Douglas Partners
Geotechnics • Environment • Groundwater

Integrated Practical Solutions

REPORT
on
BASELINE WATER QUALITY ASSESSMENT

PROPOSED DEVELOPMENT
CATHERINE HILL BAY

Prepared for
COAL & ALLIED INDUSTRIES LTD

Project 39662.06-1A
NOVEMBER 2010

Douglas Partners
Geotechnics • Environment • Groundwater

REPORT
on
BASELINE WATER QUALITY ASSESSMENT

PROPOSED DEVELOPMENT
CATHERINE HILL BAY

Prepared for
COAL & ALLIED INDUSTRIES LTD

Project 39662.06-1A
NOVEMBER 2010

Douglas Partners Pty Ltd
ABN 75 053 980 117

Box 324
Hunter Region Mail Centre
NSW 2310 Australia

15 Callistemon Close
Warabrook, NEWCASTLE

Phone: 02 4960 9600
Fax: 02 4960 9601
newcastle@douglaspartners.com.au

TABLE OF CONTENTS

ATTACHMENTS

EMG:PWW:sm

Project No: 39662.06-1A

P:\39662.06\Docs\CHB\39662.06-01A.doc

1 November 2010

REPORT ON
BASELINE WATER QUALITY ASSESSMENT
PROPOSED DEVELOPMENT
CATHERINE HILL BAY

1. INTRODUCTION

This report presents the results of a baseline water quality assessment at the proposed residential development at Middle Camp (Catherine Hill Bay). The assessment was carried out at the request of Coal & Allied Industries Ltd, in consultation with Catylis Pty Ltd.

The assessment comprised water quality sampling and testing to establish pre-development baseline data. The sampling and testing was undertaken in June 2007.

2. SITE IDENTIFICATION

The proposed development site comprises two separate areas which are within Part Lot 223, DP 110298, within the Lake Macquarie City Council area.

The extent of each of the potential development areas is shown on Figure 1 below. Each area is described as follows:

- ***Area A*** is located on the eastern side of Flowers Drive with an overall area of 7.32 ha;

- ***Area B*** includes the former Pit E and is situated north of the Middle Camp township on the western side of Flowers Drive. The area has an irregular shape with an overall area of about 20.88 ha.

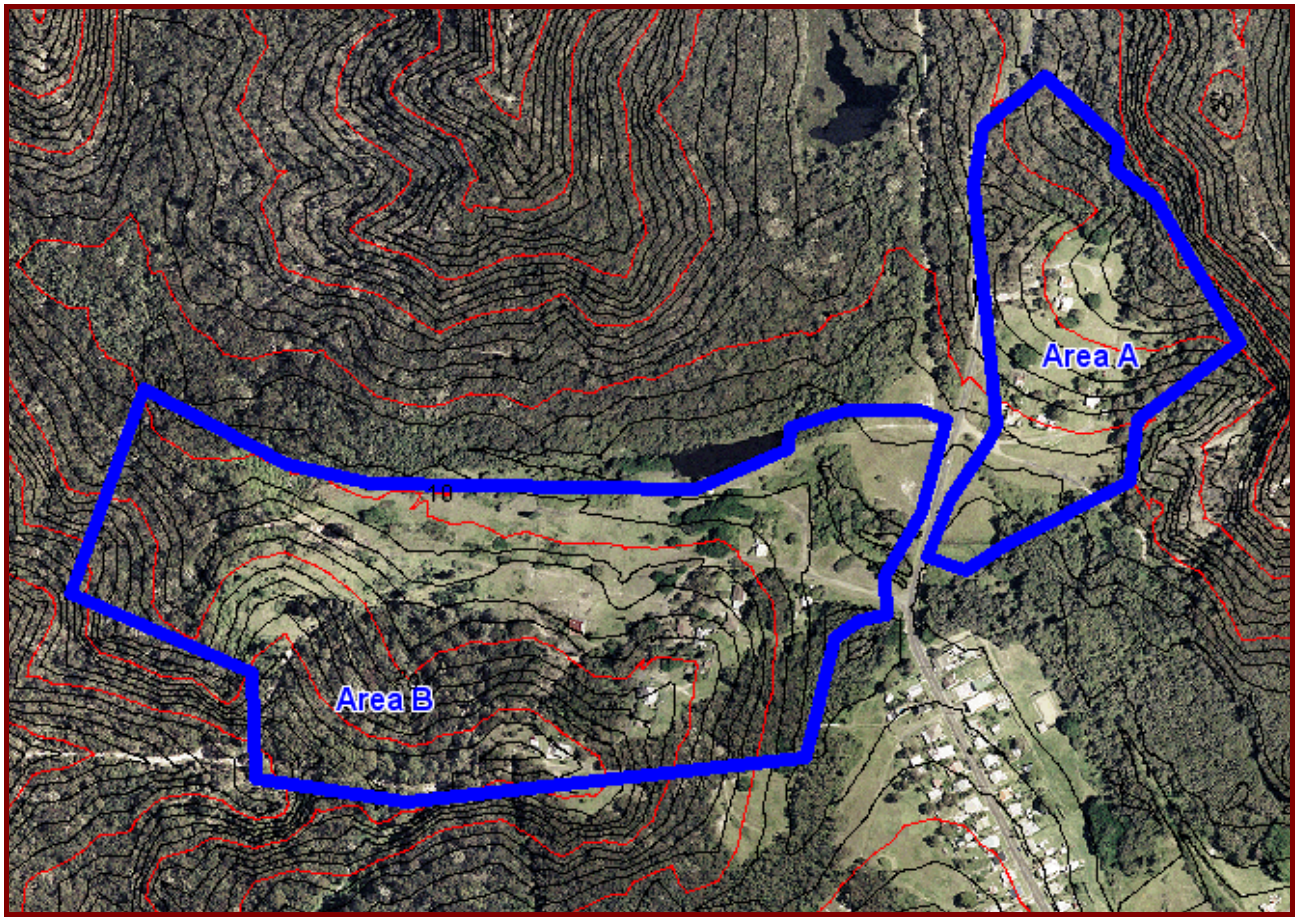

Figure 1 – Proposed Development Areas

3. FIELD WORK

3.1 Methods

Two rounds of surface water quality sampling were undertaken across the site, one 'dry' event, and one 'wet' event taken with 24 hours of significant rainfall. The dry event was undertaken on 1 May 2007 (W1 to W3) and 8 May 2007 (W4 and W5), and the wet weather event was undertaken on 7 June 2007 (W1 to W5). The rainfall on the day of the wet weather event on the 7 June 2007, at Norah Head, the closet Bureau of Meteorology Weather station was 29.2 mm.

The samples were collected from the water surface at the edge of the creeks. Field parameters measured included pH, temperature, electrical conductivity and Eh using a calibrated portable meter. Representative samples were collected for detailed laboratory analysis, described in Section 4.

The sampling was undertaken in two permanent creeks, one which flows in an easterly direction through the northern parts of North Area, continuing to the north of East Area prior to discharging at the northern end of the Catherine Hill Bay beach. The other creek is located to the south of the proposed development site in a creek which discharges at the southern end of the beach.

All sampling data was recorded on DP chain of custody sheets and the general sampling procedure comprised the following:

- Direct sampling of creek water using sampling bottles;
- Disposable gloves for handing of samples;
- Dedicated sample containers, including sealed sterilised bottles for microbiological sampling;
- Labelling of sample containers with individual and unique identification;
- Placement of sample containers into an iced box;
- Use of chain of custody documentation ensuring that sample tracking and custody could be cross checked at any point in the transfer of samples from the field to the laboratory.

The sample locations are described in Table 1, below, and shown on Drawing 1, attached.

Table 1 – Sample Locations

Test Location Number	General Location	Creek Type	Events	Comment
W1	Area A	Permanent Creek	Dry, Wet	North East of site
W2	Area B	Permanent Creek	Dry, Wet	Dam Outlet, Northern boundary
W3	Area B	Permanent Creek	Dry, Wet	Upstream areas, only minor flows
W4	South of Site	Permanent Creek	Dry, Wet	
W5	South of Site	Permanent Creek	Dry, Wet	Creek adjacent to Flowers Drive

3.2 Results

Field work was undertaken on 1 May 2007 (W1 to W3) and 8 May 2007 (W4 and W5) for the dry event, and 7 June 2007 (W1 to W5) for the wet event. The results of field measurements are presented in Tables 2 and 3 below:

Table 2 – Dry Event Field Measurements

Test Location	pH	Electrical Conductivity (µS/cm)	Eh (mV)	Temperature (° C)
W1	6.2	2.00	185	17.6
W2	5.5	0.39	209	17.1
W3	5.9	0.45	241	16.3
W4	4.9	0.93	210	22.1
W5	6.0	1.71	102	18.2

Notes to Table 2:

Measurements taken at 0.1 m depth

Table 3 – Wet Event Field Measurements

Test Location	pH	Electrical Conductivity (µS/cm)	Eh (mV)	Temperature (° C)
W1	6.9	6.65	136	14.7
W2	6.8	0.40	162	14.0
W3	6.8	0.30	185	13.6
W4	6.9	0.49	176	15.2
W5	7.0	0.56	158	14.8

Notes to Table 3:

Measurements taken at 0.1 m depth

4. LABORATORY TESTING

The collected samples were stored on ice and transported to Hunter Water Laboratories, under chain of custody documentation, for chemical analysis. The laboratory results are presented in Tables 4 and 5 below.

Table 4 – Dry Event Laboratory Results

Sample Identification Test Location Sample Date	W1 W1 7/06/2007	W2 W2 7/06/2007	W3 W3 7/06/2007	W4 W4 7/06/2007	W5 W5 7/06/2007	Laboratory PQL	ANZECC (2000) Trigger Values	
							Slightly to Moderately disturbed	Irrigation Waters
Turbidity (NTU)	11	29	38	9.7	13	NA	6-50 [10]	NC
Suspended Solids	6	21	13	11	8	NA	NC	NC
Dissolved Oxygen	3.5	5.8	6.2	5.9	4	NA	NC	NC
Anions								
Total Kjeldahl Nitrogen	1.7	1.4	1.7	2.5	0.8	0.05	NC	5 [5]
Total Nitrogen as N	1.7	1.4	1.7	2.5	0.8	0.05	NC	5 [5]
Total Oxidised Nitrogen	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	5 [5]
Total Phosphorus	NT	NT	NT	<0.05	<0.05	0.01	0.01 [1][2]	0.05 [6]
SO_4 (Sulphate)	132	60	52	112	210	1	NC	NC
Cations								
Fe^{2+} (Soluble)	0.32	0.83	1.35	2.14	0.6	0.1	0.3	NC
Metal								
As	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	0.013 [14]	0.1 [5]
Cd	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.0002	0.01 [5]
Cr	<0.001	<0.001	<0.001	0.002	0.001	0.001	0.001 [12]	0.1 [5]
Cu	0.002	0.002	0.002	0.008	0.005	0.001	0.0014	0.2 [5]
Pb	0.001	<0.001	0.001	0.003	0.002	0.001	0.0034	2 [5]
Hg	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	0.0001	0.00006 [15]	0.002 [5]
Ni	0.005	0.007	0.004	0.003	0.007	0.001	0.011	0.2 [5]
Zn	0.07	0.12	0.03	0.17	0.14	0.005	0.008	2 [5]
BOD5	2	3	2	2	<2	NA	NC	NC
E Coli (MPN/100mL)	64	30	38	187	36	1/10	230 [16]	NIL
Total Coliforms (MPN/100 mL)	14136	10462	24196	32550	8704	1/10	NC	<10 [8]
Total Oil and Grease	<2	2	2	<2	<2	2	NC	NC

See Notes to Table 5

Table 5 – Wet Event Laboratory Results

Sample Identification Test Location Sample Date	R2-W1 W1 7/06/2007	R2-W2 W2 7/06/2007	R2-W3 W3 7/06/2007	R2-W4 W4 7/06/2007	R2-W5 W5 7/06/2007	Laboratory PQL	ANZECC (2000) - Trigger Values	
							Slightly to Moderately disturbed	Irrigation Waters
Turbidity (NTU)	4	19	38	6.7	28	NA	6-50 (10)	NC
Suspended Solids	9	6	30	9	13	NA	NC	NC
Dissolved Oxygen	9.2	8	7.8	8.4	8	NA	NC	NC
Anions								
Total Kjeldahl Nitrogen	0.6	0.8	1.1	0.8	0.6	0.05	NC	5 (5)
Total Nitrogen as N	0.66	0.8	1.1	0.8	0.7	0.05	NC	5 (5)
Total Oxidised Nitrogen	0.06	<0.05	<0.05	<0.05	0.1	0.05	NC	5 (5)
Total Phosphorus	0.06	0.05	0.08	0.05	0.08	0.01	0.01 (1)(2)	0.05 (6)
SO_4 (Sulphate)	360	70	10	36	80	1	NC	NC
Cations								
Fe^{2+} (Soluble)	NT	NT	NT	NT	NT	0.1	0.3	NC
Metal								
As	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	0.013 (14)	0.1 (5)
Cd	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.0002	0.01 (5)
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001 (12)	0.1 (5)
Cu	0.002	0.002	0.002	0.004	0.004	0.001	0.0014	0.2 (5)
Pb	0.003	0.003	0.004	0.004	0.002	0.001	0.0034	2 (5)
Hg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0001	0.00006 (15)	0.002 (5)
Ni	0.004	0.007	0.003	0.002	0.004	0.001	0.011	0.2 (5)
Zn	0.06	0.06	0.03	0.05	0.08	0.005	0.008	2 (5)
BOD5	3	3	3	3	6	NA	NC	NC
E Coli (MPN/100mL)	3450	614	91	2582	3744	1/10	NIL	NIL
Total Coliforms (MPN/100 mL)	>48392	20924	6152	48392	>48392	1/10	NC	<10 (8)
Total Oil and Grease	<2	<2	<2	3	<2	2	NC	NC

Notes to Tables 4 and 5:

Shaded results indicated exceedance of relevant criteria

Results expressed in mg/L unless otherwise stated

PQL - Practical Quantification Limits
(1) - Trigger Values for physical and chemical stressors for south-east Australia for Slightly Disturbed Ecosystems (Table 3.3.2)

(2) - For Freshwater Lakes and Reservoirs (Conservative)

(5) - Long Term Trigger Values (up to 100 yrs)

(6) - To minimise bioclogging of irrigation equipment

(7) - Trigger Values for assessing corrosiveness of water

(8) - Faecal Coliforms Criteria for Raw human food crops in contact with irrigation water (ANZECC 2000 Table 4.2.2)

(9) - Most Probable Number (MPN)
(10) - Trigger Value For Lowland Rivers, lower end of range for well vegetated areas and higher end of range for slightly disturbed catchments

(11) - Trigger Value Dependent on the Location of the Water and Prevailing Winds etc (See Table 3.3.3)

(12) - Chromium (VI)

(14) - Arsenic (V) (conservative)

(15) - Mercury (Inorganic)

(16) Based on Recreational Use, secondary contact.

NT - Not Tested

NC - No Criteria

NA – Not Applicable

5. COMMENTS

5.1 General

For the purpose of assessing water quality, reference has been made to the Australia and New Zealand Guidelines for Fresh and Marine Quality (ANZECC), 2000 (Ref 1) for slightly to moderately disturbed systems and irrigation waters.

5.2 Summary of Results

The results of field and laboratory testing indicated the following:

- Total Phosphorus were greater than ANZECC criteria for all samples tested in both dry and wet weather sampling rounds;
- E coli was detected in all samples from both rounds. When compared to the ANZECC criteria for recreational use, with secondary contact, all but sample W6 were within the criteria for the dry weather round. Most samples exceeded this criteria for the wet weather round with the exception of W3 located within bushland;
- When compared to ANZECC trigger levels for lowland rivers, the turbidity was typically within the range expected for slightly disturbed catchments;
- Concentrations of Copper, Zinc and Ferrous Iron were typically above ANZECC trigger levels for most samples, however elevations of such parameters are not unusual in the natural environment and can be considered typical background levels. Slightly elevated concentrations of lead were observed at W3 and W4 for the wet weather event;
- Oil and grease concentrations were below detection limit for all samples;
- Although there is no criterion for total coliforms there appears to be a relationship between the concentration of E coli and total coliforms, with higher concentrations occurring in the wet weather round.

Elevated phosphorus and E coli concentrations, as noted above, are most likely due to animal activity across the site and possibly ineffective septic tank systems.

DOUGLAS PARTNERS PTY LTD

Reviewed by:

Will Wright
Principal

Stephen Jones
Principal

REFERENCES:

1. ANZECC (2000): Australian Water Quality Guidelines for Fresh and Marine Waters, November 2000.

Douglas Partners
Geotechnics · Environment · Groundwater

NOTES RELATING TO THIS REPORT

Introduction

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

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

Description and Classification Methods

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

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

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

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

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

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

Relative Density	SPT "N" Value (blows/300 mm)	CPT Cone Value (q_c — MPa)
Very loose	less than 5	less than 2
Loose	5—10	2—5
Medium dense	10—30	5—15
Dense	30—50	15—25
Very dense	greater than 50	greater than 25

Rock types are classified by their geological names. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

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

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

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

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

Drilling Methods.

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

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

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

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

Continuous Spiral Flight Augers — the hole is advanced using 90—115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and in sands above the water

table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling — the hole is 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.

Rotary Mud Drilling — similar to rotary drilling, but using drilling mud as a circulating fluid. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg. from SPT).

Continuous Core Drilling — a continuous core sample is obtained using a diamond-tipped core barrel, usually 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation.

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining 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 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm 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 150 mm of say 4, 6 and 7

  as 4, 6, 7
  N = 13

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

  as 15, 30/40 mm.

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

Occasionally, the test method is used to obtain samples in 50 mm diameter thin walled sample tubes in clays. In such circumstances, the test results are shown on the borelogs in brackets.

Cone Penetrometer Testing and Interpretation

Cone penetrometer testing (sometimes referred to as Dutch cone — abbreviated as CPT) described in this report has been carried out using an electrical friction cone penetrometer. The test is described in Australian Standard 1289, Test 6.4.1.

In the tests, a 35 mm diameter rod with a cone-tipped end 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 friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical 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 20 mm per second) the information is plotted on a computer screen and at the end of the test is stored on the computer for later plotting of the results.

The information provided on the plotted results comprises: —

- 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 in percent.

There are two scales available for measurement of cone resistance. The lower scale (0—5 MPa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main scale (0—50 MPa) is less sensitive and is shown as a full line.

The ratios of the sleeve friction to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1%—2% are commonly encountered in sands and very soft clays rising to 4%—10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:—

q_c (MPa) = (0.4 to 0.6) N (blows per 300 mm)

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:—

q_c = (12 to 18) c_u

Interpretation of CPT values can also be made to allow estimation of modulus or compressibility values to allow calculation of foundation settlements.

Inferred stratification as shown on the attached reports is assessed from the cone and friction traces and from experience and information from nearby boreholes, etc. This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties, and where precise information on soil classification is required, direct drilling and sampling may be preferable.

Hand Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150 mm increments of penetration. Normally, there is a depth limitation of 1.2 m but this may be extended in certain conditions by the use of extension rods.

Two relatively similar tests are used.

- Perth sand penetrometer — a 16 mm diameter flat-ended rod is driven with a 9 kg hammer, dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.
- Cone penetrometer (sometimes known as the Scala Penetrometer) — a 16 mm rod with a 20 mm diameter cone end is driven with a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). The test was developed initially for pavement subgrade investigations, and published correlations of the test results with California bearing ratio have been published by various Road Authorities.

Laboratory Testing

Laboratory testing is 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.

Bore Logs

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

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes, the frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Ground Water

Where ground water levels are measured in boreholes, there are several potential problems;

- In low permeability soils, ground water although present, 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. They may not be the same at the time of construction as are indicated in the report.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or 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 a perched water table.

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 condition, 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 depend partly on bore spacing and sampling frequency
- changes in policy or interpretation of policy by statutory authorities
- the actions of contractors responding to commercial pressures.

If these occur, the Company will be pleased to assist with investigation or advice to resolve the matter.

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 than 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.

Site Inspection

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

39662A
Catherine Hill Bay

HUNTER WATER LABORATORIES

A CONSULTING DIVISION OF HUNTER WATER AUSTRALIA PTY LIMITED
ABN 19 080 869 905

23 Rosegum Drive
WARABROOK NSW 2304
Tele: (02) 4935 0500
Fax: (02) 4935 0505

PO Box 317
Hunter Regional Mail Centre
NSW 2310

Hunter Water Australia

REPORT OF ANALYSIS

NATA Accreditation: 362(

Client: Douglas Partners
15 Callistemon Close Warabrook, Box 324, Hunter Regional Mail Cent

Contact: Will Wright

Sample Date: 1 May 2007

Date Received: 1 May 2007
3 samples sampled and submitted by client and tested as received

Order Number: 67068

Report Number: HWA-1299/07

Note: This report replaces Preliminary Report Number PR-0700561

Sample ID	*Date*	*Description*
H0709514	1/05/2007	W1

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	2	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	3.5	mg/L
Iron - Soluble	APHA (2005) 3113 B (Metals)	320	ug/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	1	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	5	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	132	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	6	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	1.7	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	1.7	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	<2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	<0.05	mg/L N
Turbidity	APHA (2005) 2130 B (Turbidity)	11	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.07	mg/L

Sample ID	*Date*	*Description*
H0709515	1/05/2007	W2

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	3	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	5.8	mg/L
Iron - Soluble	APHA (2005) 3113 B (Metals)	830	ug/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	7	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	60	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	21	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	1.4	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	1.4	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	<0.05	mg/L N
Turbidity	APHA (2005) 2130 B (Turbidity)	29	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.12	mg/L

Sample ID	*Date*	*Description*
H0709516	1/05/2007	W3

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	2	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	6.2	mg/L
Iron - Soluble	APHA (2005) 3113 B (Metals)	1350	ug/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	1	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	4	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	52	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	13	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	1.7	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	1.7	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	<0.05	mg/L N
Turbidity	APHA (2005) 2130 B (Turbidity)	38	NTU

Sample ID	*Date*	*Description*
H0709516	1/05/2007	W3

Analysis	*Method / Category*	*Result*	*Unit*
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.03	mg/L

Bob Manevski
(Approved NATA Signatory)
Production Chemist
14 May 2007

HUNTER WATER LABORATORIES

A CONSULTING DIVISION OF HUNTER WATER AUSTRALIA PTY LIMITED
ABN 19 080 869 905

23 Rosegum Drive
WARABROOK NSW 2304
Tele: (02) 4935 0500
Fax: (02) 4935 0505

PO Box 317
Hunter Regional Mail Centre
NSW 2310

Hunter Water Australia

REPORT OF ANALYSIS

NATA Accreditation: 9854

Client: Douglas Partners
15 Callistemon Close Warabrook, Box 324, Hunter Regional Mail Centr

Contact: Will Wright

Sample Date: 1 May 2007

Date Received: 1 May 2007 at 14:25 - Samples Cool
3 Water samples sampled and submitted by client

Testing Commenced: 1 May 2007 at 15:10

Order Number: 67068

Report Number: HWA-1194/07

Note: Interim Report Number HWL-0700488 sent by facsimilie transmission on the 2 May 2007.

Sample ID	*Date*	*Time*	*Description*
H0709514	1/05/2007	12:00	W1

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	64	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	14136	MPN/100mL

Sample ID	*Date*	*Time*	*Description*
H0709515	1/05/2007	12:00	W2

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	30	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	10462	MPN/100mL

Sample ID	*Date*	*Time*	*Description*
H0709516	1/05/2007	12:00	W3

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	38	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	24196	MPN/100mL

< less than *~ approximately* *est = estimated* *ND = not detected*

R Woodward

Robin Woodward
(Approved NATA Signatory)
Principal Microbiologist
3 May 2007

Bacterial Testing Conditions
OPTIMUM - within 6 hours of collection, sample cool/cold
OTHER - within 24 hours of collection, sample cool/cold and kept in the dark

39662A
1

HUNTER WATER LABORATORIES

A CONSULTING DIVISION OF HUNTER WATER AUSTRALIA PTY LIMITED
ABN 19 080 869 905

23 Rosegum Drive
WARABROOK NSW 2304
Tele: (02) 4935 0500
Fax: (02) 4935 0505

PO Box 317
Hunter Regional Mail Centre
NSW 2310

Hunter Water Australia

REPORT OF ANALYSIS

Client: Douglas Partners
15 Callistemon Close Warabrook, Box 324, Hunter Regional Mail Centre, NS

Contact: Will Wright

Sample Date: 8 May 2007

Date Received: 8 May 2007
2 samples sampled and submitted by client and tested as received

Order Number: 67085

Report Number: HWA-1442/07

Note: This report replaces Preliminary Report Number PR-0700628

Sample ID	*Date*	*Description*
H0710128	8/05/2007	W4

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	2	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	8	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	5.9	mg/L
Iron - Soluble	APHA (2005) 3113 B (Metals)	2140	ug/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	3	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	3	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	112	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	11	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	2.5	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	2.5	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	<2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	<0.05	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	<0.05	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	9.7	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.17	mg/L

REPORT OF ANALYSIS Number: 1442/07

Sample ID	*Date*	*Description*
H0710129	8/05/2007	W5

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	<2	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	5	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	4.0	mg/L
Iron - Soluble	APHA (2005) 3113 B (Metals)	600	ug/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	7	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	210	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	8	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	0.8	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	0.8	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	<2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	<0.05	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	<0.05	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	13	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.14	mg/L

Bob Manevski
Production Chemist
25 May 2007

39662 A
Catherine Hill Bay.

HUNTER WATER LABORATORIES

A CONSULTING DIVISION OF HUNTER WATER AUSTRALIA PTY LIMITED
ABN 19 080 869 905

23 Rosegum Drive
WARABROOK NSW 2304
Tele: (02) 4935 0500
Fax: (02) 4935 0505

PO Box 317
Hunter Regional Mail Centre
NSW 2310

Hunter Water Australia

REPORT OF ANALYSIS

NATA Accreditation: 9854

NATA TECHNICAL COMPETENCE

Client: Douglas Partners
15 Callistemon Close Warabrook, Box 324, Hunter Regional Mail Centr

Contact: Will Wright

Sample Date: 8 May 2007

Date Received: 8 May 2007 at 15:30 - Samples Ambient
2 Water samples sampled and submitted by client

Testing Commenced: 8 May 2007 at 16:00

Order Number: 67085

Report Number: HWA-1269/07

Note: Interim Report Number HWL-0700520 sent by email on the 10 May 2007.

Sample ID	*Date*	*Time*	*Description*
H0710128	8/05/2007	Not recorded	W4

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	187	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	32550	MPN/100mL

Sample ID	*Date*	*Time*	*Description*
H0710129	8/05/2007	Not recorded	W5

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	36	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	8704	MPN/100mL

< less than *~ approximately* *est = estimated* *ND = not detected*

Jaclyn Lindstrom
(Approved NATA Signatory)
Technical Officer
11 May 2007

Bacterial Testing Conditions
OPTIMUM - within 6 hours of collection, sample cool/cold
OTHER - within 24 hours of collection, sample cool/cold and kept in the dark

< less than *~ approximately* *est = estimated* *ND = not detected*

HUNTER WATER LABORATORIES

A CONSULTING DIVISION OF HUNTER WATER AUSTRALIA PTY LIMITED
ABN 19 080 869 905

23 Rosegum Drive
WARABROOK NSW 2304
Tele: (02) 4935 0500
Fax: (02) 4935 0505

PO Box 317
Hunter Regional Mail Centre
NSW 2310

Hunter Water Australia

REPORT OF ANALYSIS

NATA Accreditation: 3626

Client: Douglas Partners
15 Callistemon Close Warabrook, Box 324, Hunter Regional Mail Cent

Contact: Will Wright

Sample Date: 7 June 2007

Date Received: 7 June 2007
7 samples sampled and submitted by client and tested as received

Order Number: 67164

Report Number: HWA-1682/07

Note: This report replaces Preliminary Report Number PR-0700728

Sample ID	*Date*	*Description*
H0712587	7/06/2007	R2-W1

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	3	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	9.2	mg/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	3	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	4	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	360	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	9	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	0.6	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	0.66	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	<2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	0.06	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	0.06	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	4	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.06	mg/L

Sample ID	*Date*	*Description*
H0712588	7/06/2007	R2-W2

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	3	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	8.0	mg/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	3	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	7	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	70	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	6	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	0.8	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	0.8	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	<2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	<0.05	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	0.05	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	19	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.06	mg/L

Sample ID	*Date*	*Description*
H0712589	7/06/2007	R2-W3

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	3	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	7.8	mg/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	4	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	3	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	10	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	30	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	1.1	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	1.1	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	<2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	<0.05	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	0.08	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	38	NTU

Sample ID	*Date*	*Description*
H0712589	7/06/2007	R2-W3

Analysis	*Method / Category*	*Result*	*Unit*
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.03	mg/L

Sample ID	*Date*	*Description*
H0712590	7/06/2007	R2-W4

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	3	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	4	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	8.4	mg/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	4	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	36	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	9	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	0.8	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	0.8	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	3	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	<0.05	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	0.05	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	6.7	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.05	mg/L

Sample ID	*Date*	*Description*
H0712591	7/06/2007	R2-W5

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	6	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	4	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	8.0	mg/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	4	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	80	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	13	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	0.6	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	0.7	mg/L N

Sample ID	*Date*	*Description*
H0712591	7/06/2007	R2-W5

Analysis	*Method / Category*	*Result*	*Unit*
Total Oil and Grease	APHA (2005) 5520 D (Grease)	<2	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	0.10	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	0.08	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	28	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.08	mg/L

Sample ID	*Date*	*Description*
H0712592	7/06/2007	G1

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	3	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	4	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	9.2	mg/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	1	ug/L
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	20	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	226	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	0.8	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	0.9	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	3	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	0.10	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	0.05	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	440	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.04	mg/L

Sample ID	*Date*	*Description*
H0712593	7/06/2007	BH1

Analysis	*Method / Category*	*Result*	*Unit*
Arsenic - Soluble	APHA (2005) 3114 B (Metals)	<0.5	ug/L
BOD5 - Total	APHA (2005) 5210 B (BOD5)	4	mg/L
Cadmium - Soluble	APHA (2005) 3113 B (Metals)	<1	ug/L
Chromium - Soluble	APHA (2005) 3113 B (Metals)	1	ug/L
Copper - Soluble	APHA (2005) 3113 B (Metals)	2	ug/L
Dissolved Oxygen	APHA (2005) 4500-0 C (Dissolved Oxygen)	9.5	mg/L
Lead -Soluble	APHA (2005) 3113 B (Metals)	1	ug/L
Mercury - Soluble	APHA (2005) 3112 B (Metals)	<0.5	ug/L
Nickel - Soluble	APHA (2005) 3113 B (Metals)	3	ug/L

Sample ID	*Date*	*Description*
H0712593	7/06/2007	BH1

Analysis	*Method / Category*	*Result*	*Unit*
Sulfate	APHA (2005) 4500-SO42- E (Sulfate)	36	mg/L
Suspended Solids	APHA (2005) 2540 D (Suspended Solids)	163	mg/L
Total Kjeldahl Nitrogen	Inhouse 2 based on APHA (2005) 4500-Norg B (TKN)	1.7	mg/L N
Total Nitrogen	APHA (2005) 4500-Norg APHA (2005) 4500 - NO3 I (TN)	1.78	mg/L N
Total Oil and Grease	APHA (2005) 5520 D (Grease)	3	mg/L
Total Oxidised Nitrogen	APHA (2005) 4500 - NO3 I (TON)	0.08	mg/L N
Total Phosphorus	APHA (2005) 4500 - P H (Phosphorus)	0.17	mg/L P
Turbidity	APHA (2005) 2130 B (Turbidity)	145	NTU
Zinc - Soluble	APHA (2005) 3111 B (Metals)	0.02	mg/L

Andrea Swan
(Approved NATA Signatory)
Laboratory Manager
20 June 2007

HUNTER WATER LABORATORIES

A CONSULTING DIVISION OF HUNTER WATER AUSTRALIA PTY LIMITED
ABN 19 080 869 905

23 Rosegum Drive
WARABROOK NSW 2304
Tele: (02) 4935 0500
Fax: (02) 4935 0505

PO Box 317
Hunter Regional Mail Centre
NSW 2310

Hunter Water Australia

REPORT OF ANALYSIS

Client: Douglas Partners
15 Callistemon Close Warabrook, Box 324, Hunter Regional Mail Centre, NS

Contact: Will Wright

Sample Date: 7 June 2007

Date Received: 7 June 2007 at 15:30 - Samples Cold
7 Water samples sampled and submitted by client and tested as received

Testing Commenced: 7 June 2007 at 16:20

Order Number: 67164

Report Number: HWA-1597/07

Note: Interim Report Number HWL-0700627 sent by facsimilie transmission on the 8 June 2007.

Sample ID	*Date*	*Time*	*Description*
H0712587	7/06/2007	Not recorded	R2-W1

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	3450	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	>48392	MPN/100mL

Sample ID	*Date*	*Time*	*Description*
H0712588	7/06/2007	Not recorded	R2-W2

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	614	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	20924	MPN/100mL

Sample ID	*Date*	*Time*	*Description*
H0712589	7/06/2007	Not recorded	R2-W3

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	91	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	6152	MPN/100mL

The results of the tests, calibrations &/or measurements included in this document are traceable to Australian/national standards.
The results on this report relate only to the items tested.

< less than *~ approximately* *est = estimated* *ND = not detected*

REPORT OF ANALYSIS Number: 1597/07

Sample ID	*Date*	*Time*	*Description*
H0712590	7/06/2007	Not recorded	R2-W4

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	2582	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	48392	MPN/100mL

Sample ID	*Date*	*Time*	*Description*
H0712591	7/06/2007	Not recorded	R2-W5

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	3744	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	>48392	MPN/100mL

Sample ID	*Date*	*Time*	*Description*
H0712592	7/06/2007	Not recorded	G1

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	981	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	48840	MPN/100mL

Sample ID	*Date*	*Time*	*Description*
H0712593	7/06/2007	Not recorded	BH1

Analysis	*Method / Category*	*Result*	*Unit*
E coli	HWC030 (MPN-Enzyme Hydrolysable Substrates))	43520	MPN/100mL
Total Coliforms	HWC030 (MPN-Enzyme Hydrolysable Substrates))	>241960	MPN/100mL

RWoodward

Robin Woodward
Principal Microbiologist
12 June 2007

Bacterial Testing Conditions
OPTIMUM - within 6 hours of collection, sample cool/cold
OTHER - within 24 hours of collection, sample cool/cold and kept in the dark

< less than ~ approximately est = estimated ND = not detected

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY FIELD SHEET

Client: Coal & Allied

Project: ..... Project No: 39662A

Location: Catherine Hill Bay

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling By	Sampling Date	Sampling Time	Received by: LMC Date: 1/5/07 Storage Location*	☑ HWL Date: 1/5/07	
W1	–		W	G/P	LMC	1/5/07	10:45am	Fridge	Hunter Water Labs	
W2	–	–	↓	↓	↓	↓	12:00pm	↓	↓	
W3	–	–	↓	↓	↓	↓	11:30am	↓	↓	

Default containers for soil: glass = clear 125/250 mL with teflon liner, plastic =press seal bag
*Default storage: Glass containers in fridge, plastic containers shelved, all water samples in fridge

RECEIVED 1/5/07. 2:25pm.

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: Catherine Hill Bay
Project No: 39662A DP Order No: 67068
DP Contact Person: Will Wright
Prior Storage: (esky) / fridge / shelved (circle)

To: Hunter Water Labs
23 Rosegum Drive,
Warabrook NSW 2304
Ph: (02) 49350500
Attn: Bob

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: Dissolved oxygen DO	TSS	Dissolved # Metals	Total nitrogen	TKN	Total phosphorus	Sulphate SO_4	Total oil & grease	BOD	Ecoli	Total Coliforms	Turbidity			TCLP	Notes
W1	1/5/07	W		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
W2	↓	↓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
W3	↓	↓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
PQL (S)		mg/kg				0													
PQL (W)		mg/L				0													

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 1/5/07
Total number of samples in container: 3
Results required by:
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature:
Date: 1/5/07 Lab Ref:

Send results to:
Douglas Partners Pty Ltd
Address:
BOX 324 Hunter Region Mail Centre
NSW 2310
Fax: (02) 4960 9601

ug/L As-0.5, Cr-1.0, Cu-1.0, Pb-1.0, Fe-5.0, Hg-0.5, Ni-1.0, Zn-0.02.

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: Catherine Hill Bay
Project No: 39662A DP Order No: 67085
DP Contact Person: Will Wright
Prior Storage: (esky) fridge / shelved (circle)

To: Hunter Water Labs
23, Rosegum Drive
Warabrook NSW 2304
Ph: (02) 49350500
Attn: Bob

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: Dissolved Oxygen	TSS	Dissolved Metals #	Total Nitrogen	TKN	Total Phosphorus	Sulphate	Total oil & grease	BOD	Ecoli	Total Coliforms	Turbidity			TCLP	Notes
W4	8/5/07	W		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
W5	↓	↓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
PQL (S)		mg/kg																	
PQL (W)		mg/L				ANZECC													

RECEIVED 3:30pm

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 8/5/07
Total number of samples in container: 1
Results required by:
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature:
Date: 8/5/07 Lab Ref:

Send results to:
Douglas Partners Pty Ltd
Address:
BOX 324 Hunter Region Mail Centre
NSW 2310
Fax: (02) 4960 9601

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY FIELD SHEET

Client: Coal & Allied
Project: C&A Water - Sampling Project No: 39662A/39664A
Location: Catherine Hill Bay / Blackhill

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling By	Sampling Date	Sampling Time	Received by: LMC Date: 7/6/07 Storage Location*	☑ H.W.L Date: 7/6/07	
R2 - W1	—	—	W	G/P	LMC	7/6/07		Esky	✓	
R2 - W2	—	—	↓	↓	↓	↓		↓	✓	
R2 - W3	—	—	↓	↓	↓	↓		↓	✓	
R2 - W4	—	—	↓	↓	↓	↓		↓	✓	
R2 - W5	—	—	↓	↓	↓	↓		↓	✓	
G1	—	—	↓	↓	↓	↓		↓	✓	
BH1	—	—	↓	↓	↓	↓		↓	✓	

Default containers for soil: glass = clear 125/250 mL with teflon liner, plastic =press seal bag
*Default storage: Glass containers in fridge, plastic containers shelved, all water samples in fridge

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: Catherine Hill Bay / Blackhill
Project No: 39662A/~~39664A~~ DP Order No:
DP Contact Person: Will Wright
Prior Storage: (esky) / fridge / shelved (circle)

To: Hunter Water Laboratories
23 Rosegum Drive
Warabrook NSW 2304
Ph: (02) 49350500
Attn: Bob

RECEIVED 3:30pm

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: Dissolved Oxygen	TSS	Dissolved Metals #	Total Nitrogen	TKN	Total Phosphorus	Sulphate	Total oil & grease	BOD	Ecoli	Total coliforms	Turbidity			TCLP	Notes
R2-W1	7/6/07	W		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
R2-W2	↓	↓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
R2-W3				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
R2-W4				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
R2-W5				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
G1				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
BH1	↓	↓		✓	✓	✓	✓	✓	—	✓	✓	✓	✓	✓	✓				
PQL (S)		mg/kg																	
PQL (W)		mg/L																	

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): (As Cd Cr Cu Pb Zn Hg Ni) Other
Date relinquished: 7/6/07
Total number of samples in container: 7
Results required by:
TAT (Circle): (Standard) 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature:
Date: 7/6/07 Lab Ref:

Send results to:
Douglas Partners Pty Ltd
Address:
BOX 324 Hunter Region Mail Centre
NSW 2310
Fax: (02) 4960 9601

mg/L As-0.5, Cr-1.0, Cu-1.0, Pb-1.0, Fe-5.0, Hg-0.5, Ni-1.0, Zn-0.02

N

W3

W2

Area A

Area B

W1

W4

W5

Sampling Point

Extent of Proposed Development

Douglas Partners

Geotechnics . Environment . Groundwater

Sydney, Newcastle, Brisbane,
Melbourne, Perth, Darwin,
Wyong, Campbelltown, Canberra
Townsville, Cairns, Wollongong

TITLE:

WATER SAMPLE LOCATIONS
CATHERINE HILL BAY
C&A LOWER HUNTER LAND DEVELOPMENT

CLIENT: Coal & Allied Industries Ltd

DRAWN BY:	SCALE: 1:7500 at A3	PROJECT No: 39662.06	OFFICE: NEWCASTLE
APPROVED BY:		DATE:	DRAWING No: 1