotechnical inspections will be required and such joints can lead to instability that may affect both temporary and permanent support of the cuts. We would expect that at least some rock bolts will be required to support the cuts. Given the inclined joints, poor quality shale bands and significant weaker zones indicated by the core loss, consideration could be given to the use of anchored soldier pile walls to support the cuts.

Permanent cantilevered retaining walls may be designed based on a conventional triangular earth pressure distribution using an active earth pressure coefficient, K_a, of 0.3 and a bulk unit weight of 20kN/m^3. Where walls are restrained from some lateral movements, we expect the basement walls will be propped by the floor slabs, a higher earth pressure coefficient, k, of 0.5 should be used. These coefficients assume horizontal backfill surfaces and where inclined backfill is proposed the coefficients would need to be appropriately increased, or the inclined backfill taken as a surcharge load.

All appropriate surcharge loads should be allowed for in the design. Full hydrostatic pressures should be considered unless measures are undertaken to provide complete and permanent drainage of the ground behind the wall. Caution will be required not to overcompact and cause excessive lateral pressures on the retaining walls. Only small rollers should be used for fill compaction adjacent to any retaining wall.

4.3 Footings

Since sandstone is expected within the excavations, all buildings should be supported entirely on footings founded within the sandstone bedrock to provide uniform support and reduce the risk of differential settlements.

Pad or strip footings may be used, but all footings must be founded below the extremely low to very low strength shale layer encountered in BH1 and the core loss zones encountered in BH2. Once the proposed basement levels are known and additional cored boreholes have been drilled, the likelihood that these weak zones will be encountered at or below the bulk excavation should be assessed to determine the geotechnical inspection and testing procedures required during construction. Depending on the bearing pressures adopted such testing may comprise spoon testing below the base of selected footings to determine if weak layers are present.

Provided footings are founded below the weak zones detailed above, we would expect an allowable bearing pressure of the order of 6000kPa would be appropriate. However, a comprehensive geotechnical investigation of the site and spoon testing during construction would be required to allow the use of such bearing pressures.

The adoption of a more conservative bearing pressure of 3500kPa or lower would result in less stringent further investigations and inspection requirements.

4.4 Basement Slabs

Basement slabs and drainage should be detailed in accordance with good engineering principles. A grid of subsoil drains will be required around and below the basement slabs. A sub-base layer of at least 100mm thickness of DGB20 should be used below all trafficable slabs and the layer should be compacted to at least 98% of SMDD. We note that the sub-grade preparation details must be confirmed following further detailed investigations; since if there will be fill remaining below the

basement slab, more detailed earthworks and possibly the use of a lean mix concrete subbase may be required.

5 GENERAL COMMENTS

The recommendations presented in this report include specific issues to be addressed during the construction phase of the project. In the event that any of the construction phase recommendations presented in this report are not implemented, the general recommendations may become inapplicable and Jeffery and Katauskas Pty Ltd accept no responsibility whatsoever for the performance of the structure where recommendations are not implemented in full and properly tested, inspected and documented.

The long-term successful performance of floor slabs and pavements is dependent on the satisfactory completion of the earthworks. In order to achieve this, the quality assurance program should not be limited to routine compaction density testing only. Other critical factors associated with the earthworks may include subgrade preparation, selection of fill materials, control of moisture content and drainage, etc. The satisfactory control and assessment of these items may require judgement from an experienced engineer. Such judgement often cannot be made by a technician who may not have formal engineering qualifications and experience. In order to identify potential problems, we recommend that a pre-construction meeting be held so that all parties involved understand the earthworks requirements and potential difficulties. This meeting should clearly define the lines of communication and responsibility.

Occasionally, the subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic

changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on our report. However, there may be design features we are not aware of or have not commented on for a variety of reasons. The designers should satisfy themselves that all the necessary advice has been obtained. If required, we could be commissioned to review the geotechnical aspects of contract documents to confirm the intent of our recommendations has been correctly implemented.

The offsite disposal of soil will most likely require classification in accordance with the Department of Environment & Climate Change (NSW) guidelines as Virgin Un-Excavated Natural Material (VENM), General Solid, Restricted Solid or Hazardous waste. We can complete the necessary classification and testing if you wish to commission us. As testing requires about seven days to complete, allowance should be made for such testing in the construction program unless testing is completed prior to construction. If contamination is found to be present then substantial further testing and delays should be expected. We strongly recommend this issue be addressed prior to commencement of excavation on site.

If there is any change in the proposed development described in this report then all recommendations should be reviewed.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. Copyright in this report is the property of Jeffery and Katauskas Pty Ltd. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other

warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

Should you have any queries regarding this report, please do not hesitate to contact the undersigned.

For and on behalf of
JEFFERY AND KATAUSKAS PTY LTD.

Daniel Bliss
Senior Associate

Reviewed by:

Peter Wright
Senior Associate

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

Ref No: 22371S

TABLE A
SUMMARY OF POINT LOAD STRENGTH INDEX TEST RESULTS

BOREHOLE NUMBER	DEPTH m	$I_{S(50)}$ MPa	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)
1	3.20-3.23	0.4	8
	3.61-3.65	0.4	8
	4.21-4.24	0.9	18
	4.60-4.64	2.1	42
	5.28-5.31	0.7	14
	5.82-5.85	0.2	4
	6.16-6.19	0.3	6
	6.72-6.76	0.04	<1
	7.31-7.34	1.5	30
	7.65-7.69	1.6	32
	8.27-8.31	1.0	20
	8.68-8.71	0.5	10
2	4.28-4.32	0.8	16
	6.20-6.24	1.4	28
	6.75-6.78	0.4	8
	7.22-7.27	0.8	16
	7.68-7.72	1.1	22
	8.22-8.25	1.0	20
	8.74-8.77	0.7	14
	9.30-9.33	1.3	26
	9.70-9.73	0.9	18
	10.29-10.32	1.4	28
	10.64-10.68	1.1	22

NOTES:

1. In the above table testing was completed in the Axial direction.
2. The above strength tests were completed at the 'as received' moisture content.
3. Test Method: RTA T223.
4. The Estimated Unconfined Compressive Strength was calculated from the point load Strength Index by the following approximate relationship and rounded off to the nearest whole number :
   U.C.S. = 20 $I_{S(50)}$

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 1 1/2

BOREHOLE LOG

Client: BREAKFAST POINT PTY LTD

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: LOT 7D, BREAKFAST POINT, NSW

Job No. 22371S **Method:** SPIRAL AUGER JK300 **R.L. Surface:** ≈ 13.5m

Date: 20-8-08 **Datum:** AHD

Logged/Checked by: J.C.C./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING					N = 22 1,11,11	0			FILL: Igneous gravel.	MC > PL			
						1			FILL: Silty sandy clay, low to medium plasticity, brown, with sandstone and igneous gravel, and brick fragments.				APPEARS WELL COMPACTED
					N = 7 1,3,4	2							APPEARS MODERATELY COMPACTED
						3		-	SANDSTONE: fine grained, light grey.	DW	L-M	-	LOW TO MODERATE 'TC' BIT RESISTANCE
						4			REFER TO CORED BOREHOLE LOG				
						5							
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. **1** 2/2

CORED BOREHOLE LOG

Client: BREAKFAST POINT PTY LTD

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: LOT 7D, BREAKFAST POINT, NSW

Job No. 22371S **Core Size:** NMLC **R.L. Surface:** ≈ 13.5m

Date: 20-8-08 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK300 **Bearing:** **Logged/Checked by:** J.C.C./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ (EL VL L M H VH EH)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		2							
		3		START CORING AT 3.08m					
90% RET-URN		4		SANDSTONE: fine to medium grained, light grey, with dark brown laminae, cross bedded at 10-20°.	SW	M			- XWS, 30mm.t
				SANDSTONE: fine to medium gained, red brown, with light grey and red laminae, cross bedded at 10-20°.	DW				
		5			DW-SW				
						L			- J, 50°, P, S
		6		SANDSTONE: fine to medium grained, light grey, with dark grey laminae, cross bedded at 10-20°.					
		7		SHALE: dark grey, with grey sandstone laminae.	DW	EL-VL			- Be, 15°, P, S
				SANDSTONE: fine to medium grained, light grey, with dark grey laminae, cross bedded at 10-20°.	FR	H			
		8							
		9		END OF BOREHOLE AT 8.98m					

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 2 1/3

BOREHOLE LOG

Client: BREAKFAST POINT PTY LTD

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: LOT 7D, BREAKFAST POINT, NSW

Job No. 22371S **Method:** SPIRAL AUGER JK300 **R.L. Surface:** ≈ 4.7m

Date: 20-8-08 **Datum:** AHD

Logged/Checked by: J.C.C./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING					N > 29 20/150m REFUSAL	0			FILL: Silty sandy clay, low to medium plasticity, with sandstone gravel and boulders.				APPEARS MODERATELY TO WELL COMPACTED
					N = 22 8,10,12	1							
						2		-	SANDSTONE: fine to medium grained, light grey.	XW-DW	VL	-	VERY LOW 'TC' BIT RESISTANCE WITH LOW TO MODERATE BANDS
						3			REFER TO CORED BOREHOLE LOG				
						4							
						5							
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

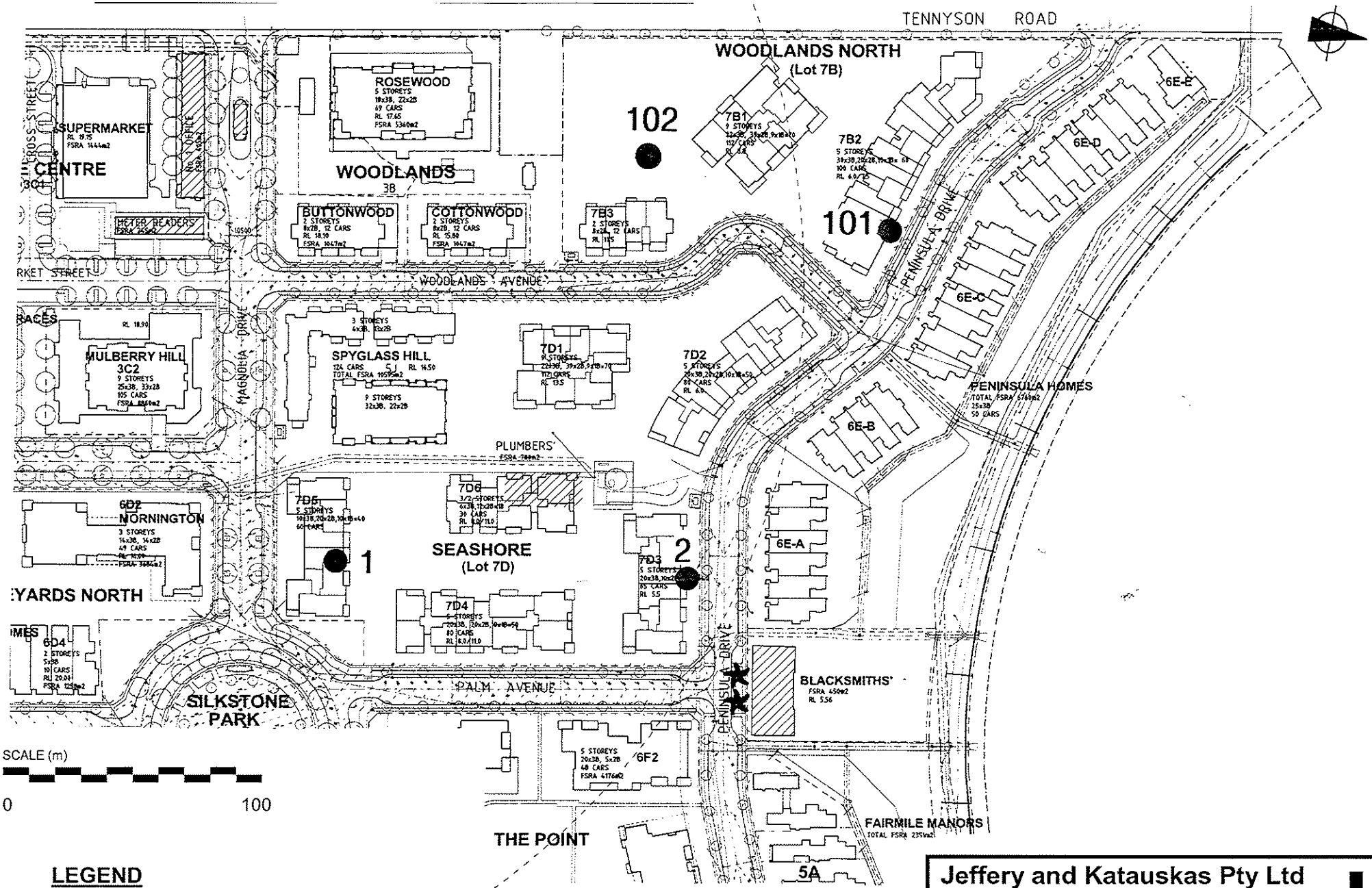
Borehole No. **2** 2/3

CORED BOREHOLE LOG

Client: BREAKFAST POINT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 7D, BREAKFAST POINT, NSW

Job No. 22371S **Core Size:** NMLC **R.L. Surface:** ≈ 4.7m
Date: 20-8-08 **Inclination:** VERTICAL **Datum:** AHD
Drill Type: JK300 **Bearing:** **Logged/Checked by:** J.C.C./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		2		START CORING AT 2.96m					
		3		CORE LOSS 1.15m					
		4		SANDSTONE: fine to medium grained, light grey.	SW	M	×		- J, 50°, P, S - J, 70°, P, S
		5		CORE LOS 1.4m					
		6		SANDSTONE: fine to medium grained, light brown and light grey, cross bedded at 10-20°.	SW	M-H	× × × × × ×		- CS, 2mm.t
		7							
		8							
		9							



LEGEND

● Drilling Rig Borehole Location

TEST LOCATION PLAN

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

Report No. 22371S **Figure No. 1**

GRAPHICAL BOREHOLE SUMMARY

Fill
Sandstone
Shale
Core Loss/ Empty
N SPT "N" VALUE
Nc SOLID CONE BLOW COUNTS PER 150mm

NOTE: REFER TO BOREHOLE LOGS

Scale: 1 : 200 (vert) ; NTS (horiz)

Jeffery and Katauskas Pty Ltd

Job No.: 22371S

Figure No.: 2

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
A.C.N. 003 550 801

VIBRATION EMISSION DESIGN GOALS

German Standard DIN 4150 – Part 3: 1986 provides guideline levels of vibration velocity for evaluating the effects of vibration in structures. The limits presented in this standard are generally recognised to be conservative.

The DIN 4150 values (maximum levels measured in any direction at the foundation, OR, maximum levels measured in (x) or (y) horizontal directions, in the plane of the uppermost floor), are summarised in Table 1 below.

It should be noted that peak vibration velocities higher than the minimum figures in Table 1 for low frequencies may be quite "safe", depending on the frequency content of the vibration and the actual condition of the structure.

It should also be noted that these levels are "safe limits", up to which no damage due to vibration effects has been observed for the particular class of building. "Damage" is defined by DIN 4150 to include even minor non-structural effects such as superficial cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls. Should damage be observed at vibration levels lower than the "safe limits" then it may be attributed to other causes. DIN 4150 also states that when vibration levels higher than the "safe limits" are present, it does not necessarily follow that damage will occur. Values given are only a broad guide.

Table 1 DIN 4150 – Structural Damage – Safe Limits for Building Vibration

Group	Type of Structure	Peak Vibration Velocity in mm/s			
		At Foundation Level At a Frequency of			Plane of Floor of Uppermost Storey
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design.	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use.	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 and 2 and have intrinsic value (eg buildings that are under a preservation order).	3	3 to 8	8 to 10	8

Note: For frequencies above 100 Hz, the higher values in the 50 Hz to 100 Hz column should be used.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
ABN 17 003 550 801

REPORT EXPLANATION NOTES

INTRODUCTION

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

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, the SAA Site Investigation Code. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (eg sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose	less than 4
Loose	4 – 10
Medium dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 – 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 – 400
Hard	Greater than 400
Friable	Strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'Shale' is used to describe thinly bedded to laminated siltstone.

SAMPLING

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

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained 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 used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All except test pits, hand auger drilling and portable dynamic cone penetrometers require the use of a mechanical drilling rig which is commonly mounted on a truck chassis.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as hard clay, gravel or ironstone, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock fragments. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses are determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the top end of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" – Test F3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N>30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

A modification to the SPT test is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as "N_c" on the borehole logs, together with the number of blows per 150mm penetration.

Static Cone Penetrometer Testing and Interpretation: Cone penetrometer testing (sometimes referred to as a Dutch Cone) described in this report has been carried out using an Electronic Friction Cone Penetrometer (EFCP). The test is described in Australian Standard 1289, Test F5.1.

In the tests, a 35mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between EFCP and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of EFCP values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a sliding hammer and counting the blows for successive 100mm increments of penetration.

Two relatively similar tests are used:

- Cone penetrometer (commonly known as the Scala Penetrometer) – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS1289, Test F3.2). The test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various Road Authorities.
- Perth sand penetrometer – a 16mm diameter flat ended rod is driven with a 9kg hammer, dropping 600mm (AS1289, Test F3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or 'reverted' chemically if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after stabilising at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg bricks, steel etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 *'Methods of Testing Soil for Engineering Purposes'*. Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty storey building). If this happens, the company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed that at some later stage, well after the event.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document *'Guidelines for the Provision of Geotechnical Information in Tender Documents'*, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. License to use the documents may be revoked without notice if the Client is in breach of any objection to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer.

SITE INSPECTION

The company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to

ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or

iii) full time engineering presence on site.

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS

SOIL


FILL


TOPSOIL


CLAY (CL, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CH)


SILTY CLAY (CL, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML)


PEAT AND ORGANIC SOILS

ROCK


CONGLOMERATE


SANDSTONE


SHALE


SILTSTONE, MUDSTONE, CLAYSTONE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

DEFECTS AND INCLUSIONS


CLAY SEAM


SHEARED OR CRUSHED SEAM


BRECCIATED OR SHATTERED SEAM/ZONE


IRONSTONE GRAVEL


ORGANIC MATERIAL

OTHER MATERIALS


CONCRETE

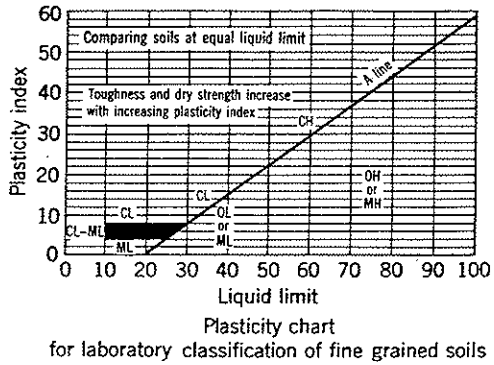

BITUMINOUS CONCRETE, COAL


COLLUVIUM

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

UNIFIED SOIL CLASSIFICATION TABLE

Field Identification Procedures (Excluding particles larger than 75 μm and basing fractions on estimated weights)						Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils: More than half of material is *larger* than 75 μm sieve size[b] (The 75 μm sieve size is about the smallest particle visible to naked eye)	Gravels: More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes			*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand*, gravelly; about 20% hard, angular gravel particles 12 mm maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	Use grain size curve in identifying the fractions as given under field identification Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than 75 μm sieve size) coarse grained soils are classified as follows: Less than 5% — *GW, GP, SW, SP* More than 12% — *GM, GC, SM, SC* 5% to 12% — *Borderline* cases requiring use of dual symbols $C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing			*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for *GW*
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)			*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)			*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits above "A" line, with *PI* greater than 7
	Sands: More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes			*SW*	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing			*SP*	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for *SW*
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)			*SM*	Silty sands, poorly graded sand-silt mixtures		Atterberg limits below "A" line or *PI* less than 5 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)			*SC*	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits below "A" line with *PI* greater than 7
Fine-grained soils: More than half of material is *smaller* than 75 μm sieve size	Identification Procedures on Fraction Smaller than 380 μm Sieve Size		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)				
	Silts and clays: liquid limit less than 50		None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)	
			Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity		
	Silts and clays: liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays		
			Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity		
Highly Organic Soils			Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils		



Plasticity chart
for laboratory classification of fine grained soils

NOTE: 1) Soils possessing characteristics of two groups are designated by combinations of group symbols (e.g. GW-GC, well graded gravel-sand mixture with clay fines).

2) Soils with liquid limits of the order of 35 to 50 may be visually classified as being of medium plasticity.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

ABN 17 003 550 801

LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record		Standing water level. Time delay following completion of drilling may be shown.
		Extent of borehole collapse shortly after drilling.
		Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	ES	Soil sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos screening.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'R' as noted below.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25	Vane shear reading in kPa of Undrained Shear Strength.
	PID = 100	Photoionisation detector reading in ppm (Soil sample headspace test).
Moisture Condition (Cohesive Soils)	MC>PL	Moisture content estimated to be greater than plastic limit.
	MC≈PL	Moisture content estimated to be approximately equal to plastic limit.
	MC<PL	Moisture content estimated to be less than plastic limit.
(Cohesionless Soils)	D	DRY - runs freely through fingers.
	M	MOIST - does not run freely but no free water visible on soil surface.
	W	WET - free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT - Unconfined compressive strength less than 25kPa
	S	SOFT - Unconfined compressive strength 25-50kPa
	F	FIRM - Unconfined compressive strength 50-100kPa
	St	STIFF - Unconfined compressive strength 100-200kPa
	VSt	VERY STIFF - Unconfined compressive strength 200-400kPa
	H	HARD - Unconfined compressive strength greater than 400kPa
	( )	Bracketed symbol indicates estimated consistency based on tactile examination or other tests.
Density Index/ Relative Density (Cohesionless Soils)		**Density Index (Id) Range (%)** / **SPT 'N' Value Range (Blows/300mm)**
	VL	Very Loose <15 0-4
	L	Loose 15-35 4-10
	MD	Medium Dense 35-65 10-30
	D	Dense 65-85 30-50
	VD	Very Dense >85 >50
	( )	Bracketed symbol indicates estimated density based on ease of drilling or other tests.
Hand Penetrometer Readings	300 250	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten carbide wing bit.
	T 60	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

ABN 17 003 550 801

LOG SYMBOLS

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered rock	XW	Rock is weathered to such an extent that it has "soil" properties, ie it either disintegrates or can be remoulded, in water.
Distinctly weathered rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly weathered rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh rock	FR	Rock shows no sign of decomposition or staining.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Journal of Rock Mechanics, Mining, Science and Geomechanics. Abstract Volume 22, No 2, 1985.

TERM	SYMBOL	Is (50) MPa	FIELD GUIDE
Extremely Low:	EL	0.03	Easily remoulded by hand to a material with soil properties.
Very Low:	VL	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.
Low:	L	0.3	A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
Medium Strength:	M	1	A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
High:	H	3	A piece of core 150mm long x 50mm dia. core cannot be broken by hand, can be slightly scratched or scored with knife; rock rings under hammer.
Very High:	VH	10	A piece of core 150mm long x 50mm dia. may be broken with hand-held pick after more than one blow. Cannot be scratched with pen knife; rock rings under hammer.
Extremely High:	EH		A piece of core 150mm long x 50mm dia. is very difficult to break with hand-held hammer. Rings when struck with a hammer.

ABBREVIATIONS USED IN DEFECT DESCRIPTION

ABBREVIATION	DESCRIPTION	NOTES
Be	Bedding Plane Parting	Defect orientations measured relative to the normal to the long core axis (ie relative to horizontal for vertical holes)
CS	Clay Seam	
J	Joint	
P	Planar	
Un	Undulating	
S	Smooth	
R	Rough	
IS	Ironstained	
XWS	Extremely Weathered Seam	
Cr	Crushed Seam	
60t	Thickness of defect in millimetres	

APPENDIX P: **TRAFFIC AND PARKING REPORT by Colston Budd Hunt & Kafes Pty Ltd**

CONSTRUCTION TRAFFIC MANAGEMENT PLAN by Rosecorp Management Services Pty Ltd

BREAKFAST POINT PTY LIMITED

TRAFFIC AND PARKING REPORT FOR PROPOSED BUILDING 7D5, BREAKFAST POINT

DECEMBER 2010

COLSTON BUDD HUNT & KAFES PTY LTD
ACN 002 334 296
Level 18 Tower A
Zenith Centre
821 Pacific Highway
CHATSWOOD NSW 2067

Telephone: (02) 9411 2411
Facsimile: (02) 9411 2422
Email: cbhk@cbhk.com.au

REF: 8119

TABLE OF CONTENTS

1. INTRODUCTION 1
2. IMPLICATIONS OF PROPOSED DEVELOPMENT 2

1. INTRODUCTION

1.1. Colston Budd Hunt & Kafes Pty Ltd has been retained by Breakfast Point Pty Limited to assess the traffic and parking aspects of the proposed Building 7D5 in at Breakfast Point. Breakfast Point is located on the southern side of the Parramatta River, as shown on Figure 1.

1.2. Breakfast Point is basically a residential development with some relatively minor components of other uses. An overall Concept Plan has previously been approved for development at Breakfast Point. We previously prepared a report[1] in relation to the approved Concept Plan.

1.3. A Project Application is now being lodged for Building 7D5. This building will include 60 apartments with basement parking below the building.

1.4. The traffic and parking aspects of the proposed Building 7D5 are assessed in the following chapter.

[1] Review of Transport Aspects of Revised Concept Plan for Breakfast Point, May 2010.

2. IMPLICATIONS OF PROPOSED DEVELOPMENT

2.1. Our assessment of the traffic and parking aspects of the proposed Building 7D5 is set down through the following sections:

- site location and road network;
- previous studies;
- proposed development;
- public transport;
- parking provision;
- access, servicing and internal layout;
- external traffic; and
- summary.

Site Location and Road Network

2.2. The site of proposed Building 7D5 is on the northern side of Magnolia Drive, west of Rosewater Circuit and Palm Avenue. These streets provide access to existing residential development in Breakfast Point. They provide for one traffic lane and one parking lane in each direction, with on-street parking provided in indented parking bays.

2.3. Magnolia Drive connects back to Tennyson Road. Palm Avenue also connects, via Peninsula Drive, back to Tennyson Road. Intersections within Breakfast Point are unsignalised, and are generally priority or sign controlled.

Previous Studies

2.4. The approved Concept Plan for Breakfast Point (Breakfast Point Concept Plan 2005, with amendments approved 18 October 2010) envisaged 60 residential dwellings in Building 7D5, including 26 one bedroom, 29 two bedroom and five three bedroom apartments.

2.5. Our report submitted with the approved Concept Plan included the following:

In summary, the proposed concept plan amendments are the same as or similar to previously approved developments in terms of their external traffic implications and site access. The internal road layout is not proposed to change. Provision of parking, public transport and service vehicles is also the same as in previous approvals.

Proposed Development

2.6. The Project Application seeks development consent for Buildings 7D5. The building will include 60 apartments, including 30 one bedroom and 30 two bedroom apartments. Two levels of basement parking are proposed, with 75 parking spaces.

Public Transport

2.7. The main spine road and the east-west spine road within Breakfast Point are designed to accommodate bus services. Pedestrian paths are provided throughout the development, including road narrowings at intersections (to reduce pedestrian crossing distances) and pram ramps. In the low speed, low traffic volume environment within Breakfast Point, bicycles are able to travel on-

street, consistent with the principles identified in AMCORD. Bicycle racks and storage areas are proposed under the building.

Parking Provision

2.8. The approved Concept Plan included 80 resident spaces and on-street visitor parking for the Silkstone Precinct. This approved provision was on the following basis:

- one space per one bedroom apartment;
- 1.5 spaces per two bedroom apartment;
- two spaces per apartment with three or more bedrooms; and
- one space per five dwellings for visitors.

2.9. With 30 one bedroom apartments and 30 two bedroom apartments proposed, the development would require 75 resident spaces and 12 visitor spaces.

2.10. The proposed development includes 75 resident and 12 on-street visitor parking spaces in accordance with the approved Concept Plan. Parking provision is therefore considered appropriate.

Access, Servicing and Internal Layout

2.11. Vehicular access to basement parking for the building is proposed to be provided from Rosewater Circuit. A combined entry/exit driveway is proposed.

2.12. The width of the proposed driveway will be provided in accordance with the Australian Standard for Parking Facilities (Part 1: Off-street car parking), AS 2890.1:2004, for a car park of the size and type proposed.

2.13. Garbage collection is proposed to occur on-street. The internal road layout within Breakfast Point has been provided to accommodate rigid trucks for garbage collection.

2.14. Within the basement car park, ramp grades and transitions will be provided in accordance with AS 2890.1:2004. Resident parking spaces will be a minimum of 5.4 metres long by 2.4 metres wide, with 5.8 metre wide circulation aisles and columns set back 750 mm from the edge of the aisle. Height clearance will be a minimum of 2.2 metres. These dimensions are considered appropriate, being in accordance with AS 2890.1:2004.

External Traffic

2.15. In relation to external traffic, these aspects were addressed at length at the time of preparation of Concord Local Environmental Plan No. 91 and previously approved masterplans (prior to the approved Concept Plan). The external works were determined by Council's resolution based on the consultant studies prepared at the time.

2.16. As previously discussed, the approved Concept Plan envisaged 60 residential dwellings in Building 7D5 (26 one bedroom, 29 two bedroom and five three bedroom dwellings).

2.17. The traffic analyses undertaken by ourselves at the time of the preparation of Concord LEP No. 91 adopted a set of traffic generation rates for the various land uses. The rates were agreed with Council's consultants, and related to traffic that was expected to be generated external to the development area during the afternoon peak hour. The adopted rates were as follows:

- 0.43 vehicles per hour per dwelling for residential dwellings up to two bedrooms;

- 0.55 vehicles per hour per dwelling for residential dwellings with three or more bedrooms.

2.18. Application of these rates to development in Building 7D5 approved under the Concept Plan results in an estimated maximum afternoon peak hour generation of some 26 vehicles per hour two-way (sum of both directions).

2.19. The Project Application, with 60 one/two bedroom apartments, would also have an external traffic generation of some 26 vehicles per hour two-way during afternoon peak hours.

2.20. Therefore, traffic generation of the proposed development would be similar to that approved in the Concept Plan. The current proposal would therefore have the same implications as the approved development. The proposed development does not therefore require changes to the agreed external works or result in any change in the external traffic implications of the development.

Summary

2.18 In summary, the main points relating to the traffic and parking implications of the proposed Building 7D5 in Breakfast Point are as follows:

i) the previously approved Concept Plan for Building 7D5 envisaged a similar scale of development to that now proposed in the Project Application;

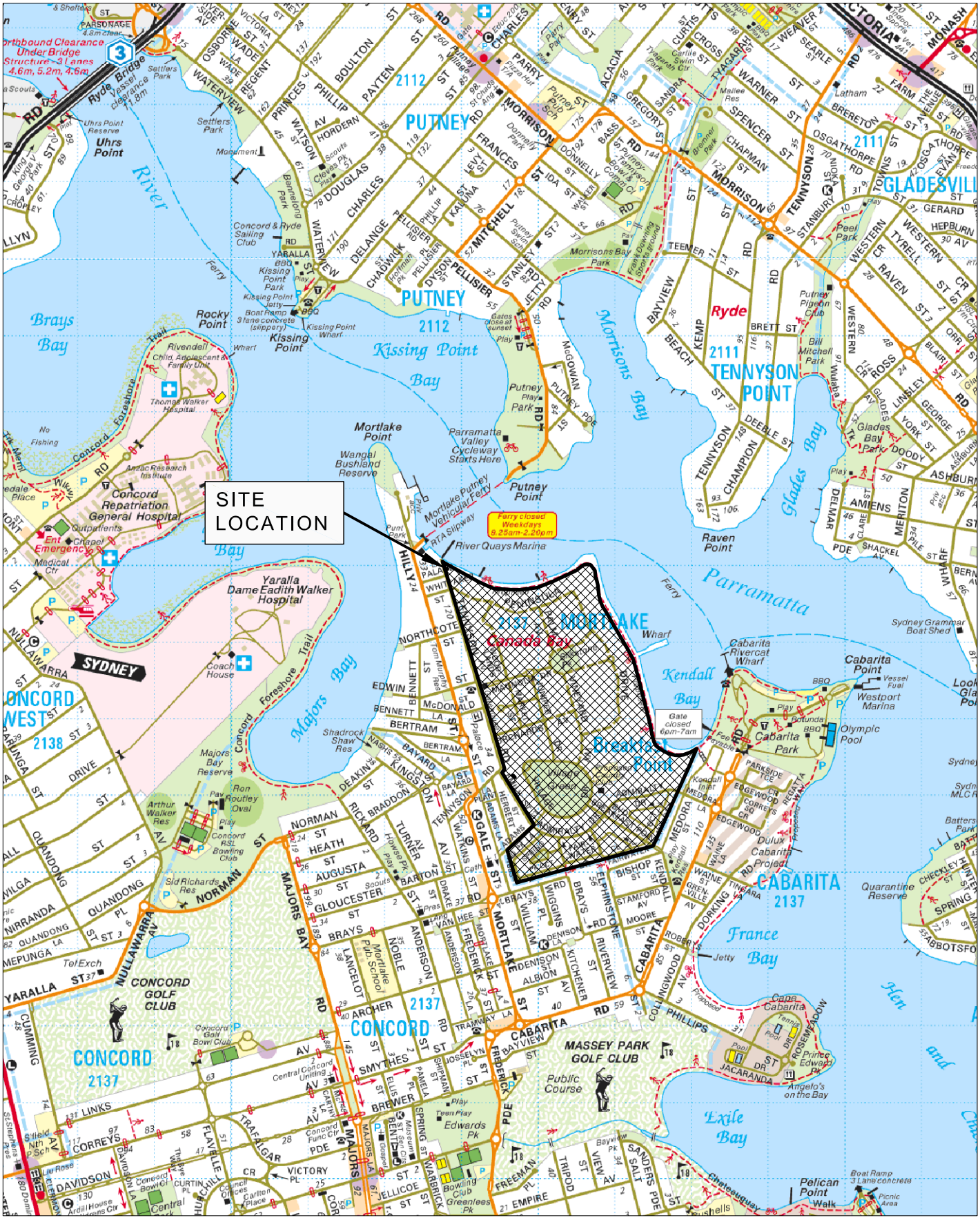
ii) the proposed parking provision is in accordance with the approved Concept Plan, and is considered appropriate;

iii) access and internal layout are considered appropriate;

iv) traffic generation of the proposed development would be similar to that approved in the Concept Plan;

v) the proposed development would therefore have similar implications as the approved development; and

vi) the proposed development does not therefore require changes to the agreed external works or result in any change in the external traffic implications of the development.



Location Plan

Colston Budd Hunt & Kafes Pty Ltd

DRAWN BY CBHK Pty Ltd_hs Ref: 7845 06 December 2010

Figure 1

BREAKFAST POINT

CONSTRUCTION TRAFFIC MANAGEMENT PLAN

For

7D5 Seashores Precinct

Part Lot 26 in DP 270347

ROSE

Creating a quality way of living

TABLE OF CONTENTS

1.0 Vehicular Traffic..... 3

Attachments

"A" Breakfast Point – Designated Heavy Vehicle Routes..... 4

"B" Breakfast Point –Vehicle Site Access Routes..... 5

1.0 Vehicle Traffic

There will be heavy vehicles frequently arriving and departing from the site each day. These vehicles will be instructed to travel on the route prescribed in attachment "A". The Consent Authority must approve any variation to the prescribed route prior to travel occurring. Any heavy vehicles not complying with the prescribed route will be banned from site.

Entry to the Breakfast Point Site will be made via the nominated entry point as noted on the designated heavy vehicle route (Attachment "A"). The Contractor is to ensure that all vehicles entering and exiting Breakfast Point via this designated route obey all road rules.

To access the Site vehicles will travel through Breakfast Point on Open Access Ways (Attachment "B").

All vehicles transporting soil materials will ensure that their load is covered by means of a tarpaulin or similar impervious material. The vehicle driver will take all precautions to prevent excess dust or dirt particles depositing on the roadway during travel to and from the site. The respective building and civil contractors will induct all site staff into the above procedures and will monitor trucks exiting the site to ensure they are met.

All site personal and delivery vehicle drivers will be reminded not to exceed the speed limits identified by the RTA when traveling on public roads.

Vehicle operation to and from the site shall do so in a manner which does not create unreasonable or unnecessary noise or vibration.

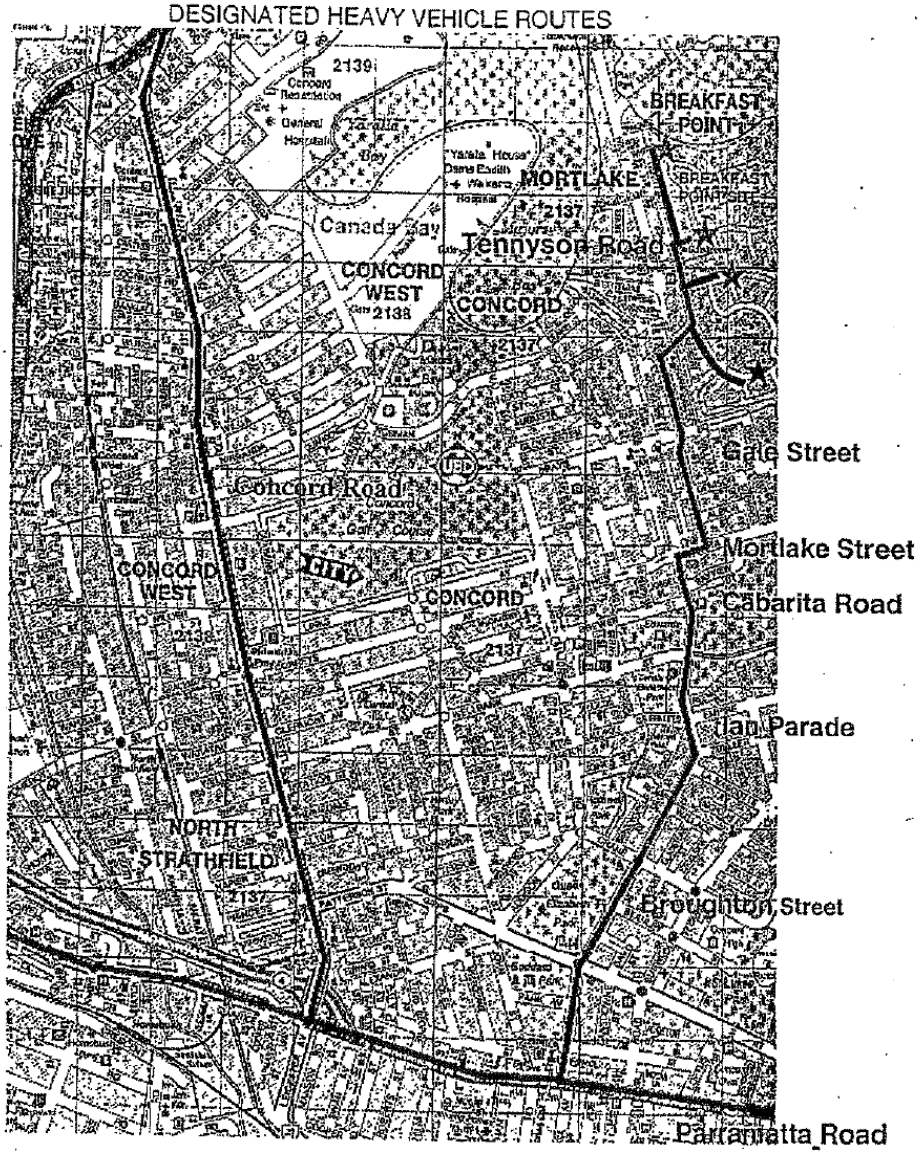
Attachments

"A" Breakfast Point - Designated Heavy Vehicle Routes

Attachment 'A'

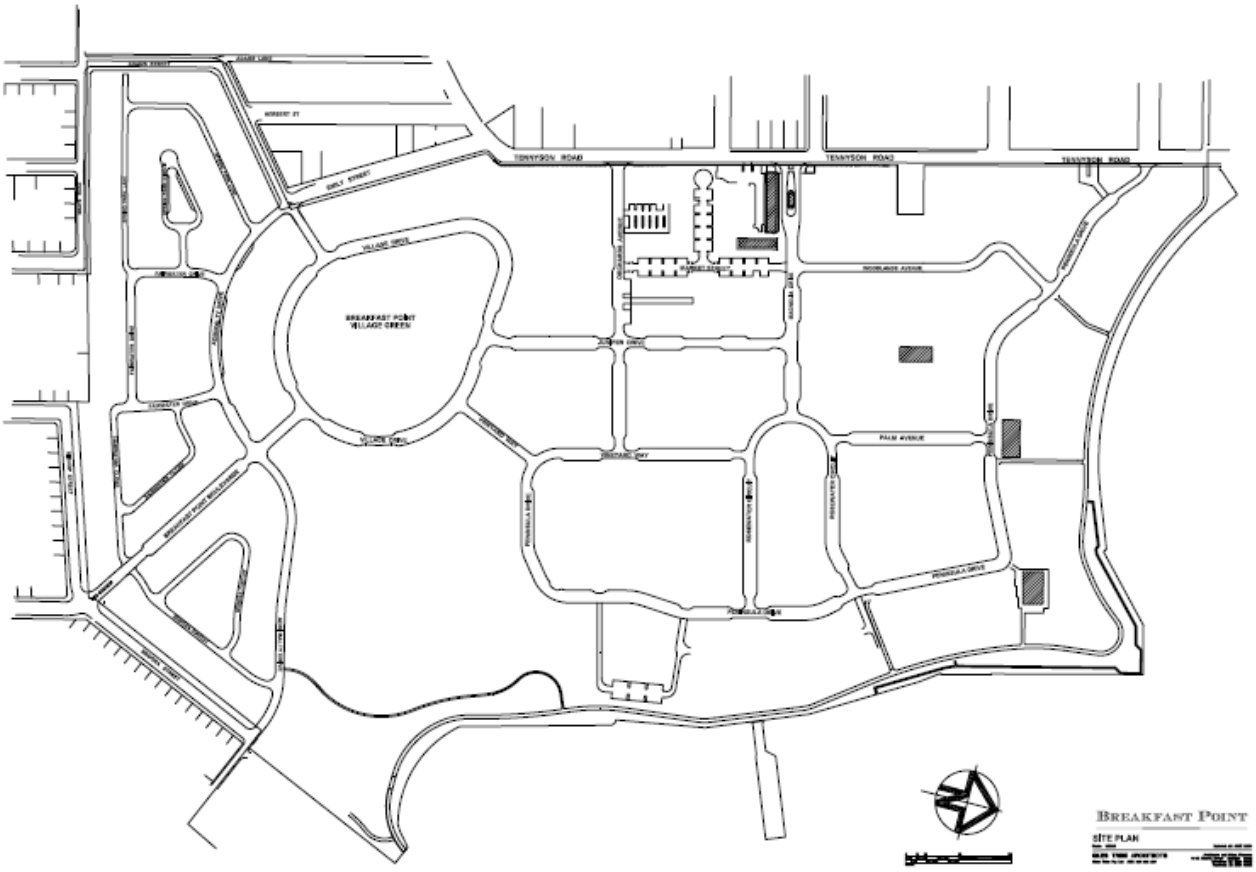
Breakfast Point – Tennyson Road, Mortlake NSW 2137

DESIGNATED HEAVY VEHICLE ROUTES



Blue Line shows Designated Heavy Vehicle Route Red Star denotes site entry and exit points

"B" Breakfast Point –Vehicle Site Access Routes



APPENDIX Q: ACCESS REPORT by Access Associates

Rose Architectural Design
51 Riley Street
Woolloomooloo NSW 2011

14 December 2010
Job No: A10121

Att: Mr Anthony Occhiuto,

Dear Anthony,

PROPOSED APARTMENT BUILDING – 7, 9 & 11 MAGNOLIA DRIVE, BREAKFAST POINT

Review of compliance for access for people with a disability

The purpose of this letter is to confirm the proposed residential development at Lot 7D5: 7, 9 and 11 Magnolia Drive, Breakfast Point complies with all relevant access provisions for people with disabilities to meet the requirements of the:

- Building Code of Australia (2010/2011) parts D3 and E3.6
- AS1428.1 (2001) Design for access and mobility Part 1: General requirements for access-New building work
- AS1428.1 (2009) Design for access and mobility Part 1: General requirements for access – New building work.
- AS1428.2 (1992) Design for access and mobility Part 2: Enhanced and additional requirements – buildings and facilities.
- AS2890.6 (2009) Parking Facilities - Off-street parking for people with disabilities
- AS1428.4 (1992) Design for access and mobility Part 4: Tactile ground surface indicators for the orientation of people with vision impairment. With reference to AS1428.4.1 (2009)
- AS1735.12 (1999) Lifts, escalators and moving walks Part 12: Facilities for persons with disabilities
- Disability Discrimination Act's obligations of equitable and dignified access for people with a disability.
- Reference to 2009 editions of AS1428 and Disability (Access to Premises – Buildings) Standards 2010
- City of Canada Bay Council requirements for accessibility

Access Associates Sydney have consulted with the design team and reviewed the following PDF copies of drawings received at this office on 30 November 2010 provided by Rose Architectural Design.

Dwg	Revision	Title	Scale	Date
DA-01	A	Site Plan	1:500@A3	Nov 2010
DA-02	A	Basement Level 1	1:100@A3	Nov 2010
DA-03	A	Basement Level 2	1:100@A3	Nov 2010
DA-04	A	Ground Floor Plan	1:100@A3	Nov 2010
DA-05	A	Level 2-5 Floor Plan Typical	1:100@A3	Nov 2010

access associates sydney

NSW Office
L3 51 Rawson Street Epping NSW 2121
PO Box 671 Epping NSW 1710
t: +61 2 9868-6923
f: +61 2 9868-6924

a trading name of
midson group pty ltd
ABN 67 107 976 312
w: www.midsongroup.com.au
e: enquiries@midsongroup.com.au

QLD Office
PO Box 1290
Noosaville BC QLD 4566
t: +61 7 5471-1107
f: +61 7 5471-1107

Introduction
Lot 7D5: 7, 9 and 11 Magnolia Drive, Breakfast Point is proposed to include 2 levels of basement parking for use by residents and 5 levels of apartments. The main pedestrian entry on Magnolia Drive is centrally located within the block and linked to the footpath via a covered walkway (1:20 gradient). The footpath on Magnolia drive is indicated to include circulation space to facilitate access and includes kerb ramps adjacent to Rosewater Circuit which facilitate functional accessible links to the open spaces within the Breakfast Point development. On street parallel parking is indicated in Magnolia Drive.

Review of Access provisions
Appropriate access for all persons is provided at the Part 3A Application stage for the residential development Lot 7D5: 7, 9 and 11 Magnolia Drive, Breakfast Point via continuous accessible paths of travel and circulation spaces complying with AS1428.1 (2009) to the pedestrian entrance, principal entry doorway and all common use areas within the development to meet the BCA 2010 and draft BCA 2011 and intent of the relevant Canada Bay Councils requirements for accessibility as detailed following:

- An accessible path of travel complying with AS1428.1 (2009) is indicated from the property boundary on Magnolia Drive to principal pedestrian entry and letterboxes via a paved walkway (gradient 1:20).

- Egress is indicated via doorways on the eastern and western sides of the principal entry doorway. Stairs are indicated to link the egress doorway on the western side with the footpath on Magnolia Drive.
  Recommendation:
  (i) Ensure in ongoing design that the stairs which are not fire isolated are provided with handrails on both sides and tactile ground surface indicators (tgsi) to meet the requirements of the BCA 2010 and draft BCA 2011 part D3.8 and AS1428.1 (2009) clause 11.1(a)(h) and figure 26 (B).

- An accessible path of travel including clear door opening and circulation space complying with AS1428.1 (2009) is indicated at the principal entry doorway.

- An accessible path of travel including circulation spaces complying with AS1428.1 (2009) is indicated for the lobby areas of all residential levels.

- An accessible path of travel including circulation spaces complying with AS1428.1 (2009) is indicated to the garbage/recycle room on Basement Level 1. There are no other indicated common use areas in this residential development.
  Recommendation:
  (i) Ensure in ongoing design that the active leaf of the double doors to the garbage/recycle room includes a clear door opening to comply with AS1428.1 (2009) clause 13.3 and figure 31.

- An accessible path of travel is indicated to the lift providing complying vertical access to all building levels.
  Recommendation:
  (i) Ensure in ongoing design that the passenger lift includes features to fully comply with AS1735.12 and BCA E3.6 including provision of a handrail and call & control

buttons meeting the requirements for tactile and Braille and luminance contrast. The inclusion of auditory announcement in lift cars for travel over 3 levels is required. To meet the proposed changes to the BCA 2011 lift cars travelling more than 12m are to include a lift car 1400mm x 1600mm.

Consequently, it is our opinion that with the inclusion of the recommendations as detailed in this report, the proposed development at Lot 7D5: 7, 9 and 11 Magnolia Drive, Breakfast Point will meet the requirements for the Part 3A application and the objectives of the Disability Discrimination Act through its intention to provide non - discriminatory access and the equitable and dignified use of all areas for use in common by the residents.

I also certify that I am an appropriately qualified and competent person practising in the relevant area of work. I have recognised relevant experience in the area of work being certified. My company is holding appropriate current insurance policy to the satisfaction of the building owner or the principal authorising the installation work being certified.

Yours faithfully
access associates sydney

Jenny Muir

Qualifications: Bachelor of Occupational Therapy, University of Queensland 1978
Affiliations: Accredited Occupational Therapist by OT Australia (No: 201169).
Accredited Member Association of Consultants in Access Australia (No: 98)
Affiliate member Australian Institute Building Surveyors (No: 4228)
OHS Construction Induction training Certificate CG100925534SEQ1

APPENDIX R: SITE SURVEY INFORMATION (Refer to separate document)

EXTRACT from SUBDIVISION PLAN by DENNY LINKER Pty Ltd

AERIAL PHOTOGRAPH WITH CONTOUR OVERLAY

APPENDIX S: EROSION AND SEDIMENT CONTROL PLAN by SEMF Pty Ltd (Refer to separate document)