



**Environmental - Remediation - Engineering - Laboratories - Drilling**

3<sup>rd</sup> May 2013

Mr Mark Sykes  
EG Funds Management  
By Email: [msyke@egfunds.com](mailto:msyke@egfunds.com)

Dear Sir,

**Re: Summer Hill Stage 1 – Groundwater Management**

I refer to your correspondence with the Department regarding potential issues pertaining to groundwater management at the subject Summer Hill property.

The department provided a request for further information being either:

- a) A groundwater assessment, or
- b) Confirmation on the depth of excavation required for footings and a report/statement indicating an assessment is not required.

This letter provides information regarding item b) of the subject.

A geotechnical assessment and environmental assessment were conducted on the subject property. The geotechnical assessment has been provided as reference with bore logs indicating the following:

- BH1 found rock at 4m then rock cored with no groundwater found to the borehole termination
- BH2 found rock at 1.0m then rock cored with no groundwater found at the borehole termination
- BH3 found rock at 1.6m then rock cored with no groundwater found to the borehole termination
- BH4 found rock at 2.6m then rock cored with no groundwater found to the borehole termination
- BH5 found rock at 4.1m then rock cored with no groundwater found to the borehole termination
- BH6 found rock at 4.3m then rock cored with groundwater found at a depth of 3.8m

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A borehole plan and site plan indicates that the only location where groundwater was found was at Borehole location 6. The site plans indicate that the Stage 1 area where BH1, BH2 and BH5 are located has a proposed single level basement. This basement level is founded at a depth of at most 3m below ground surface with an average of 2.5m (plans attached). As the basement excavation does not intersect any groundwater and in the absence of groundwater shown from the logs taken, a detailed groundwater assessment would not be warranted as the groundwater would not be disturbed during site works or foundation works. It should be noted that the closest location where groundwater was found is at location BH6. The depth of groundwater was found at 3.9m and it is considered that this is rather water seepage as a perched water layer on top of the sandstone bedrock formation.

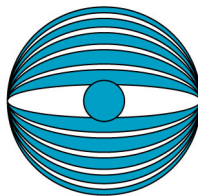
To support these findings, the detailed environmental investigation undertaken (extract attached of site plan) showed that groundwater found was not located within the Stage 1 area. The DESA boreholes located within the Stage 1 area are BH1, BH28, BH2, BH29, BH3, BH8, BH30, BH8, BH31 and BH13. None of these boreholes showed groundwater to depths upto 3m bgl, although only boreholes BH29 & BH30 extended below 3m (see logs attached).

We are happy to provide further information on any aspect of the geotechnical report as required.

For and on behalf of  
**Aargus Pty Ltd**

A handwritten signature in black ink, appearing to be 'Nick Kariotoglou', written in a cursive style.

**Nick Kariotoglou**  
Managing Director



**Aargus**  
AUSTRALIA

Environmental - Remediation - Engineering - Laboratories - Drilling

## **EG FUNDS MANAGEMENT**

### **PROPOSED MIXED USE DEVELOPMENT**

#### **ALLIED FLOUR MILLS SITE**

**NOS. 2-32 SMITH STREET AND NOS. 16-32 EDWARD STREET**

**SUMMER HILL**

### **GEOTECHNICAL INVESTIGATION REPORT**

Report No: SE07146-A AB:NK

Date: 17<sup>th</sup> February 2011

Client: EG Funds Management

Level 14, 345 George Street

SYDNEY NSW 2000

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Environmental - Remediation - Engineering - Laboratories - Drilling

SE07146-A AB:NK

17<sup>th</sup> February 2011

EG Funds Management  
Level 14, 345 George Street  
SYDNEY NSW 2000

Dear Mr Syke,

**RE: Proposed Mixed Use Development – Allied Flour Mills Site – Nos. 2-32  
Smith Street and Nos. 16-32 Edward Street, Summer Hill**

As requested, Brink & Associates' Geotechnical Engineers visited the Allied Flour Mills Site at Nos. 2-32 Smith Street and 16-32 Edward Street in Summer Hill on Monday 11<sup>th</sup>, Tuesday 12<sup>th</sup>, and Thursday 14<sup>th</sup> of March 2008 in order to undertake a Geotechnical Investigation. The purpose of the investigation was to assess the site's surface and subsurface conditions in order to determine the suitability of the site for a proposed mixed use development and to provide recommendations from a geotechnical viewpoint for the design and construction of the proposed development.

This report presents the details and results of the investigation and assessment and provides recommended geotechnical design parameters relevant to the project's structural design and structural works.

For and on behalf of

**Aargus Engineering Pty Ltd**

**Anthony Bennett**

Geotechnical Engineer

**Reviewed by**

**Nick Kariotoglou**

Principal & Managing Director

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## **Executive Summary**

This report has been prepared for EG Funds Management detailing the results of a Geotechnical Investigation at the Allied Flour Mills Site at Nos. 2-32 Smith Street and Nos. 16-32 Edward Street in Summer Hill.

We understand it is proposed to construct a mixed use residential and commercial development at the site located within the eastern part of Summer Hill, on the south-eastern corner of the intersection between Smith Street and Edward Street, and covering an area of approximately 25,000m<sup>2</sup>.

The geotechnical investigation for the proposed development comprised the drilling of six (6) boreholes through the subsurface soils and the upper reaches of the underlying bedrock down to depths of between 0.8m and 7.3m below existing ground surface levels. In-situ testing of the subsurface soils and laboratory testing of the subsurface soils and rock at our NATA accredited laboratory was undertaken to determine the condition of the soil and rock and to determine suitable design parameters.

The subsurface soil profile within the site consists predominantly of moderately to well compacted fill underlain by stiff to very stiff alluvial clay in the east and very stiff alluvial / residual clay in the west, all overlying residual sandy clays / clayey sands. The fill profile was deepest in the north-eastern corner of the site where the Hawthorne Canal has been backfilled. The depth of the alluvium decreased on increasing distance from the canal. The thickness of the residual soil profile varied between 0.5m and 1.9m, though increasing generally from south to north. Sandstone bedrock was encountered at depths increasing from between about 1.6m (BH3) to 2.4m (BH4) below ground surface levels in the southern area of the site to between about 3.8m (BH1) and 4.5m (BH5) in the northern area of the site. The near-horizontally bedded coarse grained sandstone was found to be distinctly to moderately weathered, containing some cross-bedding, weaker bedding layers and clay seams. A few low angle joints and joint sets were identified within the upper 2m of the bedrock.

Ground water seepage was encountered within one borehole (BH6) only, at a depth of about 3.9m below existing ground surface levels, indicating a possible groundwater table at that location. This location is noted at the centre of the site where no basement excavations are proposed. All basements are also single basements and are not proposed to be excavated more than 3 metres.

The laboratory test results indicate the residual and alluvial materials to be of medium to high plasticity, to have a typical CBR value of 6% and to be non-aggressive, and the rock to be of low to medium strength increasing to medium to high with depth.

We expect that the fill, alluvium and residual clays / sands will be readily excavated by conventional earthworks equipment, such as bulldozers and excavators but that heavy ripping and/or vibratory rock breaking techniques will be required for the sandstone bedrock. Vibration control will be necessary to minimise the impact of the vibrations resulting from the excavation on adjacent structures.

The majority of material at the site may be reused as fill material at the site subject to confirmation by a Geotechnical Consultant at the time of excavation.

Shallow and deep footings are considered suitable for the proposed development.

Excavation retention will not be required, particularly where the excavation extends below the zone of influence of adjacent structures. As no structures are proposed near or adjoining existing dwellings, these should only be considered if any changes to the drawings are proposed. Retaining structures, if required, must be engineer designed. Allowance for isolated rock bolts to retain potential block failure should be made where required. Earth pressures resulting from water ingress should be allowed for in the retaining wall design, unless effectively drained.

Based on the results of the investigation and laboratory testing, we consider the site to be suitable for the proposed development.

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## **1.0 PROPOSED DEVELOPMENT**

The design details for the proposed development are presented in the Hassell Summer Hill Flour Mill Site Concept Plan shown in Appendix E. It is comprised of 280-300 residential dwellings and 2,500-2,800m<sup>2</sup> of retail space and 3,500-4,000m<sup>2</sup> of commercial space.

## **2.0 LOCATION**

The subject site is located within the eastern part of Summer Hill. More specifically, it is located on the south-eastern corner of the intersection between Smith Street and Edward Street, approximately 500m south-east of Summer Hill train station.

## **3.0 FIELDWORK**

In order to determine the geotechnical condition of the subsurface materials at the site, the fieldwork component of our Geotechnical Investigation comprised the following:

- A detailed walk-over inspection of the site.
- The drilling of six (6) boreholes at various locations across the site. The boreholes were drilled using a truck-mounted drilling rig initially to V-bit refusal and then continued to TC-Bit refusal in bedrock at depths of between 1.6m (BH3) and 4.3m (BH6) below existing ground surface levels. Three boreholes (BH1, BH3 & BH6) were advanced by an additional 3.0m within the bedrock using NMLC rock coring techniques.
- Standard Penetrometer Tests (SPT) were performed at regular intervals during borehole excavation in order to determine the strength of the subsurface soils.
- All collected rock core samples were carefully boxed and transported to our NATA accredited laboratory for logging and testing.
- Three (3) disturbed bulk samples were collected for submission to our NATA accredited laboratory in order to determine a typical CBR value and the Atterberg Limits of the soils.
- Five (5) disturbed samples were collected for submission to an external NATA accredited laboratory in order to assist in an exposure classification for the design of concrete or steel structures.



The approximate test locations have been shown on the site sketch referenced Drawing No. S07146-1.in Appendix D.

#### **4.0 SITE CONDITIONS**

##### **4.1 Site Description**

The site is irregular in shape, covering an area of approximately 24,738m<sup>2</sup>. It has a grade of between approximately 2° and 5° down towards the east. Site features at the time of our investigation include:

- A three storey brick office building located in the north-west corner of the site.
- Demountable offices located in the north to central area of the site.
- A brick flour mill building located on the eastern side of the site.
- Wooden silos located south of the flour mill.
- The general store building of steel frame construction and aluminium cladding located to the south of the wooden silos.
- Four large concrete bulk wheat storage silos located to the south of the general store building.
- Rail wagon unloading facilities located on the south-eastern side of the site.
- Six concrete bulk wheat storage silos located near the centre of the site.
- A workshop of steel frame construction and aluminium cladding located in the southern area of the site.
- Three storage buildings of steel frame construction with fibro cladding, located in the southern corner of the site.
- A brick amenities building with aluminium roofing located between the merchant shed and flour silos.
- Other minor buildings on the site include the office and weigh bridge, main sprinkler pump house, the hydrant pump house, gardeners shed and flammable liquids storage shed.

The site is bound by Smith Street to the north and Edward Street to the west. Hawthorne Canal and the industrial freight line bound the site to the east. The

neighbouring properties surrounding the subject site are occupied by a mix of single and double storey brick houses and light industrial units.

#### **4.2 Topography**

The subject property is surrounded by moderately undulating land, typical of the area, which exhibits grades of between 1° to 3° sloping down towards the north-east.

#### **4.3 Regional Geology**

Reference to the Sydney 1:100,000 Geological Series Sheet 9130 (Edition 1) 1983, indicates the western part of the site to be underlain by Ashfield Shale (Rwa) of Middle Triassic Age. Ashfield Shale is characterised by black to dark grey shale and laminite, which upon weathering typically forms medium to high plasticity residual silty clays and clays. The Ashfield Shale is typically underlain by Hawkesbury Sandstone.

The eastern area of the site has been indicated to be underlain by either Quaternary Period alluvial soils comprising silty to peaty quartz sands and clays or man made fill.

#### **4.4 Subsurface Conditions**

The subsurface soils encountered during drilling confirm the eastern part of the site to have been filled and to be underlain by alluvial soils while the western part of the site is underlain by medium to high plasticity clays indicative of an extremely weathered Ashfield Shale profile. However, considering the presence of sandy clays and clayey sands underlying these surface materials and the presence of Sandstone bedrock throughout the site, we infer the site to be likely located at the transition between the Ashfield Shale and the underlying Hawkesbury Sandstone.

The results of the borehole excavations have been presented as Engineering Borehole Logs, provided in Appendix A, and have been summarised as follows:

PAVEMENT:                      Concrete,    Asphaltic    Concrete,    DGB,    Crushed  
   Sandstone, to depths of between 0.2m and 0.4m below  
   existing ground surface levels in boreholes BH2 to

BH6,

or

**TOPSOIL:** Clayey SILT, medium plasticity, brown, to a depth of 0.2m below existing ground surface levels in borehole BH1 only, overlying

**FILL:** Silty CLAY, CLAY, Sandy Gravelly CLAY, medium to high plasticity, orange/brown, pale brown, red/orange, grey, moderately to well compacted, to depths of between 0.8m (BH2) and 2.8m (BH6) below existing ground surface levels, overlying

**ALLUVIUM / RESIDUAL:** CLAY, Sandy CLAY, Clayey SAND, low to medium plasticity clay, coarse grained sand, white, brown, grey, mottled orange/red and white, mottled red and grey, to depths of between about 1.6m (BH3) and 4.3m (BH5) below existing ground surface levels, overlying

**BEDROCK:** SANDSTONE, coarse grained, distinctly weathered becoming moderately weathered and medium to high strength, yellow, orange, white, grey.

SPT testing indicated the fill material to be moderately to well compacted and the alluvium/residual material to be in a stiff to very stiff condition. V-bit and TC-bit refusal were encountered simultaneously at depths indicated in Table 1.

**Table 1: V-Bit/TC-Bit Refusal Depths**

Refusal	Depth (m) Below Existing Ground Surface Levels					
	BH1	BH2	BH3	BH4	BH5	BH6
<b>TC-Bit</b>	3.8	N/A*	1.6	2.6	4.1	4.3

\*BH2 was terminated near ground surface levels within an unknown concrete substructure not detailed on any drawings.

Three boreholes (BH1, BH3 and BH6) were advanced below TC-bit refusal by a further 3.0m into bedrock using NMLC rock coring methods. The recovered core

samples revealed bedrock to consist of a near-horizontally bedded coarse grained sandstone that was distinctly to moderately weathered, and of a medium to high strength. Some cross bedding was also encountered. Although only a few joints and joint sets were identified within the upper 2m of bedrock, numerous weak bedding planes and partings were identified throughout the core samples. Photographs of the recovered core samples are provided in Appendix B.

Ground water seepage was encountered within one borehole (BH6) at a depth of about 3.9m below existing ground surface levels, indicating a possible groundwater table at that location. Groundwater monitoring standpipes were installed in boreholes (BH1, BH3 and BH6) by Aargus Pty Ltd in order to facilitate future groundwater monitoring. All results indicated depths of perched water at between 2-2.5 metres with the unconfined aquifer standing at below 5m and below any basement parking or excavations required as part of the development. Initial readings at borehole 6 shows groundwater ingress at 3.9m but as no basement excavation is noted for this area and all basements are above 3m bgl, this does not affect the integrity of the development. The perched water is noted as water ingress and will not provide deleterious affects on building structures.

## **5.0 LABORATORY TESTING**

### **5.1 CBR Values**

Two representative soil samples of the subgrade materials (medium to high plasticity clay) were submitted to our NATA accredited soil laboratory for testing to determine the four day soaked California Bearing Ratio (CBR) value. The laboratory test results are provided in Appendix C and are summarised in Table 2 below.

**Table 2: California Bearing Ratio Test Results**

Borehole	Depth (m)	CBR (%) @	
		2.5mm*	5.0mm*
<b>BH1</b>	0.4-1.0	6	6
<b>BH4</b>	0.4-1.0	15	16

\*Penetration

## **5.2 Atterberg Limits**

Three representative soil samples of the subgrade materials (medium to high plasticity clay) were submitted to our NATA accredited soil laboratory for testing to determine their Atterberg Limits. The laboratory test results are provided in Appendix C and are summarised in Table 3 below.

**Table 3: Atterberg Limits Test Results**

<b>Borehole</b>	<b>Material Type</b>	<b>Depth (m)</b>	<b>Atterberg Limits</b>		
			<b>Liquid Limit</b>	<b>Plastic Limit</b>	<b>Plasticity Index</b>
BH1	Clay, brown	0.5-0.95	76	29	47
BH4	Sandy Gravelly Clay, orange/brown/grey	0.4-1.0	43	18	25
BH6	Clay, red	1.5-1.7	39	13	26

## **5.3 Exposure Classification**

Five representative soil samples of the subgrade materials (medium to high plasticity clay) were submitted to an external NATA accredited soil laboratory for testing to determine their Exposure Classification. The laboratory test results are provided in Appendix C and are summarised in Table 4 below.

**Table 4: Exposure Classification Test Results**

<b>Borehole</b>	<b>Depth (m)</b>	<b>Exposure Classification</b>			
		<b>pH</b>	<b>Chlorides (%)</b>	<b>Resistivity (ohm)</b>	<b>Sulphates (%)</b>
BH1	0.4-1.0	5.8	<0.5%	2941	<0.2%
BH1	2.0-2.4	6.1	<0.5%	1960	<0.2%
BH3	0.8-1.0	7.1	<0.5%	1388	<0.2%
BH4	0.4-1.0	6.5	<0.5%	259	<0.2%
BH6	2.0-2.4	6.3	<0.5%	892	<0.2%

Based on the results of the laboratory testing, the soils are assessed to be “**Non-Aggressive**” in accordance with AS2159-1995 “Piling – Design and installation”.

## **5.1 Rock Strength**

Axial point load testing of the rock cores recovered from the boreholes was carried out to aid in estimating rock strengths. The point load test results have been shown on the corelogs (See Appendix A) and are summarised in Table 5 below.

**Table 5: Point Load Test Results**

<b>Borehole</b>	<b>Depth (m)</b>	<b>I<sub>s(50)</sub></b>	<b>Strength*</b>
BH1	3.90	0.96	M-H
BH1	4.95	1.41	H
BH1	5.10	0.47	M
BH1	5.30	0.57	M
BH1	5.90	0.97	M-H
BH1	6.30	1.3	H
BH1	6.90	1.54	H
BH1	7.40	2.08	H
BH3	1.70	1.72	H
BH3	2.10	0.83	M
BH3	2.70	1.11	H
BH3	3.40	0.31	L-M
BH3	3.50	0.7	M
BH3	3.90	1.03	H
BH3	4.20	1.24	H
BH6	4.40	1.59	H
BH6	4.85	1.32	H
BH6	4.55	1.85	H
BH6	6.95	1.4	H
BH6	7.60	1.16	H

\*VL=Very Low, L=Low, M=Medium, H=High

## **6.0 GEOTECHNICAL COMMENTS AND RECOMMENDATIONS**

### **6.1 General**

The subsurface soil profile within the site consists predominantly of moderately to well compacted fill that was underlain by stiff to very stiff alluvial clay in the east and very stiff alluvial / residual clay in the west, all overlying residual sandy clays / clayey sands. The fill profile was deepest in the north-eastern corner of the site where the Hawthorne Canal has been backfilled. The depth of the Alluvium decreased on increasing distance from the canal. The thickness of the residual soil profile varied

between 0.5m and 1.9m, though increasing generally from south to north. Sandstone bedrock was encountered at depths increasing from between about 1.6m (BH3) to 2.4m (BH4) below ground surface levels in the southern area of the site to between about 3.8m (BH1) and 4.5m (BH5) in the northern area of the site. The near-horizontally bedded coarse grained sandstone was found to be distinctly to moderately weathered and of a medium to high strength, containing some cross-bedding, weaker bedding layers and clay seams. A few low angle joints and joint sets were identified within the upper 2m of the bedrock.

Ground water seepage was encountered within one borehole (BH6) only, at a depth of about 3.9m below existing ground surface levels. Further investigations showed that perched water was found at a depth of between 2-2.5m with the unconfined groundwater aquifer noted as being present below 5 metres.

## **6.2 Footings**

Based on the investigation results, we consider shallow (for light weight structures only) and deep footings to be suited to the subject site conditions. Such footings must be constructed in accordance with good engineering principles and the following recommendations:

- Owing to the fact that no compaction certificates can be presented for the placement of the fill and owing to the variable nature of the fill materials, we recommend that all footings penetrate through any fill. Should compaction certificates be available, an allowable end bearing pressure of 100kPa may be assigned to the fill materials.
- Shallow footings (such as strip and pad footings) founding on stiff to very stiff alluvium / residual material may be designed for an allowable end bearing pressure of 100kPa (see Table 6).
- Shallow and deep footings founding within low strength sandstone bedrock and/or within 1m below TC-bit refusal may be designed for an allowable end bearing pressure of 1000kPa and an allowable shaft adhesion of 100kPa (see Table 6).

- Deep footings founding on and socketed a minimum of 300mm into medium strength sandstone bedrock may be designed for an allowable end bearing pressure of 2000kPa and an allowable shaft adhesion of 200kPa (see Table 6).
- Deep footings founding on and socketed a minimum of 300mm into high strength sandstone bedrock may be designed for an allowable end bearing pressure of 3000kPa and an allowable shaft adhesion of 300kPa (see Table 6).
- Maximum footing settlements are expected to be 1% of the minimum footing dimension for the above end bearing conditions.
- All footings should be taken to the same bearing materials. Alternatively, design of the structure should incorporate articulation to minimise the effects of differential settlements.
- All footing excavations should be free of loose debris and wet soil prior to concrete placement.
- The geotechnical consultant should inspect footing excavations at the time of excavation to ensure that all foundation loadings are taken to suitable bearing materials.
- All footings must be founded below the “zone of influence” of adjacent excavations; that is, a line drawn 45° down from the foundation level to the base of any retaining walls or features.
- Groundwater infiltration into excavated footings is expected where footings extend below depths of about 3.9m. If so, all water should be pumped from the base of the excavated piles prior to concrete placement. Alternatively a tremmie system should be adopted for concrete placement.

**Table 6: Allowable Bearing Pressures**

Allowable Bearing Pressure / Adhesion (kPa)** #		Depth Below Existing Ground Surface Levels (m)***				
End Bearing	Shaft Adhesion	BH1	BH3	BH4	BH5	BH6
-	-	0-3.0	0-1.2	0-0.8	0-1.4	0-1.4
100	-	3.0-3.8	1.2-1.6	0.8-2.6	1.4-4.1	1.4-4.3
1000	100	3.8-5.8	1.6-2.6	2.6+*	4.1+*	4.3-5.3
2000	200	5.8-7.0	2.6-4.4 <sup>##</sup>	-	-	-
3000	300	7.0-7.3 <sup>##</sup>	-	-	-	5.3-7.3 <sup>##</sup>



- \* BH4 & BH5 were non-cored boreholes.
- \*\* Allowable bearing pressures must be confirmed by a Geotechnical Engineer/Engineering Geologist at the time of footing excavation.
- \*\*\* BH2 was terminated within an unknown concrete substructure not detailed on any drawings.
- # Consideration must be given to rock strength reduction as a result of the presence of shear zones, bedding weaknesses, joint sets and increased weathering within 1m of foundation level.
- ## Final Depth of core sample

### **6.3 Excavations**

We expect that the fill, alluvium and residual clays / sands will be readily excavated by conventional earthworks equipment, such as bulldozers and excavators. However, we anticipate that heavy ripping and/or vibratory rock breaking techniques will be required for the sandstone bedrock.

If vibratory rock breaking equipment is required for the proposed excavations in sandstone bedrock, we recommend that, prior to the use of vibratory equipment, the excavation perimeter is saw cut where appropriate with the aid of an excavator mounted rock saw or by drill and split techniques so as to minimise transmission of vibrations to adjoining structures. Following sawing of the perimeter of the excavation, sandstone bedrock may be broken up using a vibratory hammer suited to an excavator no larger than 30.0 tonnes. To further reduce vibration, the rock hammer should be inserted horizontally into bedding planes within the rock to be excavated. Induced vibrations in structures adjacent to the excavation are to be examined at the time of applying vibration (or at the time of excavation) to ensure that they do not exceed a peak particle velocity (PPV) of 10mm/sec. If vibrations in adjacent structures exceed a PPV of 10mm/sec or if vibrations appear excessive, excavation work should cease and this office should be contacted immediately.

If it is desired to utilise larger excavation equipment, or not to saw cut the excavation perimeter prior to use of smaller vibratory excavation equipment, then induced vibrations in structures adjacent to the proposed excavations must be monitored continuously using specialised monitoring equipment to ensure excessive vibrations do not transfer to surrounding structures. If vibrations in adjacent structures exceed a

PPV of 10mm/sec or if vibrations appear excessive, excavation work should cease at the site and this office should be contacted immediately.

We consider the majority of material at the site to be suitable for fill placement, should it be required. Suitability of the material for fill should however be determined by a Geotechnical Consultant at the time of excavation.

Groundwater is encountered within the excavations below depths of about 5m below existing ground conditions with water ingress through perched water found at some locations at between 2-2.5m. No excavations are planned to extend below the depth of groundwater so infiltration into the excavation would be minimal. We recommend that the excavation perimeter should provide adequate drainage and a sump to allow any water ingress to be appropriately removed. Any construction should provide adequate temporary drainage to allow removal of any water ingress.

Groundwater quality was tested to meet regulatory criteria and as such will not affect ecological or environmental receptors. As no groundwater pump out is required, no concerns arising from drawdown or settlement. No beneficial use of groundwater is noted for the area as Summer Hill has low recharge rates. The proposed development will remove any observed contaminants (minimal – refer to Aargus Detailed Environmental Site Assessment, June 2008) and also remove fill of poor quality from the site. This removes the potential for any fill or waste to leach into the groundwater table. The removal of these waste fill materials will enhance the local groundwater quality and green landscaped areas will allow for rainwater interaction to occur with the groundwater allowing constant hydraulic gradients to remain unchanged.

#### **6.4 Batters / Retaining walls**

Deep excavation may form part of the proposed development. Resultant unretained embankments should be battered back where appropriate to the following recommended slopes:

- Short term unretained batters in uncontrolled fill and alluvium / residual clays not steeper than 1 Vertical to 2.0 Horizontal.
- Short term unretained batters in low to medium strength sandstone bedrock not steeper than 1 Vertical to 0.5 Horizontal.
- Long term unretained batters in uncontrolled fill and alluvium / residual clays not steeper than 1 Vertical to 2.5 Horizontal.
- Long term unretained batters in low to medium strength sandstone bedrock not steeper than 1 Vertical to 1 Horizontal.

Excavations less than 1m in height may not require temporary retention.

Exposed medium to high strength sandstone may remain temporarily unretained, subject to confirmation at the time of excavation by a suitably qualified Geotechnical Engineer / Engineering Geologist. The Engineering Consultant is to inspect the exposed rock faces at the time of excavation in order to identify potential presence of any rock defects that could induce instability of the exposure and thus affect adjacent properties. The Geotechnical Consultant is to advise on the nature of the required permanent retention, should it be deemed necessary, which may include rock bolts or pre-tensioned rock anchors.

Unretained excavations should not extend below the “zone of influence” of adjacent structures; that is a line drawn 45° down from the foundation level of adjacent structures or features (including paths, fences, stairs etc). If excavations are to extend below this line, proposed excavations are to be retained prior to excavation.

Suitable permanent pre-excavation retention may comprise cantilevered contiguous bored pile walls, secant bored pile walls or diaphragm walls, should excavations extend below the ground water table, or reinforced concrete soldier pile walls in conjunction with shotcreted infill panels should excavations not extend below the ground water table. Where the toes of bored piles extend below the ground water table or where ground water inflow is encountered, a tremmie system is to be utilised to ensure correct and effective concrete placement. Alternatively all water is to be

pumped from the excavation prior to concrete placement. Furthermore, the concrete is to be placed as soon as practicable and no later than 6 hours after excavation completion.

The pressure distribution on such retaining structures above ground water levels is assumed triangular and estimated as follows:

$$p_h = \gamma kH + qk$$

Where,

$p_h$  = Horizontal pressure (kN/m<sup>2</sup>)

$\gamma$  = Wet density (kN/m<sup>3</sup>)

$k$  = Coefficient of earth pressure ( $k_a$  or  $k_o$ )

$H$  = Retained height (m)

$q$  = Surcharge pressure behind retaining wall (kN/m<sup>2</sup>)

Recommended parameters for the design of retaining structures are presented in Table 7.

**Table 7: Material parameters**

Material	$K_a$	$K_o$	$K_p$	Unit Weight kN/m <sup>3</sup>
Uncontrolled Fill	0.42	0.59	2.37	17
Alluvium / Residual Clay	0.36	0.53	2.8	18
Low to Medium Strength Sandstone	0.31	0.47	3.25	20
Medium to High Strength Sandstone	0.22	0.36	4.60	22

The above coefficients assume that ground level behind the retaining structures is horizontal and the retained material is effectively drained.

The design of any retaining structure should be checked by a Structural Engineer for bearing capacity, overturning, sliding and overall stability. Should retention comprise soldier piles with reinforced shotcrete infill panels, the design of such a system is to

allow for additional forces placed on the wall as a result of potential wedge or planar block failure from the rock face. Allowance for isolated rock bolts to retain potential block failure should be made. In addition, earth pressures resulting from groundwater should be allowed for in the retaining wall design, unless effectively drained.

## **6.5 Pavements**

Based on the results of the borehole excavations and the laboratory test results, we consider a CBR of 6% to be typical for the materials encountered at the site. We therefore recommend the use of a CBR value of 6% for the design of any new pavements.

## **7.0 LIMITATIONS**

Assessment of the sub-surface profile at the site and the recommendations presented in this report are based on information from six boreholes, drilled at locations considered representative across the site. Based on the results of the investigation and subsurface variability, there is a possibility that actual geotechnical conditions across the site could differ from the inferred geotechnical model (on which our recommendations are based) presented in this report.

The report contains geotechnical parameters to be used as input for the structural design of footings and retaining walls. On-going geotechnical input is required to ensure recommendations provided in this report are followed and that actual ground conditions reflect those indicated in this report.

Furthermore, the recommendations and conditions presented in this report pertain to the general development of the site. Upon design finalisation of the proposed development, the geotechnical conditions are to be reassessed with respect to the final design.

Please do not hesitate to contact the undersigned if you require any further information.

For and on behalf of

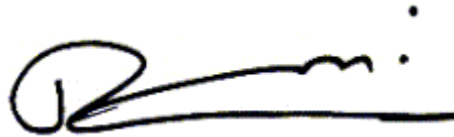
**Aargus Engineering Pty Ltd**

A handwritten signature in black ink, appearing to read 'ABennett', on a light grey rectangular background.

**Anthony Bennett**

Geotechnical Technician

**Reviewed by**

A handwritten signature in black ink, appearing to read 'R. Erni', with a stylized flourish at the end.

**Ralph Erni** B.Sc. Eng. (Civil) MIEAust CPEng NPER3

National Engineering Manager

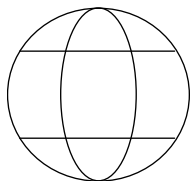
Released by

A handwritten signature in black ink, appearing to read 'Nick Kariotoglou', with a stylized flourish at the end.

**Nick Kariotoglou**

Managing Director

## **APPENDIX A**



Brink Holdings Pty Ltd ABN 75050212710 trading as

# BRINK & Associates

*Geotechnical, Geological, Environmental Consultants*

Job No:	S07146-A
Hole No:	BH1
Sheet	1 of 2

## ENGINEERING LOG OF BOREHOLE

Client:				EG Funds Management			Test Location:Ref. Dwg No. S07146-1			
Project:				Proposed Mixed Use Development			Test Method: Truck Mounted Drill Rig			
Project Location:				Nos. 2-32 Smith Street and Nos. 16-32 Edward Street, Summer Hill			Coordinates: -		Logged by: AB	
							Surface level:Existing		Date: 11/3/08	
Groundwater	Samples/ Field Tests	Depth (m)	Graphic Log	Unified Classification	Description	Moisture Condition	Consistency/ Rel. Density	Additional Comments	Depth (m)	
N I L	2,3,4 N=7			-	Clayey SILT, medium plasticity, brown.	M>Wp	-	TOPSOIL		
				-	Silty CLAY, medium plasticity, orange/brown.	M>Wp	-	FILL - appears moderately compacted		
		0.5				CLAY, high plasticity, brown.				0.5
		1.0								1.0
						CLAY, medium plasticity, white, with minor gravel.				
		1.5								1.5
		2.0								2.0
						Sandy CLAY / Clayey SAND, low plasticity clay, coarse grained sand, brown.				
	2.5								2.5	
	1,2,3 N=5									
		3.0			Cl	CLAY, medium plasticity, red/brown	M>Wp	St-VSt	RESIDUAL	3.0
		3.5								3.5
	</									

### Explanatory Notes:

#### Consistency

**VS** Very Soft  
**S** Soft  
**F** Firm  
**St** Stiff  
**VSt** Very Stiff  
**H** Hard

#### Density Index

**VL** Very Loose  
**L** Loose  
**MD** Medium Dense  
**D** Dense  
**VD** Very Dense

#### Samples

**B** Bulk Sample  
**D** Disturbed Sample  
**U50** Undisturbed Sample (50mm diam.)  
**N** S.P.T. Value

#### Moisture

**D** Dry  
**M** Moist  
**W** Wet  
**Wp** Plastic Limit  
**WL** Liquid Limit



# BRINK & Associates

***Geotechnical, Geological, Environmental Consultants***

Job No: S07146-A

Hole No: BH2

Sheet 1 of 1

# ENGINEERING LOG OF BOREHOLE

Client:				EG Funds Management			Test Location:Ref. Dwg No. S07146-1			
Project:				Proposed Mixed Use Development			Test Method: Truck Mounted Drill Rig			
Project Location:				Nos. 2-32 Smith Street and Nos. 16-32 Edward Street, Summer Hill			Coordinates: -		Logged by: AB	
							Surface level:Existing		Date: 12/3/08	
Groundwater	Samples/ Field Tests	Depth (m)	Graphic Log	Unified Classification	Description	Moisture Condition	Consistency/ Rel. Density	Additional Comments		Depth (m)
N I L	N I L			-	Asphaltic Concrete (50mm) DGB, grey. (100mm) Crushed SANDSTONE, white (250mm)	D	-	PAVEMENT		
		0.5		-	Silty CLAY, high plasticity, red/orange.	M>Wp	-	FILL - appears moderately compacted	0.5	
		1.0							1.0	
					BH2 terminated at 1.0m due to TC-bit refusal.					
		1.5			Borehole continued with NMLC rock core barrel from 1.0m revealing an unknown concrete substructure.					1.5
		2.0								2.0
		2.5								2.5
		3.0								3.0
		3.5								3.5
4.0		4.0								

Explanatory Notes:

Consistency

VS Very Soft

S Soft

F Firm

St Stiff

VSt Very Stiff

H Hard

Density Index

VL Very Loose

L Loose

MD Medium Dense

D Dense

VD Very Dense

Samples

B Bulk Sample

D Disturbed Sample

U50 Undisturbed Sample  
(50mm diam.)

N S.P.T. Value

Moisture

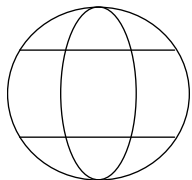
D Dry

M Moist

W Wet

Wp Plastic Limit

Wl Liquid Limit



Brink Holdings Pty Ltd ABN 75050212710 trading as

# BRINK & Associates

*Geotechnical, Geological, Environmental Consultants*

Job No:	S07146-A
Hole No:	BH3
Sheet	1 of 2

## ENGINEERING LOG OF BOREHOLE

Client:				EG Funds Management			Test Location:Ref. Dwg No. S07146-1			
Project:				Proposed Mixed Use Development			Test Method: Truck Mounted Drill Rig			
Project Location:				Nos. 2-32 Smith Street and Nos. 16-32 Edward Street, Summer Hill			Coordinates: -		Logged by: AB	
							Surface level:Existing		Date: 12/3/08	
Groundwater	Samples/ Field Tests	Depth (m)	Graphic Log	Unified Classification	Description	Moisture Condition	Consistency/ Rel. Density	Additional Comments		Depth (m)
N I L				-	Asphaltic Concrete (50mm) DGB, grey. (150mm)	D	-	PAVEMENT		
				Silty CLAY, high plasticity, dark brown / grey.  ... orange/brown from 0.6m...	M>Wp	-	FILL - appears well compacted			
		0.5								
		1.0								
	2,3,3 N=6			SC	Clayey SAND, medium to coarse grained, white	M	S-F	RESIDUAL		
		1.5								
					Borehole continued with NMLC rock core barrel from 1.6m					
		2.0								
		2.5								
		3.0								
		3.5								
		4.0								

### Explanatory Notes:

#### Consistency

**VS** Very Soft  
**S** Soft  
**F** Firm  
**St** Stiff  
**VSt** Very Stiff  
**H** Hard

#### Density Index

**VL** Very Loose  
**L** Loose  
**MD** Medium Dense  
**D** Dense  
**VD** Very Dense

#### Samples

**B** Bulk Sample  
**D** Disturbed Sample  
**U50** Undisturbed Sample  
(50mm diam.)  
**N** S.P.T. Value

#### Moisture

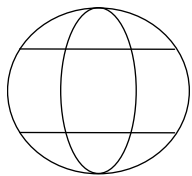
**D** Dry  
**M** Moist  
**W** Wet  
**Wp** Plastic Limit  
**WI** Liquid Limit



***Geotechnical, Geological, Environmental Consultants***

Sheet 1 of 1

**WI** Liquid Limit



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# BRINK & Associates

*Geotechnical, Geological, Environmental Consultants*

Job No:	S07146-A
Hole No:	BH5
Sheet	1 of 1

## ENGINEERING LOG OF BOREHOLE

Client:				EG Funds Management			Test Location:Ref. Dwg No. S07146-1			
Project:				Proposed Mixed Use Development			Test Method: Truck Mounted Drill Rig			
Project Location:				Nos. 2-32 Smith Street and Nos. 16-32 Edward Street, Summer Hill			Coordinates: -		Logged by: AB	
							Surface level:Existing		Date:	
Groundwater	Samples/ Field Tests	Depth (m)	Graphic Log	Unified Classification	Description	Moisture Condition	Consistency/ Rel. Density	Additional Comments		Depth (m)
Z - L	2,3,7 N=10			-	DGB, grey	D	-	PAVEMENT		
				-	Gravelly ASH, grey	D	-	FILL - appears well compacted		
		0.5		-	Gravelly CLAY, medium plasticity, grey.	M>Wp				0.5
		1.0								1.0
		1.5	CI-CH		Gravelly CLAY, medium to high plasticity, mottled grey & orange/brown.	M>Wp	St-VSt	ALLUVIUM		1.5
		2.0								2.0
		2.5								2.5
	3,5,7 N=12	3.0	CI-SC		Sandy CLAY / Clayey SAND, medium to coarse grained sand, medium plasticity clay, mottled orange/brown & white.	M>Wp	VSt	ALLUVIUM / RESIDUAL		3.0
		3.5								3.5

### Explanatory Notes:

#### Consistency

**VS** Very Soft  
**S** Soft  
**F** Firm  
**St** Stiff  
**VSt** Very Stiff  
**H** Hard

#### Density Index

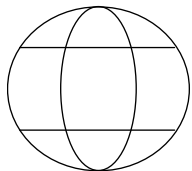
**VL** Very Loose  
**L** Loose  
**MD** Medium Dense  
**D** Dense  
**VD** Very Dense

#### Samples

**B** Bulk Sample  
**D** Disturbed Sample  
**U50** Undisturbed Sample (50mm diam.)  
**N** S.P.T. Value

#### Moisture

**D** Dry  
**M** Moist  
**W** Wet  
**Wp** Plastic Limit  
**Wl** Liquid Limit



Brink Holdings Pty Ltd ABN 75050212710 trading as

# BRINK & Associates

*Geotechnical, Geological, Environmental Consultants*

Job No:	S07146-A
Hole No:	BH6
Sheet	1 of 1

## ENGINEERING LOG OF BOREHOLE

Client:				EG Funds Management		Test Location:Ref. Dwg No. S07146-1				
Project:				Proposed Mixed Use Development		Test Method: Truck Mounted Drill Rig				
Project Location:				Nos. 2-32 Smith Street and Nos. 16-32 Edward Street, Summer Hill		Coordinates: -		Logged by: AB		
						Surface level:Existing		Date: 14/3/08		
Groundwater	Samples/ Field Tests	Depth (m)	Graphic Log	Unified Classification	Description	Moisture Condition	Consistency/ Rel. Density	Additional Comments	Depth (m)	
<div>▼</div>	3,6,7 N=13			-	Concrete (200mm) DGB (100mm)	-	-	PAVEMENT		
		0.5			-	Gravelly CLAY, medium plasticity, grey.	M>Wp	-	FILL - appears well compacted	0.5
		1.0								1.0
	4,8,8 N=16	1.5		Cl	CLAY, medium plasticity, red.	M>Wp	VSt	ALLUVIUM	1.5	
		2.0							2.0	
		2.5							2.5	
		3.0		Cl	Sandy CLAY, medium plasticity, mottled red and grey.	M>Wp	VSt-H	RESIDUAL moderate to high V-Bit resistance from 3.1m	3.0	
		3.5						3.5		
		4.0					groundwater at 3.9m	4.0		
					Borehole continued with NMLC rock core barrel from 4.3m					

### Explanatory Notes:

#### Consistency

**S** Soft  
**F** Firm  
**St** Stiff  
**VSt** Very Stiff  
**H** Hard

#### Density Index

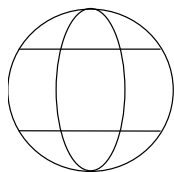
**VL** Very Loose  
**L** Loose  
**MD** Medium Dense  
**D** Dense  
**VD** Very Dense

#### Samples

**B** Bulk Sample  
**D** Disturbed Sample  
**U50** Undisturbed Sample  
(50mm diam.)  
**N** S.P.T. Value

#### Moisture

**D** Dry  
**M** Moist  
**W** Wet  
**Wp** Plastic Limit  
**WI** Liquid Limit



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# BRINK & Associates

*Geotechnical, Geological, Environmental Consultants*

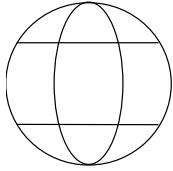
Job No: S07146-A

Hole No: BH1

Sheet: 2 of 2

## CORELOG OF TEST HOLE

Client:		EG Funds Management				Hole Commenced:		11/3/08				
Project:		Proposed Mixed Use Development				Hole Completed:		11/3/08				
Project Location:		Nos. 2-32 Smith Street and Nos. 16-32 Edward Street, Summer Hill				Supervised by:		AB				
						Checked by:		RE				
Drill Model: Truck Mounted Drill Rig				Slope: 90°				R.L. Surface: existing				
Barrel Type / Length: NMLC/ 1.5m				Bearing -				Datum: AHD				
Drilling Information		Rock Substance						Rock Mass Defects				
Method	Case - Lift	Groundwater	Samples / Field Tests	Depth (m)	Graphic Log	Substance Description	Weathering	Estimated Strength	Is(50) MPa	Defect Spacing	Defect Description	Depth (m)
NMLC	NIL	NIL	NIL	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div><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Brink Holdings Pty Ltd ABN 75050212710 trading as

# BRINK & Associates

*Geotechnical, Geological, Environmental Consultants*

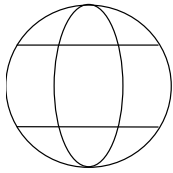
Job No: S07146-A

Hole No: BH3

Sheet: 2 of 2

## CORELOG OF TEST HOLE

Client:		EG Funds Management										Hole Commenced:		12/3/08									
Project:		Proposed Mixed Use Development										Hole Completed:		12/3/08									
Project Location:		Nos. 2-32 Smith Street and Nos. 16-32 Edward Street, Summer Hill										Supervised by:		AB									
												Checked by:		RE									
Drill Model: Truck Mounted Drill Rig										Slope: 90°		R.L. Surface: existing											
Barrel Type / Length: NMLC/ 1.5m										Bearing -		Datum: AHD											
Drilling Information						Rock Substance								Rock Mass Defects									
Method	Case - Lift	Groundwater	Samples / Field Tests	Depth (m)	Graphic Log	Substance Description	Weathering	EL	VL	L	M	H	VH	EH	Is(50) MPa	Defect Spacing	Defect Description	Depth (m)					
NMLC		N	I	L		<b>Coring Started at 1.6m</b>	DW								1.72	30	joint (jt) @ 1.70m, 10°, clean (KL), rough (Ro3), planar (PL)						
						SANDSTONE, coarse grained, yellow, orange, white.									100								
															0.83	300			jt @ 2.13m, 10°, KL, Ro3,PL jt @ 2.22m, 10°, KL, Ro3,PL jt @ 2.35m, 10°, KL, Ro3,PL	2.0			
																1000							
																3000							
															1.11				jt @ 2.54m, 10°, KL, Ro3,PL jt @ 2.76m, 10°, KL, Ro3,PL	2.5			
						Extremely weathered seam between 3.35 and 3.4m, with organic infill	EW								0.31		clay seam @ 3.08m, 5mm jt @ 3.09m to 3.25m, 90°, clay infill, Ro3, undulating						
							DW							0.70		bedding parting (bp) @ 3.68m, 0°, KL, Ro3,PL			3.5				
						Cross-bedded from 3.6m										bp @ 3.91m, 0°, KL, Ro3, PL							
														1.03		bp @ 4.17m, 0°, KL, Ro3,PL bp @ 4.29m, 10°, KL, Ro3,PL			4.0				
														1.24		Ext. weathered seam @ 4.37m, 5mm, 10°							
						<b>BH3 terminated at 4.4m</b>																	
Key - Method						Case - lift						Weathering				Strength Is (50) MPa							
AS	Auger Screwing					Casing used						Fr	Fresh				EL	Extremely Low				< 0.03	
AD	Auger Drilling					Barrel withdrawn						SW	Slightly weathered				VL	Very Low				0.03 - 0.1	
R	Roller / Tricone					water level						MW	Moderately weathered				L	Low				0.1 - 0.3	
W	Washbore					date shown						DW	Distinctly weathered				M	Medium				0.3 - 1.0	
NMLC	NMLC Core Drill					Water inflow						EW	Extremely weathered				H	High				1.0 - 3.0	
NQ,HQ	Wireline Core Drill					Partial drilling water loss											VH	Very High				3.0 - 10.0	
						Complete drilling water loss											EH	Extremely High				>10.0	



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*Geotechnical, Geological, Environmental Consultants*

Job No: S07146-A

Hole No: BH6

Sheet: 2 of 2

## CORELOG OF TEST HOLE

Client:		EG Funds Management						Hole Commenced:		14/3/08												
Project:		Proposed Mixed Use Development						Hole Completed:		14/3/08												
Project Location:		Nos. 2-32 Smith Street and Nos. 16-32 Edward Street, Summer Hill						Supervised by:		AB												
								Checked by:		RE												
Drill Model: Truck Mounted Drill Rig						Slope: 90°		R.L. Surface: existing														
Barrel Type / Length:		NMLC/ 1.5m		Bearing -		Datum: AHD																
Drilling Information		Rock Substance						Rock Mass Defects														
Method	Case - Lift	Groundwater	Samples / Field Tests	Depth (m)	Graphic Log	Substance Description	Weathering	EL	VL	M	H	VH	EH	Is(50) MPa	30	100	300	1000	3000	Defect Description	Depth (m)	
NMLC		NIL	NIL			<b>coring started at 4.3m</b>																
				4.5	SANDSTONE, coarse grained, orange, grey, white.	DW								1.59				Beddign parting (bp) @ 4.37m, 10°, KL, Ro3, PL	4.5			
									</													



## **APPENDIX B**

## Photos of Recovered Cores

S07146 - BH1  
Coring Started at 3.8m



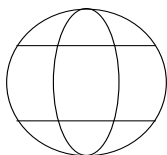
S07146 - BH3  
Coring Started at 1.6m



S07146 - BH6  
Coring Started at 4.3m



## **APPENDIX C**



Brink Holdings Pty Ltd ABN 75050212710 trading as

# BRINK & Associates

*Geotechnical, Geological, Environmental Consultants*

P.O.Box 6871  
Wetherill Park NSW 2164  
Telephone: (02) 9609 3800  
Facsimile: (02) 9604 6427

## CALIFORNIA BEARING RATIO TEST REPORT

Client	EG Funds Management	Job Number	SL07146-A
Project	Proposed Mixed Use Development	Date	4/03/2008
Location	Nos. 2-32 Smith St & Nos. 16-32 Edward St, Summer Hill	Page	1 of 1

### SAMPLE DETAILS

Test Number	MT 1	MT 2		
Date Sampled	11/03/2008	14/03/2008		
Test Location	BH:1	BH: 4		
Sample Depth	0.4m - 1.0m	0.4m-1.0m		

### LABORATORY COMPACTION

AS1289 5.1.1 (Standard) ☒

AS1289 5.2.1 (Modified) ☐

Maximum Dry Density	t/m <sup>3</sup>	1.62	1.84		
Optimum Moisture Content	%	19.2	15.3		

### TEST RESULTS

AS1289.6.1.1

Dry Density Before Soak	t/m <sup>3</sup>	1.55	1.85		
Moisture Content Before Soak	%	23.3	14.7		
Density Ratio Before Soak	%	96.0	101.0		
Moisture Ratio Before Soak	%	121.0	96.0		
Dry Density After Soak	t/m <sup>3</sup>	1.53	1.84		
Moisture Content After Soak	%	25.7	16.6		
Moisture Cont. After Test (Whole)	%	21.8	15.8		
Moisture Cont. After Test (Top30 <sub>mm</sub> )	%	23.4	16.9		
Material Retained 19.0mm	%	10.3	10.3		
+19.0mm Crushed/Included (Y/N)		N	N		
Mass of Surcharge	Kg	4.5	4.5		
Compactive Effort		STD	STD		
Period of Soaking	days	4	4		
Swell After Soaking	%	1.5	0.3		
CBR value @ 2.5/5.0mm penetration	%	6 / 6	15 / 16		

Specification:

Material Description:

Notes: 1. Unless otherwise stated the CBR test is not repeated if the 5.0mm value exceeds the 2.5mm value

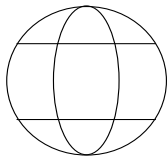


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Approved Signatory

O. Mendoza

Date 04/03/2008



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Wetherill Park NSW 2164

Telephone: (02) 9609 3800

Facsimile: (02) 9604 6427

## ATTERBERG LIMITS AND LINEAR SHRINKAGE TEST REPORT

Client	EG Funds Management	Job Number	SL07146-A
Project	Proposed Mixed Use Development	Date	15/04/2008
Location	Nos. 2-32 Smith St & Nos. 16-32 Edward St, Summer Hill	Page	1 of 1

### SAMPLE DETAILS

Sample Number	MT1	MT2	MT3	
Date Sampled	11/03/2008	14/03/2008	14/03/2008	
Sample Location / Source	BH 1 0.5- 0.7m	BH 4 0.4m - 1.0m	BH 6 1.5m-1.7m	
Material Description	Silty CLAY, orange-brown	Sandy Gravelly CLAY, orange/brown	CLAY, red	
Sample History				
Method of Preparation	Oven Dried	Oven Dried	Oven Dried	
Shrinkage Mould Length	mm	Dry Sieved	Dry Sieved	Dry Sieved

### TEST METHOD

### TEST RESULTS

<b>Liquid Limit</b>	%	76	43	39	
AS1289 3.1.1	<input checked="" type="checkbox"/>				
RTA (NSW) T108	<input type="checkbox"/>				
<b>Plastic Limit</b>	%	29	18	13	
AS1289 3.2.1	<input checked="" type="checkbox"/>				
RTA (NSW) T109	<input type="checkbox"/>				
<b>Plasticity Index</b>	%	47	25	26	
AS1289 3.3.1	<input checked="" type="checkbox"/>				
RTA (NSW) T109	<input type="checkbox"/>				
<b>Linear Shrinkage</b>	%	-	-	-	
AS1289 3.4.1	<input type="checkbox"/>				
RTA (NSW) T113	<input type="checkbox"/>				

Notes:



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Accreditation No. 12318

Approved Signatory

O.Mendoza

Date 19/03/2008

**Laboratory Report No:** E037038  
**Client Name:** Aargus Pty. Ltd  
**Contact Name:** Anthony Bennett  
**Client Reference:** Summer Hill S07146

**Page:** 1 of 5  
plus cover page  
**Date:** 22/04/08

Final  
**Certificate**  
of Analysis

This report supercedes reports issued on: 17/04/08

Laboratory Identification		149539	149540	149541	149542	149543	149540d	149540r	mb		
Sample Identification		BH1	BH1	BH3	BH4	BH6	QC	QC	QC		
Depth (m)		0.4-1.0	2.0-2.4	0.8-1.0	0.4-1.0	2.0-2.4	--	--	--		
Sampling Date recorded on COC		20/2/08	20/2/08	20/2/08	20/2/08	20/2/08	--	--	--		
Laboratory Extraction (Preparation) Date		10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	--	10/4/08		
Laboratory Analysis Date		14/4/08	14/4/08	14/4/08	14/4/08	14/4/08	14/4/08	--	14/4/08		
<b>Method : E032.2</b>											
<b>Electrical conductivity (EC)</b>		<b>EQL</b>									
Electric conductivity (uS/cm)		5	34	51	72	286	112	158	102%	<5	

Results expressed in uS/cm unless otherwise specified

Comments:

E032.2: Measurement by EC probe as per 1:5 soil:water extract. Results expressed as uS/cm as per the extract.

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Laboratory Identification		149539	149540	149541	149542	149543	149540d	149540r			
Sample Identification		BH1	BH1	BH3	BH4	BH6	QC	QC			
Depth (m)		0.4-1.0	2.0-2.4	0.8-1.0	0.4-1.0	2.0-2.4	--	--			
Sampling Date recorded on COC		20/2/08	20/2/08	20/2/08	20/2/08	20/2/08	--	--			
Laboratory Extraction (Preparation) Date		10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	--			
Laboratory Analysis Date		10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	--			
<b>Method : E018.2</b>											
<b>pH in soil</b>	<b>EQL</b>										
pH (pH units)	0.1	5.8	6.1	7.1	6.5	6.3	6.9	12%			

Results expressed in pH units unless otherwise specified

Comments:

E018.2: 1:5 soil leachate. Followed by measurement by pH ion selective electrode. Results expressed as per leachate.

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Laboratory Identification		149539	149540	149541	149542	149543	149540d	149540r	149542s	lcs	mb
Sample Identification		BH1	BH1	BH3	BH4	BH6	QC	QC	QC	QC	QC
Depth (m)		0.4-1.0	2.0-2.4	0.8-1.0	0.4-1.0	2.0-2.4	--	--	--	--	--
Sampling Date recorded on COC		20/2/08	20/2/08	20/2/08	20/2/08	20/2/08	--	--	--	--	--
Laboratory Extraction (Preparation) Date		10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	--	10/4/08	10/4/08	10/4/08
Laboratory Analysis Date		15/4/08	15/4/08	15/4/08	15/4/08	15/4/08	15/4/08	--	15/4/08	15/4/08	15/4/08
<b>Method : E033.2/E045.2/E047.2 Chloride</b>	<b>EQL</b> 10	10	<10	<10	50	30	<10	--	110%	105%	<10

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E033.2/E045.2/E047.2: 1:5 water extraction. Determination by colour and/or by Ion Chromatography.



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Laboratory Identification		149539	149540	149541	149542	149543	149540d	149540r	149540t	149542s	lcs
Sample Identification		BH1	BH1	BH3	BH4	BH6	QC	QC	QC	QC	QC
Depth (m)		0.4-1.0	2.0-2.4	0.8-1.0	0.4-1.0	2.0-2.4	--	--	--	--	--
Sampling Date recorded on COC		20/2/08	20/2/08	20/2/08	20/2/08	20/2/08	--	--	--	--	--
Laboratory Extraction (Preparation) Date		10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	--	17/4/08	10/4/08	10/4/08
Laboratory Analysis Date		15/4/08	15/4/08	15/4/08	15/4/08	15/4/08	15/4/08	--	18/4/08	15/4/08	15/4/08
<b>Method : E042.2/E045.2</b> <b>Sulphate/Sulphite</b> Sulphate	<b>EQL</b> 10	<10	130	20	210	150	10	171%	<10	116%	100%

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E042.2/E045.2: 1:5 water extraction. Determination by colour and/or Ion Chromatography. Note Sulphite test is not covered by NATA accreditation.

Laboratory Identification		lcs	mb	mb							
Sample Identification		QC	QC	QC							
Depth (m)		--	--	--							
Sampling Date recorded on COC		--	--	--							
Laboratory Extraction (Preparation) Date		17/4/08	10/4/08	17/4/08							
Laboratory Analysis Date		17/4/08	15/4/08	17/4/08							
<b>Method : E042.2/E045.2</b> <b>Sulphate/Sulphite</b> Sulphate	<b>EQL</b> 10	94%	<10	<10							

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E042.2/E045.2: 1:5 water extraction. Determination by colour and/or Ion Chromatography. Note Sulphite test is not covered by NATA accreditation.

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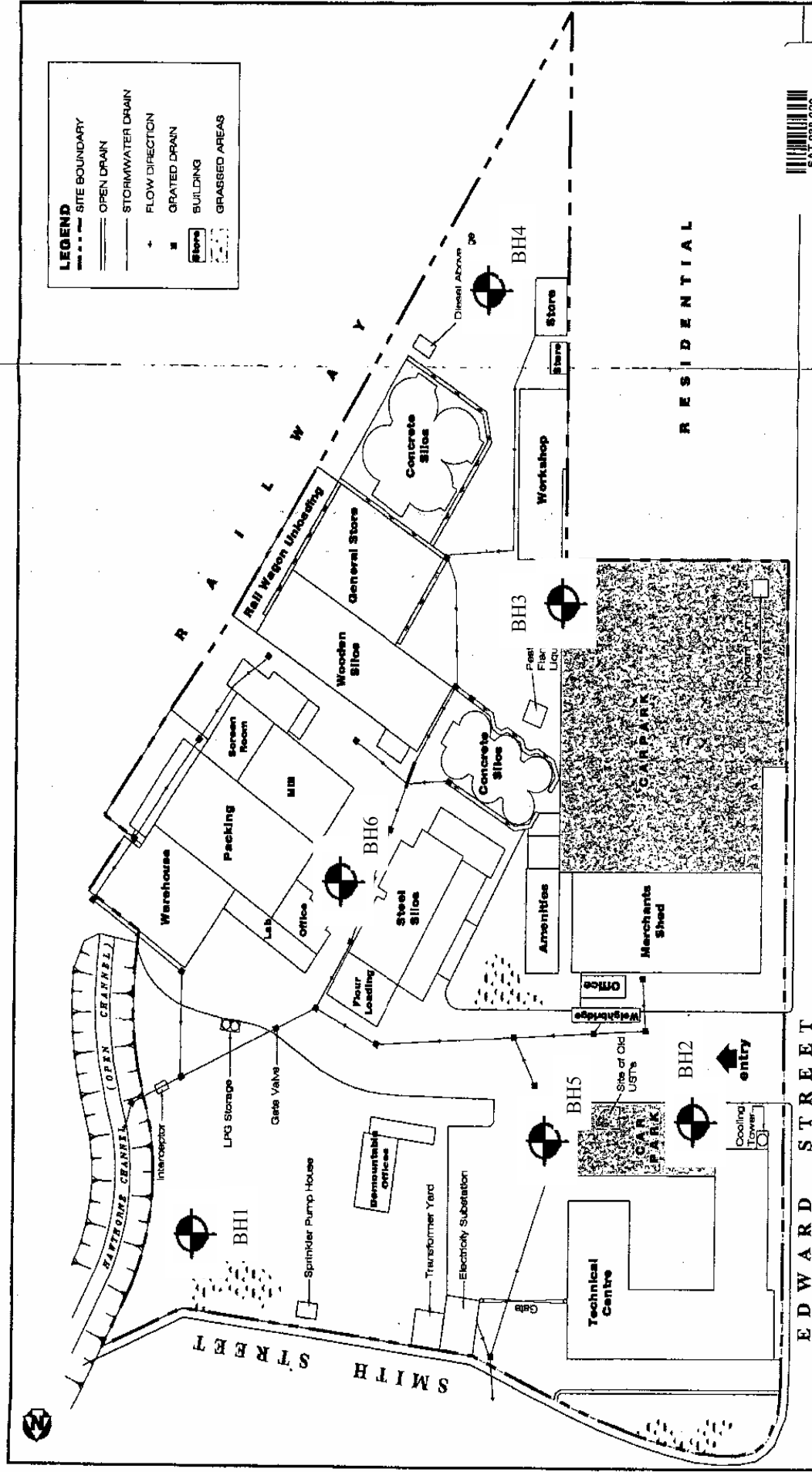
Laboratory Identification		149539	149540	149541	149542	149543	149540d	149540r			
Sample Identification		BH1	BH1	BH3	BH4	BH6	QC	QC			
Depth (m)		0.4-1.0	2.0-2.4	0.8-1.0	0.4-1.0	2.0-2.4	--	--			
Sampling Date recorded on COC		20/2/08	20/2/08	20/2/08	20/2/08	20/2/08	--	--			
Laboratory Extraction (Preparation) Date		10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	10/4/08	--			
Laboratory Analysis Date		11/4/08	11/4/08	11/4/08	11/4/08	11/4/08	11/4/08	--			
<b>Method : E005.2</b>											
<b>Moisture</b>	<b>EQL</b>										
Moisture	--	9	7	16	11	15	9	25%			

Results expressed in % w/w unless otherwise specified

Comments:

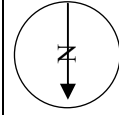
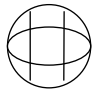
E005.2: Moisture by gravimetric analysis. Results are in % w/w.

## **APPENDIX D**



**BRINK & ASSOCIATES**  
 Geotechnical, Geological, Environmental  
 Consulting Engineers and Scientists

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 WETHERILL PARK NSW 2164  
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 Fax: (02) 9604 6427



SCALE:  
 N.T.S.  
 DRAWING NO:  
 S07146-1

EG PROPERTY GROUP  
 PROPOSED RESIDENTIAL DEVELOPMENT  
 2 SMITH STREET  
 SUMMER HILL

SITE PLAN

LEGEND

Approximate Borehole  
 Location



## **APPENDIX E**