



ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

HEALTH INFRASTRUCTURE

ON

**STAGE 1 PRELIMINARY ENVIRONMENTAL
SITE ASSESSMENT**

FOR

PROPOSED SHOALHAVEN CANCER CARE CENTRE

AT

**CORNER OF NORTH STREET AND
SCENIC DRIVE NOWRA, NSW**

APRIL 2011

REF: E24682Krpt

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Proposed Development Details	1
2	OBJECTIVES AND SCOPE OF WORK	2
2.1	Objectives	2
2.2	Scope of Work	2
3	SITE INFORMATION	3
3.1	Site Identification	3
3.2	Site Description	3
3.3	Regional Geology	4
3.4	Hydrogeology	4
4	SITE HISTORY ASSESSMENT	5
4.1	Aerial Photographs	5
4.2	Land Title Search	5
4.3	Council Records - Section 149 Certificate	6
4.4	WorkCover Database Records	6
4.5	NSW DECCW Records	6
4.6	Assessment of Historical Information Integrity	6
4.7	Summary of Historical Site Use	7
5	POTENTIAL CONTAMINATION SOURCES	7
5.1	Potential Site Specific Contamination	7
5.2	Potential Receptors	8
5.3	Contaminant Laydown and Transport Mechanisms	8
6	ASSESSMENT CRITERIA DEVELOPMENT	8
6.1	Regulatory Background	8
6.2	Soil Contaminant Threshold Concentrations	10
6.3	Evaluation of Soil Analysis Data and Contaminant Threshold Concentrations	14
7	ASSESSMENT PLAN	14
7.1	Soil Sampling Density	14
7.2	Data Quality Objectives (DQOs)	14
7.3	Data Quality Indicators (DQIs) and Quality Assurance	15
8	INVESTIGATION PROCEDURE	16
8.1	Soil Sampling Methods	16
8.2	Photoionisation Detector (PID) Screening	17
8.3	Laboratory Analysis	17
9	RESULTS OF INVESTIGATION	18
9.1	Subsurface Conditions	18
9.2	Laboratory Results	19
10	ASSESSMENT OF ANALYTICAL QA/QC	20
11	DISCUSSION	22
11.1	Summary of Soil Conditions	22
11.2	Summary of Groundwater Conditions	22
11.3	Waste Classification	22
11.4	Conclusion	23
12	LIMITATIONS	23

Abbreviations

Important Information About Your Environmental Site Assessment

LIST OF TABLES:

Table A:	Chemical Contaminant Criteria for Waste Classification
Table B:	Summary of Laboratory Test Data – Soil Characterisation Assessment
Table C:	Summary of Laboratory Test Data – QA/QC Duplicate RPD Results



Table D: Summary of Laboratory Test Data – QA/QC - Trip Blank and Field Blank Results

LIST OF FIGURES:

Figure 1: Site Location Plan

Figure 2: Borehole Location Plan

LIST OF APPENDICES:

Appendix A: Borehole Logs BH1 to BH6 Inclusive and Geotechnical Explanatory Notes

Appendix B: Laboratory Reports and Chain of Custody Documents

Appendix C: Site History Assessment Documents

Appendix D: Sampling Protocols and QA/QC Definitions



1 INTRODUCTION

Taylor Thomson Whitting (NSW) Pty Ltd, acting on behalf of, Health Infrastructure commissioned Environmental Investigation Services (EIS), a division of Jeffery & Katauskas Pty Ltd (J&K), to undertake an Stage 1 preliminary environmental site assessment to assess the likelihood of contamination of the subsurface soils for a proposed cancer care centre development located at the corner of North Street and Scenic Drive, Nowra.

The site is identified as Lot 7300 DP 1132679 and at the time of this investigation was generally undeveloped and covered with trees. The site location is shown on Figure 1 and the investigation was confined to the proposed development area as shown on Figure 2.

The screening was undertaken generally in accordance with an EIS proposal (Ref: EP5375K) of 25 January 2011 and written acceptance from Taylor Thomson Whitting (NSW) Pty Ltd on Behalf of Health Infrastructure.

This report describes the investigation procedures and presents the results of the environmental site assessment, together with comments, discussion and recommendations.

A geotechnical investigation was undertaken in conjunction with the environmental site screening by J&K and the results are presented in a separate report (Ref. 24682WHrpt, dated April 2011).

1.1 Proposed Development Details

Based on the supplied architectural drawings prepared by Hassell (Project No. AX003042, Dwg No. SK-02_F, dated 25 March 2011 and Dwg Nos. SK-03_H and SK-04_H, dated 23 March 2011), EIS understand that a two to three storey cancer care facility with a heavy reinforced concrete bunker will be constructed on the western side of the site. Several smaller single storey residential buildings will be constructed on the eastern side of the site. A driveway with car parking spaces is proposed between the main building and residential buildings. The approximate outline of the proposed buildings, car parking and driveway areas, are shown on Figure 2.



2 OBJECTIVES AND SCOPE OF WORK

2.1 Objectives

The primary objectives of the investigation were to:

- Assess the soil contamination conditions at the site in relation to the proposed residential land use;
- Undertake a waste classification assessment for off-site disposal of excavated soil associated with the proposed development works; and
- Prepare a report presenting the results of the assessment generally in accordance with the *NSW EPA (now DECCW) Guidelines for Consultants Reporting on Contaminated Sites (1997¹)* and *State Environmental Planning Policy No.55 – Remediation of Land (1998²)*.

2.2 Scope of Work

The scope of work undertaken to achieve the objective included:

1. Review of historical aerial photographs;
2. Review of historical land title records;
3. Search of the NSW DECCW notices for the site under Section 58 of the *Contaminated Land Management Act (1997³)*⁴;
4. Search of the NSW DECCW public register (POEO⁵) for licences, applications or notices for the site;
5. Search of WorkCover databases for licenses to store dangerous goods including underground fuel storage tanks (USTs);
6. Review of Shoalhaven City Council historical development applications (DA) and building approvals (BA) records for the site;
7. Review of regional geology and groundwater conditions, including the location of registered groundwater bores and major underground services in the vicinity of the site;
8. Design and implementation of a field sampling program;
9. Laboratory analysis of selected soil samples; and
10. Preparation of a report presenting the results of the assessment together with recommendations and comments on the suitability of the site for the proposed development.

¹ *Guidelines for Consultants Reporting on Contaminated Sites*, NSW EPA (now DECCW), 1997 (Reporting Guidelines 1997)

² *State Environmental Planning Policy No. 55 – Remediation of Land*, NSW Government, 1998 (SEPP55)

³ *Contaminated Land Management Act*, NSW Government Legislation, 1997 (CLM Act 1997)

⁴ <http://www.environment.nsw.gov.au/prclmapp/searchregister.aspx> visited on 17 February 2011

⁵ <http://www.environment.nsw.gov.au/prpoeoapp/searchregister.aspx> visited on 17 February 2011



Field work for this investigation was undertaken on 10 and 11 March 2011.

3 **SITE INFORMATION**

3.1 **Site Identification**

The site identification details are summarised in the following table:

Site Owner:	State of New South Wales
Site Address:	Corner North Street And Scenic Drive, Nowra, NSW
Lot & Deposited Plan:	Lot 7300 DP 1132679
Current Land Use:	Reserve
Proposed Land Use:	Hospital
Local Government Authority:	Shoalhaven
Current Zoning:	6(a) Open Space – Recreation (existing)
Area of Proposed Development:	Approximately 9,000m ²
AHD:	Approximately 30m
Geographical Location (MGA):	N: 6138662 E: 280077 (approximately)
Site Locality Plan:	Refer to Figure 1
Borehole Location Plan:	Refer to Figure 2

3.2 **Site Description**

The site was located within Nowra Park at the north-east corner of the intersection of Scenic Drive and North Street, Nowra. Regional topography in the vicinity of the site includes a north to south orientated ridge line that falls moderately to the east. To the west the ridge line has been cut by the Shoalhaven River and vertical sandstone cliffs approximately 30m high were situated approximately 20m to the west of the site. The site topography has a gradual east facing slope of approximately 3° and the ground surface of the site was generally level at the time of the site inspection.

The site was bounded by Scenic Drive to the west, North Street to the south, an open air asphaltic concrete car park associated with the Shoalhaven Hospital to the north and to the east by the Nowra Park sports field. At the time of the fieldwork, the site was vacant and covered with grass, scattered shrubs and medium to tall sized trees. In some areas the grass cover was patchy and residual silty sands and silty sandy clays were exposed.

Areas surrounding the site were occupied by the Shoalhaven District Memorial Hospital to the north, Nowra Park to the east, undeveloped bushland, sport field and residential



properties to the south of North Street and Scenic Drive to the west with Shoalhaven River beyond.

A survey plan provided to EIS indicated a north-east/south-west orientated water main in the vicinity of the proposed residential buildings and a possible sewer main in the vicinity of the south section of the proposed development. Details of the size, depth etc were not indicated on the plan.

3.3 Regional Geology

The 1:250,000 geological map of Wollongong indicates that the site is underlain by Nowra Sandstone of the Shoalhaven Group.

3.4 Hydrogeology

NSW Office of Water (formerly Department of Water and Energy⁶) records were researched for the investigation and indicated that several registered groundwater bores lie within 1km of the site, however no registered bores were located in the immediate vicinity of the site which is located on an elevated sandstone plateaux. The groundwater works summaries and a map indicating the location of the bores in relation to the site are attached in Appendix C. The bores indicated on the attached map are located on the lower elevated areas of Nowra, including the river front, and are not considered representative of groundwater conditions in the vicinity of the site. The details are summarised in the following table:

Ref No	Approximate Distance from site (m)	Approximate Direction from site	Gradient from site	Standing Water Level (S.W.L)	Registered Purpose
GW110943	630	North-east	Down	2m	Monitoring
GW110944	630	North-east	Down	1m	Monitoring
GW101695	530	North-east	Down	48m depth (S.W.L not indicated)	Domestic
GW109973	500	East	Down	3m depth (S.W.L not indicated)	Monitoring
GW109972	500	East	Down	3.7m depth (S.W.L not indicated)	Monitoring

⁶ <http://www.waterinfo.nsw.gov.au/gw/> visited on 4 April 2011



The stratigraphy of the site is expected to consist of residual clayey soils overlying relatively shallow bedrock. Based on these conditions and the results of the groundwater bore search groundwater is not considered to be a significant resource in the immediate area of the site.

4 SITE HISTORY ASSESSMENT

4.1 Aerial Photographs

A limited selection of aerial photographs of the site taken in 1961, 1970, 1984, 1993 and 2006 were obtained from the Department of Lands and were reviewed as part of the assessment of the site history. The information obtained from the photographs are summarised in the following table:

Year	Details
1961	The site appeared to be undeveloped and covered with vegetation. The existing North Street and Scenic Drive bounded the site to the south and west respectively. The surrounding areas were occupied by a cleared grass covered area to the east that appeared to be a sports field. Undeveloped bushland, sport field and residential properties were situated to the south of North Street and the existing hospital complex to the north. Beyond Scenic Drive to the west was the Shoalhaven River.
1970	The site and surrounding areas generally appeared similar to the 1961 aerial photograph.
1984	The site and surrounding areas generally appeared similar to the 1970 aerial photograph.
1993	The site and surrounding areas generally appeared similar to the 1984 aerial photograph.
2006	The site and surrounding areas generally appeared similar to the 1993 aerial photograph.

4.2 Land Title Search

A limited historical land title search was performed on our behalf by Advanced Legal Search Pty Ltd. Copies of the title records are presented in Appendix C and a summary of the relevant information is provided in the following table:



Registration Date	Proprietor
Lot 7300 DP 1132679	
2008 – to date	State of New South Wales
2008 – to date	Reserve 5592 for Public Recreation – Nowra Park
Lot 7032 DP 1002793	
1999 – 2008	State of New South Wales
1999 – 2008	Reserve 5592 for Public Recreation – Nowra Park
Crown Reserve – Parish Nowra	
Prior – 1999	Crown Land
1888 – 1999	Reserve 5592 for Public Recreation – Nowra Park

The land search has not indicated any particular land use that may be considered to have resulted in significant contamination of the soil at the site.

4.3 Council Records - Section 149 Certificate

The Section 149(2) and (5) Certificates for the site were obtained from Shoalhaven City Council. The Section 149(2) certificate stated that: the site was not declared to be significantly contaminated; was not subject to a management order; was not subject to an approved voluntary management proposal; was not subject to an ongoing maintenance order and was not subject to a site audit statement. The Section 149(5) certificate did not provide any information regarding potential or actual contamination of the site.

4.4 WorkCover Database Records

A records search for licenses to store dangerous goods is in progress on our behalf by WorkCover. The results of the search will be forwarded when received.

4.5 NSW DECCW Records

A search of the NSW DECCW (EPA) on-line database did not indicate the existence of any EPA notices for the site under section 58 of the CLM Act 1997. A search of the NSW DECCW public register (POEO) did not indicate the existence of any EPA notices, applications and licenses for the site.

4.6 Assessment of Historical Information Integrity

The site history assessment has generally been obtained from: government records including the NSW land titles office, local government archives and historical aerial photographs. The veracity of the information from these sources is considered to be high, however, given the age of the development, the gap of up to fifteen years



between aerial photographs and the lack of detailed information available on activities prior to 1990's, a certain degree of information loss is to be expected.

Non verifiable anecdotal information has not been relied upon during assessment of historical site use. Therefore, there is considered to be a high level of integrity associated with information obtained with respect to historical use of the site.

4.7 Summary of Historical Site Use

The search of historical information has indicated the following:

- The limited selection of historical aerial photographs indicated that the site has been undeveloped and covered with vegetation since at least 1961;
- The limited search of land title records indicate that the site has been reserved for public recreation since 1888 whilst under local and State government control; and
- There are no recorded notices listed on the NSW DECCW CLM or POEO register.

Based on the available historical data, EIS consider the risk of potentially contaminating activities being or having been carried out on the site to be relatively low.

5 POTENTIAL CONTAMINATION SOURCES

5.1 Potential Site Specific Contamination

Potential contamination at the site would be anticipated to be associated with:

- Potentially contaminated, imported fill material;
- Potential asbestos contamination associated with illegal dumping of demolition waste;
- Historical activities such as the use of pesticides.

5.1.1 Site Specific Soil Contaminants of Concern

The compounds identified as soil contaminants of concern at the site include:

- Heavy metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc;
- Total petroleum hydrocarbons (TPH);
- Monocyclic aromatic hydrocarbon compounds: benzene, toluene, ethyl benzene and xylenes (BTEX);
- Polycyclic aromatic hydrocarbons (PAHs) including benzo(a)pyrene;
- Organochlorine pesticides (OCPs) including Aldrin, dieldrin, chlordane, DDT, DDD, DDE and heptachlor;



- Organophosphorus pesticides (OPPs);
- Polychlorinated Biphenyls (PCBs); and
- Asbestos.

5.2 Potential Receptors

The main potential contamination receptors are considered to include:

- Shoalhaven River located approximately 750m to the north-east of the site;
- Site visitors, workers and adjacent property owners, who may come into contact with contaminated soil and/or be exposed to contaminated dust arising from construction activity; and
- Future site occupants.

5.3 Contaminant Laydown and Transport Mechanisms

At this site, mobile contaminants would be expected to move down to the rock surface and migrate laterally down-slope from the source. The movement of contaminants would be expected to be associated with groundwater seepage at the top of the bedrock.

6 ASSESSMENT CRITERIA DEVELOPMENT

6.1 Regulatory Background

In 1997 the NSW Government introduced the CLM Act. This Act has recently been amended by the *Contaminated Land Management Amendment Act (2008⁷)*.

The CLM Act 1997, associated regulations, SEPP55 and NSW DECCW (EPA) guidelines, were designed to provide uniform state-wide control of the management, investigation and remediation of contaminated land.

Prior to granting consent for any proposed rezoning or development, SEPP55 requires the consent authority to:

- Consider whether the land is contaminated;
- Consider whether the site is suitable, or if contaminated, can be made suitable by remediation, for the proposed land use; and
- Be satisfied that remediation works will be undertaken prior to use of the site for the proposed use.

⁷ *Contaminated Land Management Amendment Act*, NSW Government Legislation, 2008 (CLM Amendment Act 2008)



Should the assessment indicate that the site poses a risk to human health or the environment, remediation of the site may be required prior to occupation of the proposed development. SEPP55 requires that the relevant local council be notified of all remediation works, whether or not development consent is required. Where development consent is not required, 30 days written notice of the proposed works must be provided to council. Details of validation of remediation work must also be submitted to Council within one month of completion of remediation works.

The consent authority may request that a site audit be undertaken during, or following the completion of the site assessment process. Under the terms of the CLM Act 1997 the NSW DECCW (EPA) Site Auditor Scheme was developed to provide a system of independent review for assessment reports. An accredited Contaminated Site Auditor is engaged to review reports prepared by suitably qualified consultants to ensure that the investigation has been undertaken in accordance with the guidelines and confirm that the sites are suitable for their intended use.

Section 59(2) of the CLM Act 1997 states that specific notation relating to contaminated land issues must be included on Section 149 (s149) planning certificates prepared by Council where the land to which the certificate relates is:

- Within an investigation or remediation area;
- Subject to an investigation or remediation order by the DECCW (EPA);
- The subject of a voluntary investigation or remediation proposal; and/or
- The subject of a site audit statement.

Submission of contaminated site investigation and validation reports to council as part of rezoning or development application submissions may also result in notation of actual or potential site contamination on future s149 certificates prepared for the site.

Section 60 of the CLM Amendment Act 2008 sets out a positive duty on a land owner, or person whose activities have caused contamination, to notify the DECCW if they are or become aware that contamination exists on a site that generally poses "*an unacceptable risk to human health or the environment, given the site's current or approved use*". This duty to report is based on trigger values, above which notification is required.

Off-site disposal of fill, contaminated material and excess soil/rock excavated as part of the proposed development works is regulated by the provisions of the *Protection of the Environment Operations Act* (1997⁸) and associated regulations and guidelines

⁸ *Protection of Environment Operations Act*, NSW Government, 1997 (POEO Act 1997)



including the *NSW DECC (now DECCW) Waste Classification Guidelines - Part 1: Classifying Waste* (2009⁹). All materials should be classified in accordance with these guidelines prior to disposal.

Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.

6.2 Soil Contaminant Threshold Concentrations

The soil investigation levels adopted for this investigation are derived from the NSW DEC (now DECCW) document *Guidelines for the NSW Site Auditor Scheme, 2nd Edition* (2006¹⁰) and the National Environmental Protection Council document *National Environmental Protection (Assessment of Site Contamination) Measure* (1999¹¹). The contaminant thresholds listed below are levels at which further investigation and evaluation is required to assess whether the site is considered suitable for the proposed urban land use.

To accommodate the range of human and ecological exposure settings, a number of generic settings are used on which the Health based Investigation Levels (HILs) can be based. Four categories of HILs are adopted for urban site assessments. Contaminant levels for a standard residential site with gardens and accessible soil (Column A) are based on protection of a young child resident at the site. The remaining categories (Columns D to F) present alternative exposure settings where there is reduced access to soil or reduced exposure time. These categories include residential land use with limited soil access, recreational and public open space and commercial/industrial use. Where the proposed land use will include more than one land use category (eg. mixed residential/commercial development) the exposure setting of the most "sensitive" land use is adopted for the site.

Threshold concentrations for petroleum hydrocarbon contaminants including total TPH and BTEX compounds have previously been established in the *NSW EPA (now DECCW) Contaminated Sites: Guidelines for Assessing Service Station Sites* (1994¹²) publication and this document is referenced in the Site Auditor Guidelines 2006. Heavy fraction

⁹ *Waste Classification Guidelines, Part 1: Classifying Waste*, NSW DECC, 2009 (Waste Classification Guidelines 2009)

¹⁰ *Guidelines for the NSW Site Auditor Scheme, 2nd ed.*, NSW DEC, 2006 (Site Auditor Guidelines 2006)

¹¹ *National Environmental Protection (Assessment of Site Contamination) Measure*, National Environment Protection Council (NEPC), 1999 (NEPM 1999)

¹² *Guidelines for Assessing Service Station Sites*, NSW EPA, 1994 (Service Station Guidelines 1994)



petroleum hydrocarbon aliphatic/aromatic component threshold concentrations have also been introduced in NEPM 1999.

Soil samples for this investigation have been analysed for total recoverable hydrocarbons (TRH) rather than TPH. TRH analysis is undertaken without a preliminary silica gel clean-up of the sample. Consequently the TRH result may include other compounds such as phthalates, humic acids, fatty acids and sterols (if present). For comparative purposes in relation to the threshold concentrations, we have referred to TRH as TPH within this report.

6.2.1 Provisional Phyto-toxicity Investigation Levels (PPILs)

The Provisional Phyto-toxicity Investigation Levels (PPILs) are generic values based on phytotoxicity data for plant response to specific contaminants in a sandy loam matrix and are included in the contaminated site assessment where the proposed land use includes gardens or accessible soils. The PPILs are listed in the Site Auditor Guidelines 2006. The PPILs are identical to the Ecological Investigation Levels (EILs) originally specified in NEPM 1999.

6.2.2 Asbestos in Soil

NEPM 1999 does not provide numeric guidelines for the assessment of asbestos in soil. NSW DECCW (EPA) advice (2006) has indicated that consultants should use their 'professional judgement' regarding determination of appropriate investigation and remediation levels for asbestos in soils; however the NSW DECCW (EPA) have not published numerical guidelines for the assessment of asbestos in subsurface soils.

The WorkCover publication *Working with Asbestos Guide* (2008¹³) states that, where buried asbestos is encountered, "A competent occupational hygienist should assess the site to determine:

- If asbestos material is bonded or friable
- The extent of asbestos contamination
- Safe work procedures for the remediation of the site"

"Any asbestos cement products that have been subjected to weathering, or damaged by hail, fire or water blasting are considered to be friable asbestos and an asbestos removal contractor with a WorkCover license for friable asbestos removal is required for its removal". Under the NSW Occupational Health and Safety (OHS) Regulations

¹³ *Working with Asbestos Guide*, NSW WorkCover, 2008 (WorkCover Working with Asbestos Guide 2008)



2001¹⁴ and WorkCover requirements all necessary disturbance works associated with friable asbestos containing materials must be conducted by a licensed AS-1 Asbestos Removal Contractor.

6.2.3 Site Assessment Criteria (SAC) for Soil Contaminants

The 'residential' (Column A) exposure setting has been adopted for this assessment and the appropriate soil criteria are listed in the following table:

¹⁴ *Occupational Health and Safety Regulation*, NSW Government, 2001 (NSW OH&S Regulation 2001)

Contaminant	SAC - HILs Column A (mg/kg)	PPILs (mg/kg)
Heavy Metals		
Arsenic (total)	100	20
Cadmium	20	3
Chromium (III)	12%	400
Copper	1000	100
Lead	300	600
Mercury (inorganic)	15	1
Nickel	600	60
Zinc	7000	200
Petroleum Hydrocarbons		
TPH (C ₆ -C ₉)	65 ^a	-
TPH (C ₁₀ -C ₃₆)	1000 ^a	-
Benzene	1 ^a	-
Toluene	1.4 ^a	-
Ethylbenzene	3.1 ^a	-
Total Xylenes	14 ^a	-
PAHs		
Total PAHs	20	-
Benzo(a)pyrene	1	-
Pesticides (OCPs & OPPs)		
Aldrin + Dieldrin	10	-
Chlordane	50	-
DDT + DDD + DDE	200	-
Heptachlor	10	-
Total OPPs	0.1 ^b	-
Others		
PCBs (Total)	10	-
Asbestos	NDLR ^c	-

Note:

^a Service Station Guidelines 1994

^b Due to the absence of locally endorsed guideline criteria, the laboratory practical quantitation limit (PQL) has been adopted.

^c Not Detected at Limit of Reporting (NDLR)

6.2.4 Waste Classification Assessment Criteria

For the purpose of off-site disposal, the classification of soil into 'General Solid Waste (non-putrescible)', 'Restricted Solid Waste (non-putrescible)' and 'Hazardous Waste (non-putrescible)' categories is defined by chemical contaminant criteria outlined in the Waste Classification Guidelines 2009. The contaminant criteria are summarised in Table A.



6.3 Evaluation of Soil Analysis Data and Contaminant Threshold Concentrations

Assessment of the soil analytical data using the soil contaminant threshold concentrations has been undertaken in accordance with the methodology outlined in the NEPM 1999 Schedule 7(a).

The following criteria have been adopted for assessment of the analytical data:

- For a site to be considered suitable for the proposed land use each individual contaminant concentration should be less than the SAC; and
- Where the concentration of each contaminant is less than the SAC in all samples, the suitability of the site for the proposed use may be assessed based solely on individual analytical results.

Where contamination results exceed the SAC, a method of remediating the site is to physically and selectively remove the contamination hotspots from the site. This process should be continued until statistical analysis of the data meets the SAC. Validation of the remediated site is generally required to demonstrate that the site is suitable for the proposed land use.

7 ASSESSMENT PLAN

7.1 Soil Sampling Density

The general framework of the preliminary environmental site assessment has been designed with reference to the NSW DECCW (EPA) endorsed guidelines under the *NSW Contaminated Land Management (CLM) Act* (1997) framework.

Sampling was undertaken from six locations within the proposed development area.

7.2 Data Quality Objectives (DQOs)

The DQOs for the assessment were developed with reference to the US EPA document *Data Quality Objectives Process for Hazardous Waste Site Investigations* (2000¹⁵). The document includes seven steps as follows:

1. State the problem
2. Identify the decision
3. Identify inputs into the decision
4. Study Boundaries
5. Develop a Decision Rule
6. Specify Limits on Decision Errors

¹⁵ *Data Quality Objectives Process for Hazardous Waste Site Investigations*, US EPA, 2000 (US EPA 2000)



7. Optimise the Design for Obtaining data

Field investigations are undertaken generally in accordance with EIS sampling protocols outlined in Appendix D.

7.3 Data Quality Indicators (DQIs) and Quality Assurance

The validation, as part of the DQOs, involves the technical review of the data using defined QA Assessment Criteria. The success of the DQIs is based on assessment of the data set as a whole and not on individual acceptance or exceedance within the data set.

Review of QA criteria was based on laboratory data including surrogate recovery, repeat analysis, duplicate, laboratory control samples and method blanks.

Field QA/QC included collection and analysis of the following for the contaminants of concern:

- One field soil samples as an inter-laboratory duplicate; and
- One water field trip blank and one sand field trip blank.

Success of field DQIs is based on the following criteria:

- Relative percentage differences (RPDs) were calculated for the inter-laboratory duplicates. The RPD was calculated as the absolute value of the difference between the initial and repeat result divided by the average value, expressed as a percentage. The following acceptance criteria were used to assess the RPD results:
 - For results that were greater than 10 times the Practical Quantitation Limit (PQL) RPDs less than 50% were considered acceptable.
 - For results that were between 5 and 10 times PQL RPDs less than 75% were considered acceptable.
 - For results that were less than 5 times the PQL RPDs less than 100% were considered acceptable.
- Acceptable concentrations in blank samples



8 INVESTIGATION PROCEDURE

8.1 Soil Sampling Methods

Subsurface investigation was undertaken using a truck mounted hydraulically operated drill rig equipped with spiral flight augers. Soil samples were obtained from a Standard Penetration Test (SPT) sampler or directly from the auger when conditions did not allow use of the SPT sampler.

The SPT sampler was washed with phosphate free detergent and rinsed following each sampling event. The spiral flight augers were decontaminated using a scrubbing brush and potable water and Decon 90 solution (phosphate free detergent) followed by rinsing with potable water. Details of the decontamination procedure adopted during sampling are presented in Appendix D.

Soil samples were obtained at various depths, based on observations made during the field investigation. During sampling, soil at selected depths was split into initial and duplicate samples for QA/QC assessment.

All samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. Sampling personnel used disposable nitrile gloves during sampling activities.

During the investigation, soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with AS 4482.1-2005¹⁶ and AS 4482.2-1999¹⁷ as summarised in the following table:

Analyte	Preservation	Storage
Heavy metals	Unpreserved glass jar with Teflon lined lid	Store at <4°, analysis within 28 days (mercury and Cr[VI]) and 180 days (other metals).
VOCs (TPH/BTEX)		Store at <4°, nil headspace, extract within 14 days, analysis within forty days
PAHs, OCP, OPP & PCBs		
Asbestos	Sealed plastic bag	None

¹⁶ *Guide to the Investigation and Sampling of sites with Potentially Contaminated Soil*, Standards Australia, 2005 (AS 2005)

¹⁷ *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part2: Volatile Substances*, Standards Australia, 1999 (AS 1999)



The samples were labelled with the job number, sampling location, sampling depth and date. All samples were recorded on the borehole logs presented in Appendix A and on the laboratory chain of custody (COC) record presented in Appendix B.

On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures. Detailed EIS field sampling protocols are included in Appendix D.

8.2 Photoionisation Detector (PID) Screening

A portable PID was used in this investigation to assist with selection of samples for laboratory hydrocarbon (TPH/BTEX) analysis.

The sensitivity of the PID is dependent on the organic compound and varies for different mixtures of hydrocarbons. Some compounds give relatively high readings and some can be undetectable even though present in identical concentrations. The portable PID is best used semi-quantitatively to compare samples contaminated by the same hydrocarbon source.

The PID is calibrated before use by measurement of an isobutylene standard gas. All the PID measurements are quoted as parts per million (ppm) isobutylene equivalents.

PID screening of detectable volatile organic compounds (VOCs) was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. The PID headspace data is presented on the COC documents and Table B.

8.3 Laboratory Analysis

Laboratory analysis was undertaken by Envirolab Services Pty Ltd (NATA Accreditation No. 2901) with additional Quality Control Analysis undertaken by NMI (NATA Accreditation No. 981).

8.3.1 Soil Samples

Soil samples were analysed using the following analytical methods detailed in Schedule B(3) of NEPM (1999¹⁸):

- Heavy metals – Nitric acid digestion. Analysis by ICP/AES.

¹⁸ *Guideline on Laboratory Analysis of Potentially Contaminated Soils*, Schedule B(3), NEMP, 1999 (Schedule B(3))



- Low level mercury – cold vapour AAS.
- OC and OP pesticides and PCBs – Extracted with dichloromethane/acetone. Analysis by GC/ECD.
- PAHs – Soil extracted with dichloromethane/acetone. Analysis by GC/MS.
- TPH (volatile) – Soil extracted with methanol. Analysis by P&T GC/MS.
- TPH – Soil extracted with dichloromethane/acetone. Analysis by GC/FID.
- BTEX – Soil extracted with methanol. Analysis by P&T GC/MS.
- Asbestos – Polarizing light microscopy.

9 RESULTS OF INVESTIGATION

9.1 Subsurface Conditions

Borehole locations are shown on Figure 2 and details of the subsurface soil profile is shown on the borehole logs in Appendix A. A summary of the subsurface conditions encountered in the boreholes is presented below:

Fill

Fill material was encountered at boreholes BH1, BH4 and BH5. The fill consisted of residual silty sand and contained inclusions of igneous and sandstone gravel. The fill was encountered at the ground surface and extended to depths of between 0.2m (BH4) and 0.5m (BH1) below existing site levels.

Natural Soils

A thin band of natural silty sand topsoil was encountered at the ground surface of boreholes BH2 and BH3 (100mm thick) and BH6 (200mm). Natural silty sand and silty sandy clay was encountered at all borehole locations beneath the topsoil or fill material. The natural soil extended to depths of between 0.5m (BH2) to 1.3m (BH5) below existing site levels.

Bedrock

Sandstone bedrock was encountered below the fill material in borehole BH1 and below the natural soils at the remaining borehole locations and extended to the termination depths of the boreholes between 1.5m and 7.46m below existing site levels.

Groundwater

All three boreholes were dry on the completion of auger drilling to a maximum depth of 4.3m. A temporary standpipe was installed at borehole BH3 to a depth of 4m below the existing ground level. The well remained dry 24hrs after installation.



9.2 Laboratory Results

The laboratory reports are presented in Appendix B. The results have been assessed against the SAC adopted for this investigation.

9.2.1 Soil Samples

The soil laboratory results are presented in Table B to Table D inclusive. The results of the analyses are summarised below.

Heavy Metals

Three fill and three natural soil samples were analysed for heavy metals. The results of the analyses were below the SAC.

Waste Classification:

The results of all analyses were less than the CT1 criteria outlined in the Waste Classification Guidelines 2009.

Petroleum Hydrocarbons (TPH) and Monocyclic Aromatic Hydrocarbons (BTEX)

PID soil sample headspace readings ranged from zero to 0.3 ppm equivalent isobutylene. These results indicate a lack of PID detectable volatile organic contaminants.

Three fill and three natural soil samples were analysed for TPH and BTEX compounds. The results of the analyses were below the SAC.

Waste Classification:

The results of all analyses were less than the relevant CT1 and SCC1 criteria outlined in the Waste Classification Guidelines 2009.

Polycyclic Aromatic Hydrocarbons (PAHs)

Three fill and three natural soil samples were analysed for a range of PAHs including Benzo(a)pyrene. The results of the analyses were less than the SAC.

Waste Classification:

The results of all analyses were less than the relevant CT1 and SCC1 criteria outlined in the Waste Classification Guidelines 2009.



Organochlorine (OCPs) and Organophosphorous (OPPs) Pesticides

Three fill and three natural soil samples were analysed for a range of OCPs and OPPs. The results of the analyses were below the laboratory PQL and less than the SAC.

Waste Classification:

The results of all analyses were less than the SCC1 criteria outlined in the Waste Classification Guidelines 2009.

Polychlorinated Biphenyls (PCBs)

Three fill and three natural soil samples were analysed for a range of PCBs. The results of the analyses were below the laboratory PQL and less than the SAC.

Waste Classification:

The results of all analyses were less than the SCC1 criteria outlined in the Waste Classification Guidelines 2009.

Asbestos

Three fill and three natural soil samples were screened for the presence of asbestos fibres. The results of the analyses indicated that asbestos fibres were not encountered within the samples and no respirable fibres were detected.

10 ASSESSMENT OF ANALYTICAL QA/QC

The DQOs and DQIs established for the investigation have been assessed in this section of the report. The assessment includes a review of the laboratory QA/QC procedure to assess whether the sample data is reliable.

The laboratory reports for this investigation have been checked and issued as final by:

- Envirolab Services Pty Ltd
NATA Accreditation No. 2901
Report number 52979
- National Measurement Institute
NATA Accreditation No. 198
Report number RN846566

The RPD results for the field QA/QC duplicate samples are summarised in Table C. An assessment of the DQIs adopted for this investigation is summarised in the following table. A brief explanation of the individual DQI is presented in Appendix D.



DQO	Number of Samples	DQI
Precision:		
Inter-laboratory duplicate <u>Sample Reference:</u> Dup 1 is a duplicate of soil sample BH1 (0-0.1m)	Soil x 1	The intra-laboratory RPD values indicated that field precision was acceptable. The copper value outside the acceptable limits can be attributed to results that are close to PQL and /or sample heterogeneity. As both the initial results and the duplicate results were less than the SAC these results are not considered to have had an adverse impact on the data set at a whole.
Field Blank	Soil x 1	The field blank was found to be free of analyte concentrations above the PQLs.
Trip Blank	Water x 1	Trip blank recovery values were within acceptable limits.
Accuracy:		
Surrogate Spikes	All organic analytes	Laboratory accuracy was good and that no outliers were reported.
Laboratory Control Sample (LCS)	Soil x 6 Water x 1	Laboratory accuracy was good and that no outliers were reported.
Representativeness:		
Samples extracted and analysed within holding time	All Samples	All samples were extracted and analysed within the appropriate holding times outlined in the investigation procedure.
Analysis of Laboratory Blanks	Soil x 7 Water x 1	All laboratory blanks were found to be free of analyte concentrations above the PQLs.
Comparability:		
EIS sampling protocols	All Samples	Sampling was undertaken in accordance with the EIS sampling protocols outlined in Appendix D
Standard laboratory analytical methods used	All Samples	All Samples
Samples obtained by qualified staff	All Samples	All Samples
Completeness:		
Documentation (including site notes, borehole logs and COC etc) was correctly maintained	All Samples	All Samples
Samples obtained were analysed for the contaminants of concern	All Samples	All Samples
Appropriate analytical methods used by the laboratory.	All Samples	All Samples



11 DISCUSSION

The Stage 1 preliminary environmental site assessment undertaken for the proposed cancer care centre development was designed to assess the suitability of the site for the proposed land use and to provide a waste classification assessment for off-site disposal of excavated soil.

11.1 Summary of Soil Conditions

Soil samples obtained for the investigation were analysed for the potential contaminants of concern identified at the site.

Elevated concentrations of contaminants were not encountered in the soil samples analysed for the investigation. All results were below the site assessment criteria (SAC).

Based on the results, EIS are of the opinion that the potential for significant widespread soil contamination at the site is relatively low.

11.2 Summary of Groundwater Conditions

Groundwater was not encountered in the boreholes drilled for this investigation to a maximum depth of 4.3m below existing site levels. A detailed assessment of the groundwater conditions was outside the scope of this investigation. However, based on the results of the investigation, EIS consider the potential for groundwater contamination at the site to be very low for the following reasons:

- Elevated concentrations of contaminants above the laboratory practical quantitation limits were not detected in the fill or natural soils at the site; and
- The site and surrounding land use did not identify a significant source of potential contamination.

11.3 Waste Classification

11.3.1 Classification of Fill Soils

Based on the results of the assessment, the fill material is classified as 'General Solid Waste (non-putrescible)' according to the criteria outlined in the Waste Classification Guidelines 2009.

The material should be disposed of to a suitably licensed NSW DECCW (EPA) landfill only.



11.3.2 Classification of Natural Soil and Bedrock

The natural silty sand, silty sandy clay and underlying sandstone bedrock at the site is considered to be virgin excavated natural material (VENM). The material is considered suitable for re-use on-site, or alternatively, the information included in this report may be used to assess whether the material is suitable for beneficial reuse at another site as fill material. Where doubt exists about the difference between fill and VENM material an environmental/geotechnical engineer should be contacted.

VENM must not be mixed with any fill material (including building rubble) as this will invalidate the VENM classification.

In the event the natural soils require disposal to a NSW DECCW (EPA) licensed landfill, the material can be disposed as 'General Solid Waste (non-putrescible)'.

11.4 Conclusion

Based on the scope of work undertaken for this investigation, EIS consider that the site to be suitable for the proposed development.

12 LIMITATIONS

The boreholes drilled for the investigation have enabled an assessment to be made of the existence of significant, large quantities of contaminated soils. The conclusions based on this investigation are that, while major contamination of the site is not apparent, problems may be encountered with smaller scale features between boreholes. EIS adopts no responsibility whatsoever for any problems such as underground storage tanks, buried items or contaminated material that may be encountered between sampling locations at the site. The proposed construction activities at the site should be planned on this basis, and any unexpected problem areas that are encountered between boreholes should be immediately inspected by experienced environmental personnel. This should ensure that such problems are dealt with in an appropriate manner, with minimal disruption to the project timetable and budget.

The conclusions developed in this report are based on site conditions which existed at the time of the site assessment and the scope of work outlined previously in this report. They are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, and visual observations of the site and vicinity, together with the interpretation of available historical information and documents reviewed as described in this report.



The investigation for this assessment and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined previously in this report.

Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated.

EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination.

Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes.

Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work.

EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site.

EIS have not and will not make any determination regarding finances associated with the site.

Changes in the proposed or current site use may result in remediation or further investigation being required at the site.

During construction at the site, soil, fill and any unsuspected materials that are encountered should be monitored by qualified environmental and geotechnical engineers to confirm assumptions made on the basis of the limited investigation data, and possible changes in site level and other conditions since the investigation. Soil materials considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other



purpose. Copyright in this report is the property of EIS. EIS has used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report.

Should you require any further information regarding the above, please do not hesitate to contact us.

Yours faithfully

For and on behalf of

ENVIRONMENTAL INVESTIGATION SERVICES

A handwritten signature in black ink, appearing to read 'C Hollands', with a long horizontal line extending from the end of the signature.

Cameron Hollands
Environmental Scientist

A handwritten signature in black ink, appearing to read 'A Kingswell', with a long horizontal line extending from the end of the signature.

Adrian Kingswell
Senior Associate



ABBREVIATIONS

AAS	Atomic Absorption Spectrometry
AGST	Above Ground Storage Tank
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment Conservation Council
ASS	Acid Sulfate Soil
B(a)P	Benzo(a)pyrene
BH	Borehole
BTEX	Benzene, Toluene, Ethyl benzene, Xylene
COC	Chain of Custody documentation
CLM	Contaminated Land Management
DECCW	Department of Environment, Climate Change and Water (formerly DECC, DEC and EPA)
DNR	NSW Department of Natural Resources (now split between DWE and DECCW)
DWE	NSW Department of Water and Energy
DP	Deposited Plan
DQO	Data Quality Objective
EC	Electrical Conductivity
EPA NSW	Environment Protection Authority, New South Wales (now part of DECCW)
GC-ECD	Gas Chromatograph-Electron Capture Detector
GC-FID	Gas Chromatograph-Flame Ionisation Detector
GC-MS	Gas Chromatograph-Mass Spectrometer
HIL	Health Based Investigation Level
HM	Heavy Metals
ICP-AES	Inductively Couple Plasma – Atomic Emission Spectra
NATA	National Association of Testing Authorities, Australia
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
OCPs	Organochlorine Pesticides
OHS (OH&S)	Occupational Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photo-ionisation Detector
PPIL	Provisional Phyto-toxicity Investigation Levels
PQL	Practical Quantitation Limit
P&T	Purge & Trap
RAP	Remedial Action Plan
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SEPP	State Environmental Planning Policy
sPOCAS	suspension Peroxide Oxidation Combined Acidity and Sulfate
SPT	Standard Penetration Test
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TP	Test Pit
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOC	Volatile Organic Compounds



IMPORTANT INFORMATION ABOUT THE SITE ASSESSMENT REPORT

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

An Environmental Assessment Report is Based on a Unique Set of Project Specific Factors:

This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- the proposed land use is altered;
- the defined subject site is increased or sub-divided;
- the proposed development details including size, configuration, location, orientation of the structures are modified;
- the proposed development levels are altered, eg addition of basement levels;
or
- ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions

Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (eg. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.



This Assessment is Based on Professional Interpretations of Factual Data

Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Environmental Site Assessment Limitations

Although information provided by an environmental site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Environmental Site Assessments by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an environmental assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Environmental Assessment Report

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but



significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problems, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the text of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

TABLE A
CHEMICAL CONTAMINANT CRITERIA FOR WASTE CLASSIFICATION

Waste Classification Guidelines. Part 1: Classifying Waste DECC (now DECCW) NSW July 2009

GENERAL SOLID WASTE	RESTRICTED SOLID WASTE	HAZARDOUS WASTE
IF $SCC \leq CT1$, TCLP NOT NEEDED TO CLASSIFY AS GENERAL SOLID WASTE	IF $SCC \leq CT2$, TCLP NOT NEEDED TO CLASSIFY AS RESTRICTED SOLID WASTE	IF $SCC > CT2$, TCLP NOT NEEDED TO CLASSIFY AS HAZARDOUS WASTE
IF $TCLP \leq TCLP1$ AND $SCC \leq SCC1$ TREAT AS GENERAL SOLID WASTE	IF $TCLP \leq TCLP2$ AND $SCC \leq SCC2$ TREAT AS RESTRICTED SOLID WASTE	IF $TCLP > TCLP2$ AND/OR $SCC > SCC2$ TREAT AS HAZARDOUS WASTE

	GENERAL SOLID WASTE			RESTRICTED SOLID WASTE		
CONTAMINANT	CT1 (mg/kg)	TCLP1 (mg/L)	SCC1 (mg/kg)	CT2 (mg/kg)	TCLP2 (mg/L)	SCC2 (mg/kg)
Arsenic	100	5	500	400	20	2,000
Beryllium	20	1.0	100	80	4	400
Cadmium	20	1.0	100	80	4	400
Chromium VI	100	5	1,900	400	20	7,600
Cyanide (total)	320	16	5,900	1280	64	23,600
Cyanide (Amenable)	70	3.5	300	280	14	1,200
Fluoride	3,000	150	10,000	12,000	600	40,000
Lead	100	5	1,500	400	20	6,000
Mercury	4	0.2	50	16	0.8	200
Molybdenum	100	5	1,000	400	20	4,000
Nickel	40	2	1,050	160	8	4,200
Selenium	20	1	50	80	4	200
Silver	100	5.0	180	400	20	720
Benzene	10	0.5	18	40	2	72
Toluene	288	14.4	518	1,152	57.6	2,073
Ethylbenzene	600	30	1,080	2,400	120	4,320
Total xylenes	1,000	50	1,800	4,000	200	7,200
Total petroleum hydrocarbons (C6-C9)	-	-	650	-	-	2,600
Total petroleum hydrocarbons (C10-C36) (C10-C14, C15-C28, C29-C36)	-	-	10,000	-	-	40,000
Benzo(a)pyrene	0.8	0.04	10	3.2	0.16	23
Polycyclic aromatic hydrocarbons (Total)	-	-	200	-	-	800
Polychlorinated biphenyls	-	-	< 50	-	-	< 50
Phenol (nonhalogenated)	288	14.4	518	1,152	57.6	2,073
Scheduled chemicals	-	-	< 50	-	-	< 50

NOTE:

SCC – Specific Contaminant Concentration

CT – Contaminant Threshold

TCLP – Toxicity Characteristics Leaching Procedure



TABLE B
SUMMARY OF LABORATORY RESULTS
SOIL ASSESSMENT
All data in mg/kg unless stated otherwise

ANALYTE			HEAVY METALS							PAHs		ORGANOCHLORINE PESTICIDES				OP PESTICIDES	PCBs	PETROLEUM HYDROCARBONS								PID VALUES	ASBESTOS FIBRES		
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE			Heptachlor	Petroleum Hydrocarbons					Benzene	Toluene			Ethyl benzene	Total Xylenes
																			C ₆ -C ₉	C ₁₀ -C ₁₄	C ₁₅ -C ₂₈	C ₂₉ -C ₃₆	C ₁₀ - C ₃₆						
PQL - Envirolab Services			4	0.5	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	0.1	25	50	100	100	250	0.5	0.5	1	3	-	100
Site Assessment Criteria ^			100 *	20 *	12% *	1000 *	300 *	15 *	600 *	7000 *	20 *	1 *	10 *	50 *	200 *	10 *	0.1 ^^	10 *	65 #	nsI	nsI	nsI	1000 #	1 #	1.4 #	3.1 #	14 #	-	100^^
PPILs			20 **	3 **	400 **	100 **	600 **	1 **	60 **	200 **	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	nsI	-	-
General Solid Waste CT1*			100	20	100	nsI	100	4	40	nsI	nsI	0.8	nsI				nsI	nsI	nsI			nsI	10	288	600	1000	-	-	
Sample Reference	Sample Depth	Sample Description																											
BH1	0-0.1	Fill	LPQL	LPQL	4	3	7	LPQL	LPQL	5	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1	LPQL
BH3	0-0.1	Silty sand	LPQL	LPQL	13	6	20	LPQL	2	20	0.27	0.07	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1	LPQL
BH3	0.4-0.5	Silty sandy clay	LPQL	LPQL	15	LPQL	7	LPQL	2	3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1	LPQL
BH4	0-0.1	Fill	LPQL	LPQL	11	6	12	LPQL	2	11	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.3	LPQL
BH5	0-0.1	Fill	LPQL	LPQL	8	4	10	LPQL	2	14	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0	LPQL
BH6	0-0.1	Silty sand	LPQL	LPQL	7	9	15	LPQL	5	22	1.5	0.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1	LPQL
Total Number of samples			6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Maximum Value			0	0	15	9	20	0	5	22	1.5	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	nc

EXPLANATION:
^ Site Assessment Criteria: Guideline concentrations adopted for the investigation as outlined below:
* National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC Guidelines)
Health Investigation Levels (HIL) - Column A, Residential with accessible soils
** Provisional Phyto-toxicity Investigation Levels (PPILs)
[#] NSW DECC (EPA) Guidelines for Assessing Service Station Sites (1994)
^^ In the absence of Australian guidelines, the laboratory PQL has been adopted as the site assessment criteria
* NSW DECCW (EPA) Waste Classification Guidelines (2009)

Concentration above the Site Assessment Criteria **VALUE**
Concentration above PPILs **VALUE**

ABBREVIATIONS:
PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)Pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL
OP: Organophosphorus Pesticides
PID: Photoionisation Detector
PCBs: Polychlorinated Biphenyls
UCL: Upper Level Confidence Limit on Mean Value
na: Not Analysed
nc: Not Calculated
nsI: No Set Limit

TABLE C
SOIL INTER-LABORATORY DUPLICATE RESULTS
QA/QC - RELATIVE PERCENTAGE DIFFERENCES
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	NMI PQL	INITIAL	REPEAT	MEAN	RPD %
Intra-laboratory Soil Sample ID = BH1 (0-0.1m) Dup ID = Dup 1 Envirolab Report: 52979 and NMI Report: RN846566	Arsenic	4	0.5	LPQL	0.9	0.9	NC
	Cadmium	0.5	0.5	LPQL	LPQL	NC	NC
	Chromium	1	0.5	4	3	3.5	29
	Copper	1	0.5	3	0.84	1.92	113
	Lead	1	0.5	7	4.3	5.65	48
	Mercury	0.1	0.2	LPQL	LPQL	NC	NC
	Nickel	1	0.5	LPQL	LPQL	NC	NC
	Zinc	1	0.5	5	2.5	3.75	67
	Total PAHs	1.55	8	LPQL	LPQL	NC	NC
	Total OCPs	0.1	0.1	LPQL	LPQL	NC	NC
	Total OPPs	0.1	0.1	LPQL	LPQL	NC	NC
	Total PCBs	0.1	0.1	LPQL	LPQL	NC	NC
	C ₆ -C ₉ TPH	25	25	LPQL	LPQL	NC	NC
	C ₁₀ -C ₁₄ TPH	50	50	LPQL	LPQL	NC	NC
	C ₁₅ -C ₂₈ TPH	100	100	LPQL	LPQL	NC	NC
	C ₂₉ -C ₃₆ TPH	100	100	LPQL	LPQL	NC	NC
	Benzene	0.5	0.5	LPQL	LPQL	NC	NC
	Toluene	0.5	0.5	LPQL	LPQL	NC	NC
	Ethylbenzene	1	0.5	LPQL	LPQL	NC	NC
	Total Xylenes	1	1	LPQL	LPQL	NC	NC

EXPLANATION:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

- Results > 10 times PQL = RPD value < 50% are acceptable
- Results between 5 & 10 times PQL = RPD value < 75% are acceptable
- Results < 5 times PQL = RPD value < 100% are acceptable

RPD Results Above the Acceptance Criteria

VALUE

ABBREVIATIONS:

PQL: Practical Quantitation Limit

LPQL: Less than PQL

NC: Not Calculated

TABLE D
LABORATORY RESULTS
QA/QC - TRIP BLANK AND FIELD BLANK

ANALYSIS	Envirolab PQL		Field Blank ^S	Trip Blank ^W
	mg/kg	µg/L	11.3.11 52979 mg/kg	11.3.11 52979 µg/L
C ₆ -C ₉ TPH	10	10	LPQL	LPQL
Benzene	1	1	LPQL	LPQL
Toluene	1	1	LPQL	LPQL
Ethylbenzene	1	1	LPQL	LPQL
Total Xylenes	1	1	LPQL	LPQL

EXPLANATION:

^W Sample type (water)

^S Sample type (sand)

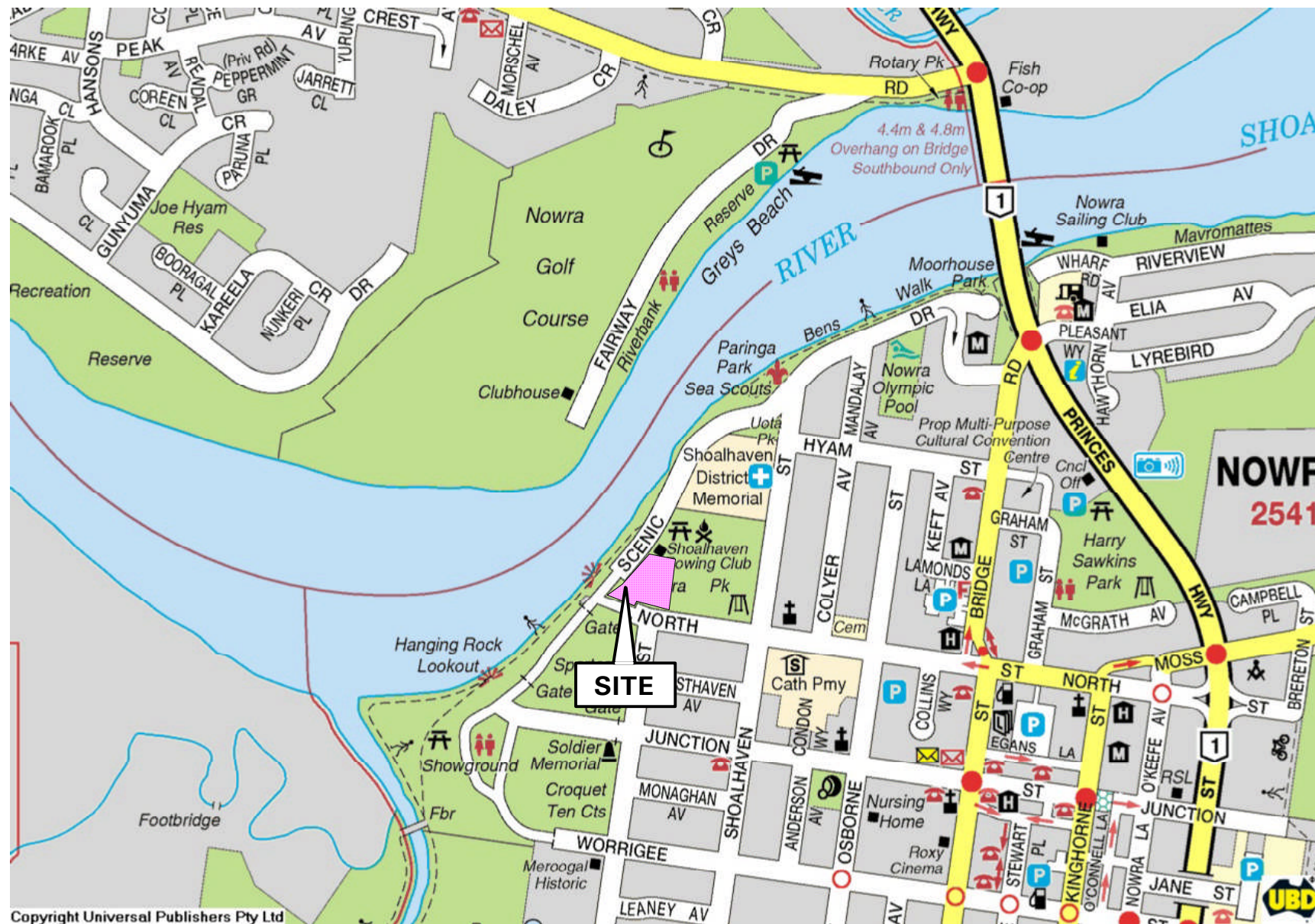
Results Above the PQLs

VALUE

ABBREVIATIONS:

PQL: Practical Quantitation Limit

LPQL: Less than PQL



Copyright Universal Publishers Pty Ltd

NOTES:
Figure 1 has been recreated from UBD on disc (version 5.0). Figure is not to scale.

UBD Map ref: 87 N10

Reference should be made to the report text for a full understanding of this plan.

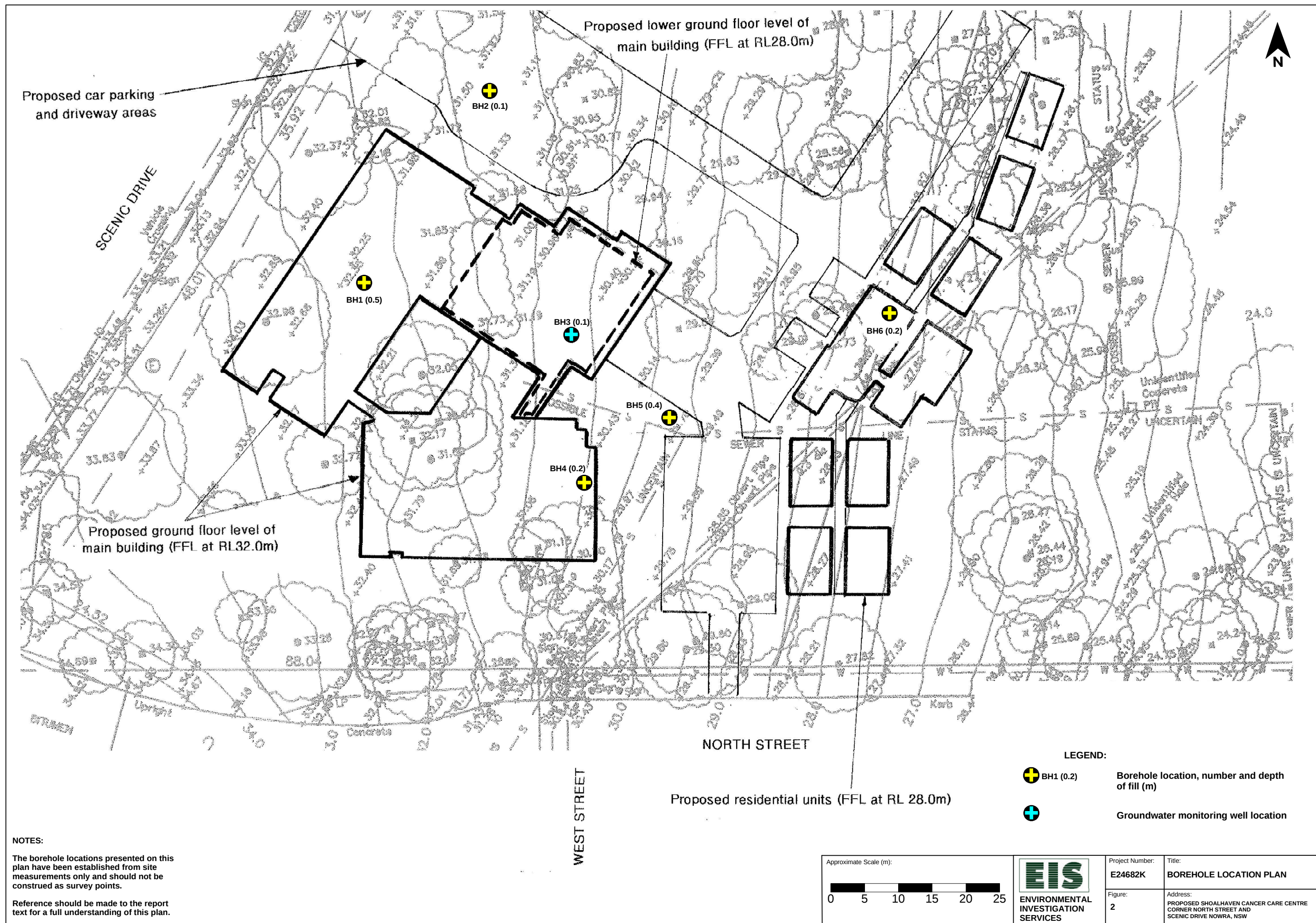


Project Number:
E24682K

Figure:
1

Title:
SITE LOCATION PLAN

Address:
**PROPOSED SHOALHAVEN CANCER CARE CENTRE
CORNER NORTH STREET AND
SCENIC DRIVE NOWRA, NSW**





APPENDIX A

(Borehole Logs and Geotechnical Explanatory Notes)

Borehole No.

1

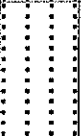
1/2

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED SHOALHAVEN CANCER CARE CENTRE
Location: CNR NORTH STREET AND SCENIC DRIVE, NOWRA, NSW

Job No. 24682WH **Method:** SPIRAL AUGER **R.L. Surface:** $\cong$ 32.3m
Date: 11-3-11 JK350 **Datum:** AHD

Logged/Checked by: M.L.T./*ASH*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	US	DB	DS									
DRY ON COMPLETION OF AUGERING						0			FILL: Silty sand, fine to medium grained, dark brown, with roots and fine to medium grained sandstone and igneous gravel.	M			GRASS COVER
					SPT 17/130mm REFUSAL	1			As above, but light brown and brown with fine to coarse grained sandstone gravel.	XW DW	EL M		VERY LOW 'TC' BIT RESISTANCE
									SANDSTONE: fine to coarse grained, light grey and orange brown, with a trace of fine grained quartz gravel.				MODERATE RESISTANCE
									REFER TO CORED BOREHOLE LOG				HIGH RESISTANCE 'TC' BIT REFUSAL
						2							
						3							
						4							
						5							
						6							
						7							



Borehole No.

1

2/2

CORED BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED SHOALHAVEN CANCER CARE CENTRE
Location: CNR NORTH STREET AND SCENIC DRIVE, NOWRA, NSW

Job No. 24682WH **Core Size:** NMLC **R.L. Surface:** $\approx$ 32.3m
Date: 11-3-11 **Inclination:** VERTICAL **Datum:** AHD
Drill Type: JK350 **Bearing:** - **Logged/Checked by:** M.L.T./A/H

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
								DEFECT SPACING (mm)												DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
								EL	VL	L	M	H	VH	EH	500	300	100	50	30	10	Specific	General																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																</



Borehole No.

2

1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED SHOALHAVEN CANCER CARE CENTRE
Location: CNR NORTH STREET AND SCENIC DRIVE, NOWRA, NSW

Job No. 24682WH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** $\approx$ 31.3m
Date: 11-3-11 **Datum:** AHD

Logged/Checked by: M.L.T./ *ASH*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	US	DB	DS									
DRY ON COMPLETION AND AFTER 2HRS						0		SM	TOPSOIL: Silty sand, fine grained, dark brown, with root fibres.	D			RESIDUAL
									SILTY SAND: fine grained, brown with fine to medium grained sandstone gravel.	D	(MD)	-	
					N > 29 10,14, 15/ 120mm			-	SANDSTONE: fine to medium grained, orange brown and red brown, with M-H strength iron indurated bands and fine to coarse grained quartz gravel.	XW	EL	-	VERY LOW 'TC' BIT RESISTANCE WITH MODERATE BANDS
					END	1				DW	VL-L		
									END OF BOREHOLE AT 1.5m				
						2							
						3							
						4							
						5							
						6							
						7							



Borehole No.

3

1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED SHOALHAVEN CANCER CARE CENTRE
Location: CNR NORTH STREET AND SCENIC DRIVE, NOWRA, NSW

Job No. 24682WH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** $\approx$ 30.5m
Date: 10-3-11 **Datum:** AHD

Logged/Checked by: M.L.T./ ASA

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	US	DB	DS									
DRY ON COMPLETION AND AFTER 24 HRS					N > 8 3,8/60mm REFUSAL	0		CL	TOPSOIL: Silty sand, fine grained, dark brown, with roots. SILTY SANDY CLAY: low plasticity, orange brown, fine grained sand, with fine to coarse grained ironstone gravel.	D MC < PL	H	-	GRASS COVER RESIDUAL
						1		-	SANDSTONE: fine to coarse grained, light grey and red brown.	DW	L	440 410	MODERATE 'TC' BIT RESISTANCE
						2			As above, but light grey, with fine to coarse grained quartz gravel.	XW	EL		VERY LOW RESISTANCE PROPOSED LOWER GROUND FLOOR LEVEL, RL 28.0m
						3			As above, but coarse grained, light grey and orange brown.	DW	M H		MODERATE RESISTANCE HIGH RESISTANCE
						4			END OF BOREHOLE AT 4.0m				'TC' BIT REFUSAL
						5							50mm DIA. PVC STANDPIPE INSTALLED TO 4.0m DEPTH. SLOTTED BETWEEN 2.5m AND 4.0m DEPTH. GATIC COVER CONCRETED FLUSH WITH SURFACE
						6							
						7							



Borehole No.

4

1/2

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED SHOALHAVEN CANCER CARE CENTRE
Location: CNR NORTH STREET AND SCENIC DRIVE, NOWRA, NSW

Job No. 24682WH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** $\approx$ 29.9m
Date: 11-3-11 **Datum:** AHD

Logged/Checked by: M.L.T./ *ASH*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	US	DS	DS									
DRY ON COMPLETION OF AUGERING						0			FILL: Silty sand, fine grained, dark brown, with roots and fine to coarse grained igneous gravel.	D			GRASS COVER
								SP		D	(MD)	-	RESIDUAL
								CL	SILTY SAND: fine grained, brown. SILTY SANDY CLAY: medium plasticity, orange brown, fine grained sand, with fine to medium grained ironstone gravel.	MC < PL	H	> 600 > 600 > 600	
						1			SANDSTONE: fine to coarse grained, light grey, orange brown and red brown, with M-H strength iron indurated bands.	DW	M-H		
						2					H		MODERATE 'TC' BIT RESISTANCE WITH HIGH BANDS
									As above, but light grey, without iron indurated bands.	XW	EL		PROPOSED LOWER GROUND FLOOR LEVEL RL 28.0m
						3							HIGH RESISTANCE VERY LOW RESISTANCE
						4				DW	L		LOW RESISTANCE
									REFER TO CORED BOREHOLE LOG				
						5							
						6							
						7							



Borehole No.

4

2/2

CORED BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED SHOALHAVEN CANCER CARE CENTRE
Location: CNR NORTH STREET AND SCENIC DRIVE, NOWRA, NSW

Job No. 24682WH

Core Size: NMLC

R.L. Surface: $\approx$ 29.9m

Date: 11-3-11

Inclination: VERTICAL

Datum: AHD

Drill Type: JK350

Bearing: -

Logged/Checked by: M.L.T./A34

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
								DEFECT SPACING (mm)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
								EL	VL	L	M	H	VH	EH	500	300	100	50	25	10	Specific	General																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		4		START CORING AT 4.30m																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						



Borehole No.

5

1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED SHOALHAVEN CANCER CARE CENTRE
Location: CNR NORTH STREET AND SCENIC DRIVE, NOWRA, NSW

Job No. 24682WH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** $\approx$ 29.0m
Date: 10-3-11 **Datum:** AHD

Logged/Checked by: M.L.T./*AM*

Groundwater Record	ES	US	DB	DS	SAMPLES	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty sand, fine grained, dark brown, with roots, a trace of fine to coarse grained sandstone gravel.	M			GRASS COVER
						N = 10 4,5,5			CL	As above, but brown, with concrete fragments.	MC < PL	VSt- H	- 300 450 470	RESIDUAL
							1			SILTY SANDY CLAY: low plasticity, orange brown and red brown, with a trace of fine grained ironstone gravel.				
						SPT 17/100mm REFUSAL			-	SANDSTONE: fine to coarse grained, orange brown, light brown and red brown.	XW-DW	EL-VL	-	VERY LOW 'TC' BIT RESISTANCE
										END OF BOREHOLE AT 1.6m				
							2							
							3							
							4							
							5							
							6							
							7							



Borehole No.

6

1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE
Project: PROPOSED SHOALHAVEN CANCER CARE CENTRE
Location: CNR NORTH STREET AND SCENIC DRIVE, NOWRA, NSW

Job No. 24682WH

Method: SPIRAL AUGER
JK350

R.L. Surface: $\approx$ 27.6m

Date: 11-3-11

Datum: AHD

Logged/Checked by: M.L.T./ *MLT*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	US	DB	DS									
DRY ON COMPLETION					N = 22 10,11,11	0		SP	TOPSOIL: Silty sand, fine grained, dark brown, with roots. SILTY SAND: fine grained, brown, with fine to coarse grained cemented sand nodules.	D	MD	-	RESIDUAL
						1		-	SANDSTONE: fine to coarse grained, orange brown and red brown.	XW-DW	EL-VL		VERY LOW 'TC' BIT RESISTANCE
						2			as above, but with M-H strength iron indurated bands.	DW	L		LOW RESISTANCE WITH MODERATE BANDS
						3			As above, but grey and orange brown.				LOW RESISTANCE WITH VERY LOW AND MODERATE BANDS
						4			END OF BOREHOLE AT 3.6m				HIGH RESISTANCE 'TC' BIT REFUSAL
						5							
						6							
						7							



REPORT EXPLANATION NOTES

INTRODUCTION

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

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

DESCRIPTION AND CLASSIFICATION METHODS

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

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

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

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

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

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

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

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

SAMPLING

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

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

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

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



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

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

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

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

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

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

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

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

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

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as
$$N = 13$$
$$4, 6, 7$$
- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as
$$N > 30$$
$$15, 30/40\text{mm}$$

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

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

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

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

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

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

The information provided on the charts comprise:

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

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

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

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

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

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

Two relatively similar tests are used:

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

LOGS

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

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

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

GROUNDWATER

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

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



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

FILL

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

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

LABORATORY TESTING

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

ENGINEERING REPORTS

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

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

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

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

SITE ANOMALIES

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

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

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

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

REVIEW OF DESIGN

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

SITE INSPECTION

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

Requirements could range from:

- i) a site visit to confirm that conditions exposed are no worse than those interpreted, to
- ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or
- iii) full time engineering presence on site.

GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS

SOIL		ROCK		DEFECTS AND INCLUSIONS	
	FILL		CONGLOMERATE		CLAY SEAM
	TOPSOIL		SANDSTONE		SHEARED OR CRUSHED SEAM
	CLAY (CL, CH)		SHALE		BRECCIATED OR SHATTERED SEAM/ZONE
	SILT (ML, MH)		SILTSTONE, MUDSTONE, CLAYSTONE		IRONSTONE GRAVEL
	SAND (SP, SW)		LIMESTONE		ORGANIC MATERIAL
	GRAVEL (GP, GW)		PHYLLITE, SCHIST		
	SANDY CLAY (CL, CH)		TUFF		
	SILTY CLAY (CL, CH)		GRANITE, GABBRO		
	CLAYEY SAND (SC)		DOLERITE, DIORITE		
	SILTY SAND (SM)		BASALT, ANDESITE		
	GRAVELLY CLAY (CL, CH)		QUARTZITE		
	CLAYEY GRAVEL (GC)				
	SANDY SILT (ML)				
	PEAT AND ORGANIC SOILS				
				OTHER MATERIALS	
					CONCRETE
					BITUMINOUS CONCRETE, COAL
					COLLUVIUM



UNIFIED SOIL CLASSIFICATION TABLE

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

Determine percentages of gravel and sand from grain size curve

Depending on percentage of fines (fraction smaller than 75 µm sieve size) coarse grained soils are classified as follows:

Less than 5% GW, GP, SW, SP
More than 5% GM, GC, SM, SC
Borderline cases requiring use of dual symbols

Use grain size curve in identifying the fractions as given under field identification

Comparing soils at equal liquid limit

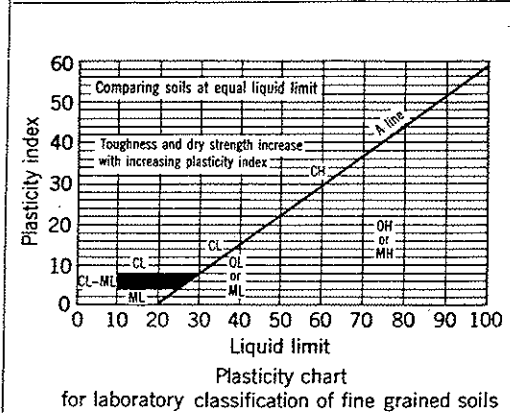
Toughness and dry strength increase with increasing plasticity index

Plasticity index

Liquid limit

Plasticity chart for laboratory classification of fine grained soils

Determine percentages of gravel and sand from grain size curve
Depending on percentage of fines (fraction smaller than 75 µm sieve size) coarse grained soils are classified as follows:
Less than 5% GW, GP, SW, SP
More than 12% GM, GC, SM, SC
Borderline cases requiring use of dual symbols



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

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



LOG SYMBOLS

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



LOG SYMBOLS

ROCK MATERIAL WEATHERING CLASSIFICATION

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

ROCK STRENGTH

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

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

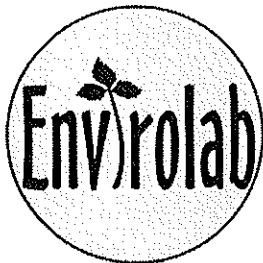
ABBREVIATIONS USED IN DEFECT DESCRIPTION

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



APPENDIX B

(Laboratory Reports and Chain of Custody Documents)



EnviroLab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS

52979

Client:

Environmental Investigation Services

PO Box 976
North Ryde BC
NSW 1670

Attention: Cameron Hollands

Sample log in details:

Your Reference:	<u>E24682K, Nowra</u>
No. of samples:	11 Soils, 1 Water
Date samples received / completed instructions received	14/03/11 / 16/03/11

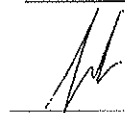
Analysis Details:

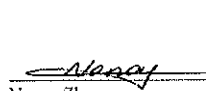
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

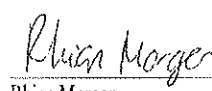
Report Details:

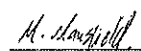
Date results requested by: / Issue Date: 22/03/11 / 22/03/11
Date of Preliminary Report: Not issued
NATA accreditation number 2901. This document shall not be reproduced except in full.
This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:


Jacinta Hurst
Laboratory Manager


Nancy Zhang
Chemist


Rhian Morgan
Reporting Supervisor


Matt Mansfield
Approved Signatory

EnviroLab Reference: 52979
Revision No: R 00




Jeremy Faircloth
Chemist

vTRH & BTEX in Soil	UNITS	52979-1	52979-4	52979-5	52979-6	52979-8
Our Reference:	-----	BH1	BH3	BH3	BH4	BH5
Your Reference	-----	0-0.1	0-0.1	0.4-0.5	0-0.1	0-0.1
Depth						
Date Sampled		11/03/2011	11/03/2011	11/03/2011	11/03/2011	11/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Date analysed	-	19/03/2011	19/03/2011	19/03/2011	19/03/2011	19/03/2011
vTRHC ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
m+p-xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	115	106	106	94	103

vTRH & BTEX in Soil	UNITS	52979-10	52979-14
Our Reference:	-----	BH6	Field Blank
Your Reference	-----	0-0.1	-
Depth			
Date Sampled		11/03/2011	11/03/2011
Type of sample		Soil	Soil
Date extracted	-	18/03/2011	18/03/2011
Date analysed	-	19/03/2011	19/03/2011
vTRHC ₆ - C ₉	mg/kg	<25	[NA]
Benzene	mg/kg	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1.0	<1.0
m+p-xylene	mg/kg	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	92	105

sTRH in Soil (C10-C36)						
Our Reference:	UNITS	52979-1	52979-4	52979-5	52979-6	52979-8
Your Reference	-----	BH1	BH3	BH3	BH4	BH5
Depth	-----	0-0.1	0-0.1	0.4-0.5	0-0.1	0-0.1
Date Sampled		11/03/2011	11/03/2011	11/03/2011	11/03/2011	11/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Date analysed	-	20/03/2011	20/03/2011	20/03/2011	20/03/2011	20/03/2011
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	90	87	84	92	88

sTRH in Soil (C10-C36)		
Our Reference:	UNITS	52979-10
Your Reference	-----	BH6
Depth	-----	0-0.1
Date Sampled		11/03/2011
Type of sample		Soil
Date extracted	-	18/03/2011
Date analysed	-	20/03/2011
TRHC ₁₀ - C ₁₄	mg/kg	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100
Surrogate o-Terphenyl	%	91

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- -----	52979-1 BH1 0-0.1 11/03/2011 Soil	52979-4 BH3 0-0.1 11/03/2011 Soil	52979-5 BH3 0.4-0.5 11/03/2011 Soil	52979-6 BH4 0-0.1 11/03/2011 Soil	52979-8 BH5 0-0.1 11/03/2011 Soil
Date extracted	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Date analysed	-	20/03/2011	20/03/2011	20/03/2011	20/03/2011	20/03/2011
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.07	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d ₁₄	%	104	105	104	108	102

PAHs in Soil		
Our Reference:	UNITS	52979-10
Your Reference	-----	BH6
Depth	-----	0-0.1
Date Sampled		11/03/2011
Type of sample		Soil
Date extracted	-	18/03/2011
Date analysed	-	20/03/2011
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.3
Pyrene	mg/kg	0.3
Benzo(a)anthracene	mg/kg	0.1
Chrysene	mg/kg	0.2
Benzo(b+k)fluoranthene	mg/kg	0.3
Benzo(a)pyrene	mg/kg	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Surrogate p-Terphenyl-d14	%	105

Organochlorine Pesticides in soil						
Our Reference:	UNITS	52979-1	52979-4	52979-5	52979-6	52979-8
Your Reference	-----	BH1	BH3	BH3	BH4	BH5
Depth	-----	0-0.1	0-0.1	0.4-0.5	0-0.1	0-0.1
Date Sampled		11/03/2011	11/03/2011	11/03/2011	11/03/2011	11/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Date analysed	-	20/03/2011	20/03/2011	20/03/2011	20/03/2011	20/03/2011
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	96	97	98	95	96

Organochlorine Pesticides in soil		
Our Reference:	UNITS	52979-10
Your Reference	-----	BH6
Depth	-----	0-0.1
Date Sampled		11/03/2011
Type of sample		Soil
Date extracted	-	18/03/2011
Date analysed	-	20/03/2011
HCB	mg/kg	<0.1
alpha-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Surrogate TCLMX	%	100

Organophosphorus Pesticides						
Our Reference:	UNITS	52979-1	52979-4	52979-5	52979-6	52979-8
Your Reference:	-----	BH1	BH3	BH3	BH4	BH5
Depth	-----	0-0.1	0-0.1	0.4-0.5	0-0.1	0-0.1
Date Sampled		11/03/2011	11/03/2011	11/03/2011	11/03/2011	11/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Date analysed	-	20/03/2011	20/03/2011	20/03/2011	20/03/2011	20/03/2011
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	96	97	98	95	96

Organophosphorus Pesticides		
Our Reference:	UNITS	52979-10
Your Reference:	-----	BH6
Depth	-----	0-0.1
Date Sampled		11/03/2011
Type of sample		Soil
Date extracted	-	18/03/2011
Date analysed	-	20/03/2011
Diazinon	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Chlorpyrifos	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Ethion	mg/kg	<0.1
Surrogate TCLMX	%	100

PCBs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- -----	52979-1 BH1 0-0.1 11/03/2011 Soil	52979-4 BH3 0-0.1 11/03/2011 Soil	52979-5 BH3 0.4-0.5 11/03/2011 Soil	52979-6 BH4 0-0.1 11/03/2011 Soil	52979-8 BH5 0-0.1 11/03/2011 Soil
Date extracted	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Date analysed	-	20/03/2011	20/03/2011	20/03/2011	20/03/2011	20/03/2011
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1221*	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	96	97	98	95	96

PCBs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- -----	52979-10 BH6 0-0.1 11/03/2011 Soil
Date extracted	-	18/03/2011
Date analysed	-	20/03/2011
Arochlor 1016	mg/kg	<0.1
Arochlor 1221*	mg/kg	<0.1
Arochlor 1232	mg/kg	<0.1
Arochlor 1242	mg/kg	<0.1
Arochlor 1248	mg/kg	<0.1
Arochlor 1254	mg/kg	<0.1
Arochlor 1260	mg/kg	<0.1
Surrogate TCLMX	%	100

Client Reference: E24682K, Nowra

Acid Extractable metals in soil	UNITS	52979-1	52979-4	52979-5	52979-6	52979-8
Our Reference:	-----	BH1	BH3	BH3	BH4	BH5
Your Reference	-----	0-0.1	0-0.1	0.4-0.5	0-0.1	0-0.1
Depth		11/03/2011	11/03/2011	11/03/2011	11/03/2011	11/03/2011
Date Sampled		Soil	Soil	Soil	Soil	Soil
Type of sample						
Date digested	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Date analysed	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	4	13	15	11	8
Copper	mg/kg	3	6	<1	6	4
Lead	mg/kg	7	20	7	12	10
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	2	2	2	2
Zinc	mg/kg	5	20	3	11	14

Acid Extractable metals in soil	UNITS	52979-10
Our Reference:	-----	BH6
Your Reference	-----	0-0.1
Depth		11/03/2011
Date Sampled		Soil
Type of sample		
Date digested	-	18/03/2011
Date analysed	-	18/03/2011
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.5
Chromium	mg/kg	7
Copper	mg/kg	9
Lead	mg/kg	15
Mercury	mg/kg	<0.1
Nickel	mg/kg	5
Zinc	mg/kg	22

Client Reference: E24682K, Nowra

Moisture						
Our Reference:	UNITS	52979-1	52979-4	52979-5	52979-6	52979-8
Your Reference	-----	BH1	BH3	BH3	BH4	BH5
Depth	-----	0-0.1	0-0.1	0.4-0.5	0-0.1	0-0.1
Date Sampled		11/03/2011	11/03/2011	11/03/2011	11/03/2011	11/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Date analysed	-	21/03/2011	21/03/2011	21/03/2011	21/03/2011	21/03/2011
Moisture	%	3.6	14	7.8	6.9	9.2

Moisture			
Our Reference:	UNITS	52979-10	52979-14
Your Reference	-----	BH6	Field Blank
Depth	-----	0-0.1	-
Date Sampled		11/03/2011	11/03/2011
Type of sample		Soil	Soil
Date prepared	-	18/03/2011	18/03/2011
Date analysed	-	21/03/2011	21/03/2011
Moisture	%	6.1	6.2

Asbestos ID - soils						
Our Reference:	UNITS	52979-1	52979-4	52979-5	52979-6	52979-8
Your Reference	-----	BH1	BH3	BH3	BH4	BH5
Depth	-----	0-0.1	0-0.1	0.4-0.5	0-0.1	0-0.1
Date Sampled		11/03/2011	11/03/2011	11/03/2011	11/03/2011	11/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	18/03/2011	18/03/2011	18/03/2011	18/03/2011	18/03/2011
Sample Description	-	Approx 40g Soil	Approx 40g Soil	Approx 40g Soil	Approx 40g Soil	Approx 40g Soil
Asbestos ID in soil	-	No asbestos found at reporting limit of 0.1g/kg	No asbestos found at reporting limit of 0.1g/kg	No asbestos found at reporting limit of 0.1g/kg	No asbestos found at reporting limit of 0.1g/kg	No asbestos found at reporting limit of 0.1g/kg
Trace Analysis	-	Respirable fibres not detected	Respirable fibres not detected	Respirable fibres not detected	Respirable fibres not detected	Respirable fibres not detected

Asbestos ID - soils		
Our Reference:	UNITS	52979-10
Your Reference	-----	BH6
Depth	-----	0-0.1
Date Sampled		11/03/2011
Type of sample		Soil
Date analysed	-	18/03/2011
Sample Description	-	Approx 40g Soil
Asbestos ID in soil	-	No asbestos found at reporting limit of 0.1g/kg
Trace Analysis	-	Respirable fibres not detected

vTRH & BTEX in Water		
Our Reference:	UNITS	52979-13
Your Reference	-----	Trip Blank
Depth	-----	-
Date Sampled		11/03/2011
Type of sample		Water
Date extracted	-	19/03/2011
Date analysed	-	19/03/2011
TRHCs - Cs	µg/L	<10
Benzene	µg/L	<1.0
Toluene	µg/L	<1.0
Ethylbenzene	µg/L	<1.0
m+p-xylene	µg/L	<2.0
o-xylene	µg/L	<1.0
Surrogate Dibromofluoromethane	%	97
Surrogate toluene-d8	%	95
Surrogate 4-BFB	%	98

MethodID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.
AS4964-2004	Asbestos ID - Qualitative identification of asbestos type fibres in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques.

Client Reference: E24682K, Nowra

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH & BTEX in Soil						Base II Duplicate II %RPD		
Date extracted	-			18/03/2011	[NT]	[NT]	LCS-4	18/03/2011
Date analysed	-			19/03/2011	[NT]	[NT]	LCS-4	19/03/2011
vTRHC6 - C9	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-4	84%
Benzene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-4	78%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-4	84%
Ethylbenzene	mg/kg	1	Org-016	<1.0	[NT]	[NT]	LCS-4	84%
m+p-xylene	mg/kg	2	Org-016	<2.0	[NT]	[NT]	LCS-4	86%
o-Xylene	mg/kg	1	Org-016	<1.0	[NT]	[NT]	LCS-4	90%
Surrogate aaa-Trifluorotoluene	%		Org-016	104	[NT]	[NT]	LCS-4	98%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
sTRH in Soil (C10-C36)						Base II Duplicate II %RPD		
Date extracted	-			18/03/2011	[NT]	[NT]	LCS-5	18/03/2011
Date analysed	-			20/03/2011	[NT]	[NT]	LCS-5	20/03/2011
TRHC10 - C14	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-5	88%
TRHC15 - C28	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	94%
TRHC29 - C36	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	90%
Surrogate o-Terphenyl	%		Org-003	87	[NT]	[NT]	LCS-5	87%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Date extracted	-			18/03/2011	[NT]	[NT]	LCS-5	18/03/2011
Date analysed	-			18/03/2011	[NT]	[NT]	LCS-5	18/03/2011
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	76%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	80%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	91%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	88%
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	93%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]

Client Reference: E24682K, Nowra

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	93%
Benzo(b+k)fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	[NT]	[NT]	LCS-5	90%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	100	[NT]	[NT]	LCS-5	97%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Organochlorine Pesticides in soil						Base II Duplicate II %RPD		
Date extracted	-			18/03/2011	[NT]	[NT]	LCS-5	18/03/2011
Date analysed	-			20/03/2011	[NT]	[NT]	LCS-5	20/03/2011
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	101%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	103%
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	94%
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	94%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	102%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	107%
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	103%
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	98%
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	105%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	103%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-005	99	[NT]	[NT]	LCS-5	104%

Client Reference: E24682K, Nowra

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Organophosphorus Pesticides						Base Duplicate %RPD		
Date extracted	-			18/03/2011	[NT]	[NT]	LCS-5	18/03/2011
Date analysed	-			20/03/2011	[NT]	[NT]	LCS-5	20/03/2011
Diazinon	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Dimethoate	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyrifos-methyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Ronnel	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyrifos	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	108%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	105%
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	98%
Surrogate TCLMX	%		Org-008	99	[NT]	[NT]	LCS-5	103%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PCBs in Soil						Base Duplicate %RPD		
Date extracted	-			18/03/2011	[NT]	[NT]	LCS-5	18/03/2011
Date analysed	-			20/03/2011	[NT]	[NT]	LCS-5	20/03/2011
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1221*	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	LCS-5	132%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	99	[NT]	[NT]	LCS-5	93%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Acid Extractable metals in soil						Base Duplicate %RPD		
Date digested	-			18/03/2011	[NT]	[NT]	LCS-1	18/03/2011
Date analysed	-			18/03/2011	[NT]	[NT]	LCS-1	18/03/2011
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-1	91%
Cadmium	mg/kg	0.5	Metals-020 ICP-AES	<0.5	[NT]	[NT]	LCS-1	96%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	93%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	98%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	92%

Client Reference: E24682K, Nowra

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Acid Extractable metals in soil						Base II Duplicate II %RPD		
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-1	118%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	94%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	92%
QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank				
Date prepared	-			18/03/2011				
Date analysed	-			20/03/2011				
Moisture	%	0.1	Inorg-008	<0.10				
QUALITY CONTROL Asbestos ID - soils	UNITS	PQL	METHOD	Blank				
Date analysed	-			[NT]				
QUALITY CONTROL vTRH & BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
						Base II Duplicate II %RPD		
Date extracted	-			19/03/2011	[NT]	[NT]	LCS-W1	19/03/2011
Date analysed	-			19/03/2011	[NT]	[NT]	LCS-W1	19/03/2011
TRHCs - C9	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	102%
Benzene	µg/L	1	Org-016	<1.0	[NT]	[NT]	LCS-W1	102%
Toluene	µg/L	1	Org-016	<1.0	[NT]	[NT]	LCS-W1	102%
Ethylbenzene	µg/L	1	Org-016	<1.0	[NT]	[NT]	LCS-W1	102%
m+p-xylene	µg/L	2	Org-016	<2.0	[NT]	[NT]	LCS-W1	101%
o-xylene	µg/L	1	Org-016	<1.0	[NT]	[NT]	LCS-W1	101%
Surrogate	%		Org-016	105	[NT]	[NT]	LCS-W1	100%
Dibromofluoromethane								
Surrogate toluene-d8	%		Org-016	95	[NT]	[NT]	LCS-W1	103%
Surrogate 4-BFB	%		Org-016	94	[NT]	[NT]	LCS-W1	102%

Report Comments:

Asbestos ID was analysed by Approved Identifier: Paul Ching
Asbestos ID was authorised by Approved Signatory: Matt Mansfield

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

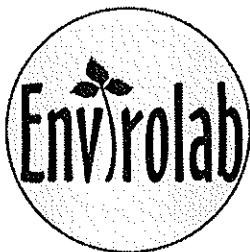
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

TO: Envirolab Services Pty Ltd 12 Ashley Street Chatswood NSW 2067 Phone: (02) 99106200 Fax: (02) 99106201			EIS Job Number: E 24682K			FROM: Environmental Investigation Services Rear 115 Wicks Road Macquarie Park NSW 2113 Phone: (02) 9888 5000 Fax: (02) 9888 5004												
Attention: Aileen			Date Results Required: Standard MT			Contact: CAMERON HOLLANDS												
Project: PROPOSED CANCER CARE CENTRE			Location: NOWRA			Sample Preservation: In esky on ice												
Sampler: MT			Tests Required															
Date Sampled	Lab Ref:	Borehole/ Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	Combo 6a	Combo 13	8 Metals	TPH	BTEX	PAHs	OC/OPPI/ PCBs	Asbestos	TCLP 6 Metals	TCLP PAHs	13a
11/3/11		BH1	0-1	Glass jar + Asb Bag	0.1	Fill		X										
		" "	0.3-0.5	Glass jar + Asb Bag	0.2	Fill												
		BH2	0.2-4	Glass jar + Asb Bag	0													
		BH3	0-0.1	Glass jar + Asb Bag	0.1	Fill		X										
		" "	0.4-0.5	Glass jar + Asb Bag	0.1	Silty clay		X										
		BH4	0-0.1	Glass jar + Asb Bag	0.3	Fill		X										
		" "	0.4-0.5	Glass jar + Asb Bag	0.1	Silty sand												
		BH5	0-0.1	Glass jar + Asb Bag	0	Fill		X										
		" "	0.5-0.7	Glass jar + Asb Bag	0.1	Silty sand/clay												
		BH6	0-0.1	Glass jar + Asb Bag	0.1	Fill		X										
		" "	0.3-0.5	Glass jar + Asb Bag	0	Silty sand												
		DUP1	-	Glass jar + Asb Bag	0	Soil		X	X									END TO NM1
2/3/11		TRIP blank		Glass jar + Asb Bag	-	Water					X	X						
		Field blank		Glass jar + Asb Bag		Sand						X						
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
Remarks (comments/detection limits required): Please send DUP1 to NM1 for Combo 6a (NM, PAH, OC, OP PCB, TPH & BTEX) for asbestos.																		
Relinquished By: CH			Date: 10/3/11			Time:			Received By:									



Environmental Services
12 Ashley St
Chatswood NSW 2067
Ph: 9916 6200

Job No: 52979 CM
Date received: 11/3 1600
Time received:
Received by:
Temp: Cool/Ambient
Cooling: Isopack
Security: Intact/Broken/None



Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC NSW 1670

ph: 02 9888 5000
Fax: 02 9888 5001

Attention: Cameron Hollands

Sample log in details:

Your reference:
Envirolab Reference:
Date received:
Date results expected to be reported:

E24682K, Nowra
52979
14/03/11
22/03/11

Samples received in appropriate condition for analysis:	YES
No. of samples provided	11 Soils, 1 Water
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice

Comments:

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au



25 MAR 2011



REPORT OF ANALYSIS

Page: 1 of 4

Report No. RN846566

Client	: Environmental Investigation Services 115 WICKS ROAD MACQUARIE PARK NSW 2113	Job No.	: ENVI78/110316
		Quote No.	: QT-01783
		Order No.	: E24682K
		Date Sampled	:
		Date Received	: 16-MAR-2011
		Sampled By	:
Attention	: CAMERON HOLLANDS		
Project Name	: E24682K		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N11/008811	DUP1	SOIL NOWRA E24682K

Lab Reg No.	Sample Reference	Units	N11/008811 DUP1				Method
Poly Aromatic Hydrocarbons							
	Naphthalene	mg/kg	<0.5				NGCMS_1111
	Acenaphthylene	mg/kg	<0.5				NGCMS_1111
	Acenaphthene	mg/kg	<0.5				NGCMS_1111
	Fluorene	mg/kg	<0.5				NGCMS_1111
	Phenanthrene	mg/kg	<0.5				NGCMS_1111
	Anthracene	mg/kg	<0.5				NGCMS_1111
	Fluoranthene	mg/kg	<0.5				NGCMS_1111
	Pyrene	mg/kg	<0.5				NGCMS_1111
	Benzo(a)anthracene	mg/kg	<0.5				NGCMS_1111
	Chrysene	mg/kg	<0.5				NGCMS_1111
	Benzo(b)&(k)fluoranthene	mg/kg	<1				NGCMS_1111
	Benzo(a)pyrene	mg/kg	<0.5				NGCMS_1111
	Indeno(1,2,3-cd)pyrene	mg/kg	<0.5				NGCMS_1111
	Dibenzo(a,h)anthracene	mg/kg	<0.5				NGCMS_1111
	Benzo(g,h,i)perylene	mg/kg	<0.5				NGCMS_1111
Organochlorine (OC) Pesticides							
	HCB	mg/kg	<0.01				NR_19
	Heptachlor	mg/kg	<0.01				NR_19
	Heptachlor epoxide	mg/kg	<0.01				NR_19
	Aldrin	mg/kg	<0.01				NR_19
	gamma-BHC (Lindane)	mg/kg	<0.01				NR_19
	alpha-BHC	mg/kg	<0.01				NR_19
	beta-BHC	mg/kg	<0.01				NR_19
	delta-BHC	mg/kg	<0.01				NR_19
	trans-Chlordane	mg/kg	<0.01				NR_19
	cis-Chlordane	mg/kg	<0.01				NR_19
	Oxychlordane	mg/kg	<0.01				NR_19
	Dieldrin	mg/kg	<0.01				NR_19
	pp-DDE	mg/kg	<0.01				NR_19
	pp-DDD	mg/kg	<0.01				NR_19
	pp-DDT	mg/kg	<0.01				NR_19

This report is issued in accordance with NATA's accreditation requirements

1 Suakin Street, Pymble NSW 2073 Tel: +61 2 9449 0111 Fax: +61 2 9449 1653 www.measurement.gov.au

REPORT OF ANALYSIS

Page: 2 of 4
Report No. RN846566

Lab Reg No.		N11/008811				
Sample Reference		DUP1				
	Units					Method
Organochlorine (OC) Pesticides						
Endrin	mg/kg	<0.01				NR_19
Endrin Aldehyde	mg/kg	<0.01				NR_19
Endrin Ketone	mg/kg	<0.01				NR_19
alpha-Endosulfan	mg/kg	<0.01				NR_19
beta-Endosulfan	mg/kg	<0.01				NR_19
Endosulfan Sulfate	mg/kg	<0.01				NR_19
Methoxychlor	mg/kg	<0.01				NR_19
BTEX						
Benzene	mg/kg	<0.5				NGCMS_1121
Toluene	mg/kg	<0.5				NGCMS_1121
Ethyl Benzene	mg/kg	<0.5				NGCMS_1121
m, p - Xylene	mg/kg	<1				NGCMS_1121
o - Xylene	mg/kg	<0.5				NGCMS_1121
PCB Aroclors						
Aroclor 1016	mg/kg	<0.1				NR_19
Aroclor 1221	mg/kg	<0.1				NR_19
Aroclor 1232	mg/kg	<0.1				NR_19
Aroclor 1242	mg/kg	<0.1				NR_19
Aroclor 1248	mg/kg	<0.1				NR_19
Aroclor 1254	mg/kg	<0.1				NR_19
Aroclor 1260	mg/kg	<0.1				NR_19
Total PCB's (as above)	mg/kg	<0.1				NR_19
Organophosphate (OP) Pesticides						
Dichlorvos	mg/kg	<0.1				NR_19
Demeton-S-Methyl	mg/kg	<0.1				NR_19
Diazinon	mg/kg	<0.1				NR_19
Dimethoate	mg/kg	<0.1				NR_19
Chlorpyrifos	mg/kg	<0.1				NR_19
Chlorpyrifos Methyl	mg/kg	<0.1				NR_19
Malathion	mg/kg	<0.1				NR_19
Fenthion	mg/kg	<0.1				NR_19
Ethion	mg/kg	<0.1				NR_19
Fenitrothion	mg/kg	<0.1				NR_19
Chlorfenvinphos (E)	mg/kg	<0.1				NR_19
Chlorfenvinphos (Z)	mg/kg	<0.1				NR_19
Parathion (Ethyl)	mg/kg	<0.1				NR_19
Parathion Methyl	mg/kg	<0.1				NR_19
Pirimiphos Methyl	mg/kg	<0.1				NR_19
Pirimiphos Ethyl	mg/kg	<0.1				NR_19
Azinphos Methyl	mg/kg	<0.1				NR_19
Azinphos Ethyl	mg/kg	<0.1				NR_19
Total Petroleum Hydrocarbons						
TPH C6 - C9	mg/kg	<25				NGCMS_1121

REPORT OF ANALYSIS

Page: 3 of 4
Report No. RN846566

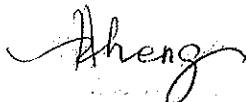
Lab Reg No.		N11/008811				
Sample Reference		DUP1				
	Units					Method
Total Petroleum Hydrocarbons						
TPH C10 - C14	mg/kg	<50				NGCMS_1112
TPH C15 - C28	mg/kg	<100				NGCMS_1112
TPH C29 - C36	mg/kg	<100				NGCMS_1112
Surrogate						
Surrogate semivolatile Rec.	%	123				
Surrogate volatile Rec	%	97				
Surrogate OC Rec.	%	117				NR_19
Surrogate OP Rec.	%	119				NR_19
Dates						
Date extracted		18-MAR-2011				
Date analysed		18-MAR-2011				



Danny Slee, Section Manager
Organics - NSW
Accreditation No. 198

23-MAR-2011

Lab Reg No.		N11/008811				
Sample Reference		DUP1				
	Units					Method
Trace Elements						
Arsenic	mg/kg	0.9				NT2_49
Cadmium	mg/kg	<0.5				NT2_49
Chromium	mg/kg	3				NT2_49
Copper	mg/kg	0.84				NT2_49
Lead	mg/kg	4.3				NT2_49
Mercury	mg/kg	<0.2				NT2_49
Nickel	mg/kg	<0.5				NT2_49
Zinc	mg/kg	2.5				NT2_49
Total Solids	%	96.5				NT2_49



Anna Zheng, Analyst
Inorganics - NSW
Accreditation No. 198

23-MAR-2011

REPORT OF ANALYSIS

Page: 4 of 4
Report No. RN846566

All results are expressed on a dry weight basis.



This report is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025.
This report shall not be reproduced except in full.
Results relate only to the sample(s) tested.

This Report supersedes reports: *RN846326* *RN846559*



Australian Government
National Measurement Institute

QUALITY ASSURANCE REPORT

Client: Environmental Investigation Services

NMI QA Report No: ENVI78/110316

Sample Matrix: Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
Organics Section								
OC Pesticides								
HCB	NR19	0.01	<0.01	NA	NA	NA	-	NA
Heptachlor	NR19	0.01	<0.01	NA	NA	NA	98	NA
Heptachlor epoxide	NR19	0.01	<0.01	NA	NA	NA	-	NA
Aldrin	NR19	0.01	<0.01	NA	NA	NA	99	NA
gamma-BHC (Lindane)	NR19	0.01	<0.01	NA	NA	NA	88	NA
alpha-BHC	NR19	0.01	<0.01	NA	NA	NA	-	NA
beta-BHC	NR19	0.01	<0.01	NA	NA	NA	-	NA
delta-BHC	NR19	0.01	<0.01	NA	NA	NA	-	NA
trans-Chlordane	NR19	0.01	<0.01	NA	NA	NA	-	NA
cis-Chlordane	NR19	0.01	<0.01	NA	NA	NA	-	NA
Oxychlordane	NR19	0.01	<0.01	NA	NA	NA	-	NA
Dieldrin	NR19	0.01	<0.01	NA	NA	NA	97	NA
pp-DDE	NR19	0.01	<0.01	NA	NA	NA	-	NA
pp-DDD	NR19	0.01	<0.01	NA	NA	NA	-	NA
pp-DDT	NR19	0.01	<0.01	NA	NA	NA	111	NA
Endrin	NR19	0.01	<0.01	NA	NA	NA	85	NA
Endrin Aldehyde	NR19	0.01	<0.01	NA	NA	NA	-	NA
Endrin Ketone	NR19	0.01	<0.01	NA	NA	NA	-	NA
alpha-Endosulfar	NR19	0.01	<0.01	NA	NA	NA	-	NA
beta-Endosulfan	NR19	0.01	<0.01	NA	NA	NA	-	NA
Endosulfan Sulfate	NR19	0.01	<0.01	NA	NA	NA	-	NA
Methoxychlor	NR19	0.01	<0.01	NA	NA	NA	-	NA
Surrogate OC Rec.	NR19	-	-	NA	NA	NA	112	NA
PCB Compounds								
PCB	NR19	0.1	<0.1	NA	NA	NA	82	NA
OP Pesticides								
Dichlorvos	NR19	0.1	<0.1	NA	NA	NA	-	NA
Demeton-S-Methyl	NR19	0.1	<0.1	NA	NA	NA	-	NA
Diazinon	NR19	0.1	<0.1	NA	NA	NA	82	NA
Dimethoate	NR19	0.1	<0.1	NA	NA	NA	-	NA
Chlorpyrifos	NR19	0.1	<0.1	NA	NA	NA	83	NA
Chlorpyrifos Methy	NR19	0.1	<0.1	NA	NA	NA	-	NA
Malathion (Maldison)	NR19	0.1	<0.1	NA	NA	NA	-	NA
Fenthion	NR19	0.1	<0.1	NA	NA	NA	-	NA
Ethion	NR19	0.1	<0.1	NA	NA	NA	75	NA
Fenitrothion	NR19	0.1	<0.1	NA	NA	NA	-	NA
Chlorfenvinphos (E)	NR19	0.1	<0.1	NA	NA	NA	-	NA
Chlorfenvinphos (Z)	NR19	0.1	<0.1	NA	NA	NA	-	NA
Parathion (Ethyl)	NR19	0.1	<0.1	NA	NA	NA	95	NA
Parathion Methy	NR19	0.1	<0.1	NA	NA	NA	-	NA
Pirimiphos Ethy	NR19	0.1	<0.1	NA	NA	NA	-	NA
Pirimiphos Methy	NR19	0.1	<0.1	NA	NA	NA	-	NA
Azinphos Methy	NR19	0.1	<0.1	NA	NA	NA	-	NA
Azinphos Ethy	NR19	0.1	<0.1	NA	NA	NA	-	NA
Surrogate OP Rec.		-	-	NA	NA	NA	122	NA

Results expressed in percentage (%) or mg/kg wherever appropriate

Acceptable Spike recovery is 50-150%

Acceptable RPDs on spikes and duplicates is 40%

'NA' = Not Applicable.

RPD= Relative Percentage Difference.

This report shall not be reproduced except in full

Signed:

Danny Slee
Organics Manager, NMI-Pymble
23/03/2011

Date:



Australian Government
National Measurement Institute

QUALITY ASSURANCE REPORT

Client: Environmental Investigation Services

NMI QA Report No: ENVI78/110316

Sample Matrix: Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
Organics Section								
BTEX								
Benzene	NGCMS_1121	0.5	<0.5	NA	NA	NA	81	NA
Toluene	NGCMS_1121	0.5	<0.5	NA	NA	NA	99	NA
Ethyl Benzene	NGCMS_1121	0.5	<0.5	NA	NA	NA	111	NA
m, p - Xylene	NGCMS_1121	1	<1	NA	NA	NA	87	NA
o-Xylene	NGCMS_1121	0.5	<0.5	NA	NA	NA	109	NA
TPH								
TPH C6-C9	NGCMS_1121	25	<25	NA	NA	NA	97	NA
TPH C10-C14	NGCMS_1112	50	<50	NA	NA	NA	118	NA
TPH C15-C28	NGCMS_1112	100	<100	NA	NA	NA	112	NA
TPH C29-C36	NGCMS_1112	100	<100	NA	NA	NA	-	NA
PAH								
Naphthalene	NGCMS_1111	0.5	<0.5	NA	NA	NA	120	NA
Acenaphthylene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Acenaphthene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Fluorene	NGCMS_1111	0.5	<0.5	NA	NA	NA	113	NA
Phenanthrene	NGCMS_1111	0.5	<0.5	NA	NA	NA	117	NA
Anthracene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Fluoranthene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Pyrene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Benz[a]anthracene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Chrysene	NGCMS_1111	0.5	<0.5	NA	NA	NA	120	NA
Benzo[b]&[k]fluoranthene	NGCMS_1111	1	<1	NA	NA	NA	-	NA
Benzo[a]pyrene	NGCMS_1111	0.5	<0.5	NA	NA	NA	120	NA
Indeno[1,2,3-cd]pyrene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Dibenz[ah]anthracene	NGCMS_1111	0.5	<0.5	NA	NA	NA	109	NA
Benzo[ghi]perylene	NGCMS_1111	0.5	<0.5	NA	NA	NA	-	NA
Surrogate Volatile Recovery		-	-	NA	NA	NA	104	NA
Surrogate Semivolatile Recovery		-	-	NA	NA	NA	109	NA

Results expressed in percentage (%) or mg/kg wherever appropriate.

Acceptable Spike recovery is 70-130% (BTEX and TPH C₆-C₉); 50-150% (PAH and TPH C10-C36)

Acceptable RPDs on spikes and duplicates is 40%.

'NA' = Not Applicable.

RPD= Relative Percentage Difference.

This report shall not be reproduced except in full.

Signed:

Danny Slee
Organics Manager, NMI-Pymble
23/03/2011

Date:

ENV178/110316

SAMPLE AND CHAIN OF CUSTODY FORM

Due 23/3/11

TO: Envirolab Services Pty Ltd 12 Ashley Street Chatswood NSW 2067 Phone: (02) 99106200 Fax: (02) 99106201 Attention: Aileen	EIS Job Number: E 24682K Date Results Required: Standard MT	FROM: Environmental Investigation Services Rear 115 Wicks Road Macquarie Park NSW 2113 Phone: (02) 9888 5000 Fax: (02) 9888 5004 Contact: CAMERON HOLLANDS
---	--	---

Project: PROPOSED CANCER CARE CENTRE Location: NOWRA Sampler: MT	Tests Required	Sample Preservation: In esky on ice
---	-----------------------	---

Date Sampled	Lab Ref:	Borehole/ Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	Combo 6a	Combo 13	8 Metals	TPH	BTEX	PAHs	OC/OPP/ PCBs	Asbestos	TCLP 6 Metals	TCLP PAHs	13a
11/3/11		BH1	0-1	Glass jar + Asb Bag	0.1	Fill		X										
2		" "	0.3-0.5	Glass jar + Asb Bag	0.2	Fill												
3		BH2	0.2-0.4	Glass jar + Asb Bag	0													
4		BH3	0-0.1	Glass jar + Asb Bag	0.1	Fill		X										
5		" "	0.4-0.5	Glass jar + Asb Bag	0.1	Silty clay		X										
6		BH4	0-0.1	Glass jar + Asb Bag	0.2	Fill		X										
7		" "	0.4-0.5	Glass jar + Asb Bag	0.1	Silty sand												
8		BH5	0-0.1	Glass jar + Asb Bag	0	Fill		X										
9		" "	0.5-0.7	Glass jar + Asb Bag	0.1	Silty sand/clay												
10		BH6	0-0.1	Glass jar + Asb Bag	0.1	Fill		X										
11		" "	0.3-0.5	Glass jar + Asb Bag	0	Silty sand												
				Glass jar + Asb Bag														
		DUP1	-	Glass jar + Asb Bag	0	Soil		X										
2/3/11		Field blank		Glass jar + Asb Bag	-	Water					X	X						
		Field blank		Glass jar + Asb Bag		Sand						X						
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														
				Glass jar + Asb Bag														

Remarks (comments/detection limits required):

Please send DUP1 to NMI for COMBO 6a (HM, PAH, OC, OP, PCB, TPH & BTEX)

Relinquished By: CH	Date: 14/3/11	Time:	Received By: [Signature]
---------------------	---------------	-------	--------------------------

As, Cd, Cr, Cu, Pb, Hg, Ni, Zn


 Envirolab Services
 12 Ashley St
 Chatswood NSW 2067
 Ph: 9910 6200

Job No: 52979

Date received: 14/3 1600

Time received:

Received by:

Temp: Ambient

Cooling: Icepack

Container: Intact/Broken/None

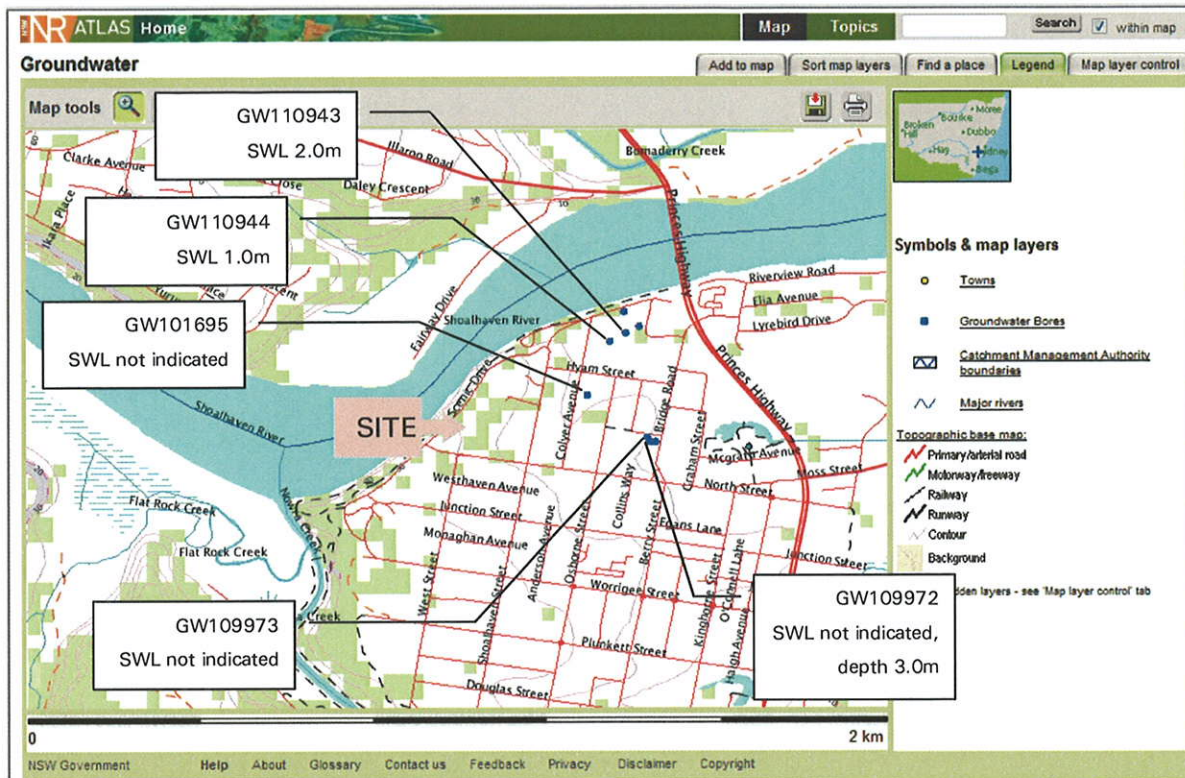
16/3/11



APPENDIX C

(Site History Documents – Groundwater Bore Records)

Groundwater bore locations - NOWRA



Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
Document Generated on Thursday, February 17, 2011

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A](#) [Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW110943

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW110943
LIC-NUM 10BL603847
AUTHORISED-PURPOSES MONITORING BORE
INTENDED-PURPOSES MONITORING BORE
WORK-TYPE Bore
WORK-STATUS
CONSTRUCTION-METHOD Auger - Solid Flight
OWNER-TYPE Private
COMMENCE-DATE
COMPLETION-DATE 2010-01-25
FINAL-DEPTH (metres) 5.50
DRILLED-DEPTH (metres) 5.50
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY NOWRA SWIMMING POOL
GWMA -
GW-ZONE -
STANDING-WATER-LEVEL 2.00
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
RIVER-BASIN
AREA-DISTRICT
CMA-MAP
GRID-ZONE
SCALE
ELEVATION
ELEVATION-SOURCE
NORTHING 6139066.00
EASTING 280590.00

LATITUDE 34 52' 2"
LONGITUDE 150 35' 59"
GS-MAP
AMG-ZONE 56
COORD-SOURCE
REMARK

Form-A [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1//738518

Licensed [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1 738518

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	5.50	100			Auger - Solid Flight

Water Bearing Zones [\(top\)](#)

no details

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	1.20	1.20	FILL.CLAY LOAM,MEDIUM BROWN,SOME SHALE		
1.20	3.00	1.80	LOAM SIKLTY,MED.BROWN,SOME CLAY		
3.00	5.50	2.50	LOAM SILTY,MED.BROWN,FIRM,SATURATED		

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
Document Generated on Thursday, February 17, 2011

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A](#) [Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW110944

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW110944
LIC-NUM 10BL603847
AUTHORISED-PURPOSES MONITORING BORE
INTENDED-PURPOSES MONITORING BORE
WORK-TYPE Bore
WORK-STATUS
CONSTRUCTION-METHOD Auger - Solid Flight
OWNER-TYPE Private
COMMENCE-DATE
COMPLETION-DATE 2010-01-25
FINAL-DEPTH (metres) 4.00
DRILLED-DEPTH (metres) 4.00
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY NOWRA SWIMMING POOL
GWMA -
GW-ZONE -
STANDING-WATER-LEVEL 1.00
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
RIVER-BASIN
AREA-DISTRICT
CMA-MAP
GRID-ZONE
SCALE
ELEVATION
ELEVATION-SOURCE
NORTHING 6139032.00
EASTING 280541.00

LATITUDE 34 52' 3"
LONGITUDE 150 35' 57"
GS-MAP
AMG-ZONE 56
COORD-SOURCE
REMARK

Form-A [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1//738518

Licensed [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1 738518

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	4.00	100			Auger - Solid Flight

Water Bearing Zones [\(top\)](#)

no details

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	1.00	1.00	FILL,CLAY LOAM,RED/BROWN,GRAVEL		
1.00	3.90	2.90	LOAM SILTY,DARK GREY(ORGANIC)		
3.90	4.00	0.10	BEDROCK,SANDSTONE,HARD		

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)

Document Generated on Thursday, February 17, 2011

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A](#) [Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW101695

Works Details [\(top\)](#)

GROUNDWATER NUMBER	GW101695
LIC-NUM	10BL158526
AUTHORISED-PURPOSES	DOMESTIC
INTENDED-PURPOSES	DOMESTIC
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	Rotary Air
OWNER-TYPE	
COMMENCE-DATE	
COMPLETION-DATE	1998-04-21
FINAL-DEPTH (metres)	48.00
DRILLED-DEPTH (metres)	48.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N/A
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details [\(top\)](#)

REGION	10 - SYDNEY SOUTH COAST
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6138822.00
EASTING	280474.00

LATITUDE 34 52' 9"
LONGITUDE 150 35' 54"
GS-MAP
AMG-ZONE 56
COORD-SOURCE
REMARK

Form-A [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1//523436

Licensed [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1 523436

Construction [\(top\)](#)

Negative depths indicate Above Ground Level; H-Hole; P-Pipe; OD-Outside Diameter; ID-Inside Diameter; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	12.00	180			Rotary Air
1		Hole	Hole	12.00	48.00	160			Rotary Air

Water Bearing Zones [\(top\)](#)

no details

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.50	0.50	Soil		
0.50	3.00	2.50	Clay		
3.00	48.00	45.00	Grey Sandstone		

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
Document Generated on Thursday, February 17, 2011

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A](#) [Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW109973

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW109973
LIC-NUM 10BL602597
AUTHORISED-PURPOSES MONITORING BORE
INTENDED-PURPOSES MONITORING BORE
WORK-TYPE Bore
WORK-STATUS
CONSTRUCTION-METHOD
OWNER-TYPE Other Govt
COMMENCE-DATE
COMPLETION-DATE 2008-05-19
FINAL-DEPTH (metres) 3.70
DRILLED-DEPTH (metres)
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY NSW FIRE BRIGADE
GWMA -
GW-ZONE -
STANDING-WATER-LEVEL
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
RIVER-BASIN
AREA-DISTRICT
CMA-MAP
GRID-ZONE
SCALE
ELEVATION
ELEVATION-SOURCE
NORTHING 6138664.00
EASTING 280666.00

LATITUDE 34 52' 15"
LONGITUDE 150 36' 1"
GS-MAP
AMG-ZONE 56
COORD-SOURCE
REMARK

Form-A [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1//581509

Licensed [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1 581509

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	3.70	110			
1	1	Casing	P.V.C.	0.00	0.00	50			

Water Bearing Zones [\(top\)](#)

no details

Drillers Log [\(top\)](#)

no details

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
Document Generated on Thursday, February 17, 2011

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A](#) [Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW109972

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW109972
LIC-NUM 10BL602597
AUTHORISED-PURPOSES MONITORING BORE
INTENDED-PURPOSES MONITORING BORE
WORK-TYPE Bore
WORK-STATUS
CONSTRUCTION-METHOD
OWNER-TYPE Other Govt
COMMENCE-DATE
COMPLETION-DATE 2008-05-19
FINAL-DEPTH (metres) 3.00
DRILLED-DEPTH (metres)
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY NSW FIRE BRIGADE
GWMA -
GW-ZONE -
STANDING-WATER-LEVEL
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
RIVER-BASIN
AREA-DISTRICT
CMA-MAP
GRID-ZONE
SCALE
ELEVATION
ELEVATION-SOURCE
NORTHING 6138646.00
EASTING 280674.00

LATITUDE 34 52' 15"
LONGITUDE 150 36' 2"
GS-MAP
AMG-ZONE 56
COORD-SOURCE
REMARK

Form-A [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1//581509

Licensed [\(top\)](#)

COUNTY ST VINCENT
PARISH NOWRA
PORTION-LOT-DP 1 581509

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	3.00	110			
1	1	Casing	P.V.C.	0.00	0.00	50			

Water Bearing Zones [\(top\)](#)

no details

Drillers Log [\(top\)](#)

no details

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.



(Site History Documents – Historical Land Title Records)

CH 23 FEB 2011

ADVANCE LEGAL SEARCHERS PTY LIMITED

(ACN 47 943 842)
ABN 82 147 943 842

P.O. Box 149
Yagoona NSW 2199

Telephone: +612 9754 1590
Mobile: 0412 169 809
Facsimile: +612 9754 1364
Email: alsearch@optusnet.com.au

21st January, 2011

ENVIRONMENTAL INVESTIGATION SERVICES
PO BOX 976,
NORTH RYDE BC NSW 1670

Attention: Cameron Hollands,

**RE: Shoalhaven Hospital,
Nowra
Job No. E24682K**

Current Search

Folio Identifier 7300/1132679 (title attached)
DP 1132679 (plan attached)
Dated 16th February, 2011
Registered Proprietor:
THE STATE OF NEW SOUTH WALES

Title Tree
Lot 7300 DP 1132679

Folio Identifier 7300/1132679

Crown Land

Government Gazette 25 February 1888

Summary of proprietor(s)
Lot 7300 DP 1132679

Year	Proprietor
	(Lot 7300 DP 1132679)
2008 – todate	State of New South Wales
<i>(2008 – todate)</i>	<i>(Reserve 5592 for Public Recreation – Nowra Park)</i>
	(Lot 7032 DP 1002793)
1999 – 2008	State of New South Wales
<i>(1999 – 2008)</i>	<i>(Reserve 5592 for Public Recreation – Nowra Park)</i>
	(Crown Reserve – Parish Nowra)
Prior – 1999	Crown Land
<i>(1888 – 1999)</i>	<i>(Reserve 5592 for Public Recreation – Nowra Park)</i>

DP 1132679

Registered : 28-10-2008

Title System : CROWN LAND

Purpose : CROWN LAND CONVERSION

Reference Map: W5532-32

Last Plan: DP1002793 L+ 7032.

DP755952_UP104211_7300 CA136690
PLAN OF CROWN LAND BEING
RESERVE

Lengths are in metres. Reduction Ratio - NTS

Sheet 1 of 1 sheets

LGA: SHOALHAVEN

LOCALITY : NOWRA

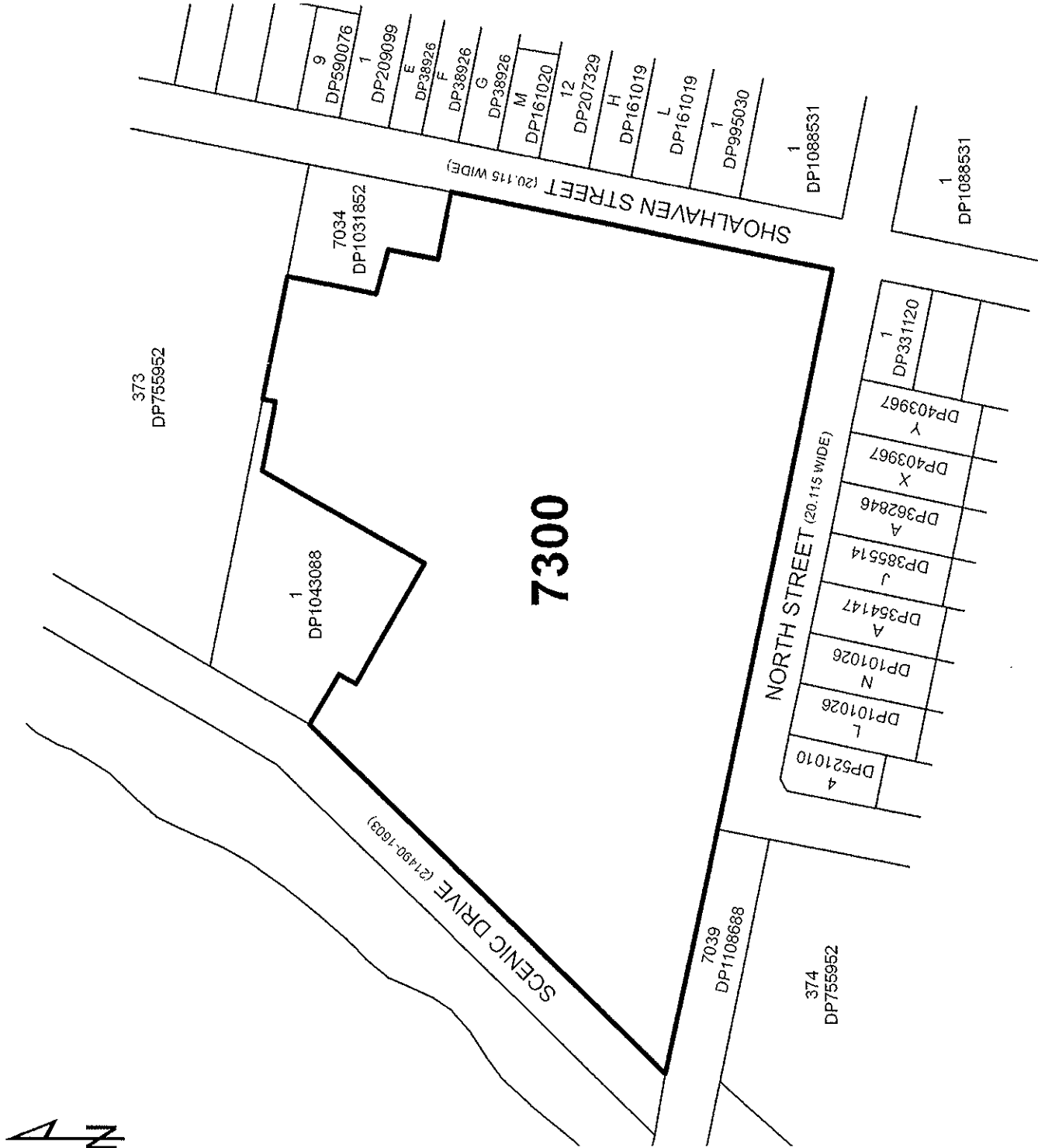
PARISH : NOWRA

COUNTY : ST VINCENT

THIS PLAN WAS PREPARED SOLELY TO
IDENTIFY THE LAND ABOVE AND THE
BOUNDARIES HAVE NOT BEEN
INVESTIGATED BY THE REGISTRAR GENERAL

THIS PLAN IS NOT A CURRENT PLAN IN TERMS OF
S.7A CONVEYANCING ACT 1919

Drawn By: DS
Signed Off: DP
Office: NX





Advance Legal Search Pty Ltd

Phone: 02 9754 1590

LPI On-Line

Advance Legal Search Pty Ltd hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act.

Information provided through Tri-Search an approved LPI/NSW Information Broker

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 7300/1132679

SEARCH DATE	TIME	EDITION NO	DATE
16/2/2011	10:30 PM	-	-

CERTIFICATE OF TITLE HAS NOT ISSUED

LAND

LOT 7300 IN DEPOSITED PLAN 1132679
 AT DP1132679
 LOCAL GOVERNMENT AREA SHOALHAVEN
 PARISH OF NOWRA COUNTY OF ST VINCENT
 TITLE DIAGRAM DP1132679

FIRST SCHEDULE

THE STATE OF NEW SOUTH WALES (CA136690)

SECOND SCHEDULE (3 NOTIFICATIONS)

- * 1 THE LAND IS A RESERVE WITHIN THE MEANING OF PART 5 OF THE CROWN LANDS ACT 1989 AND THERE ARE RESTRICTIONS ON TRANSFER AND OTHER DEALINGS IN THE LAND UNDER THAT ACT, WHICH MAY REQUIRE CONSENT OF THE MINISTER.
- * 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.
- * 3 THE LAND IS DEDICATED FOR A PUBLIC PURPOSE

NOTATIONS

DP646252 NOTE: (PROPOSED EASEMENT)
 DP1128777 NOTE: (PLAN OF ACQUISITION)
 UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Cadastral Records Enquiry Report

Requested Parcel: Lot 7300 DP 1132679

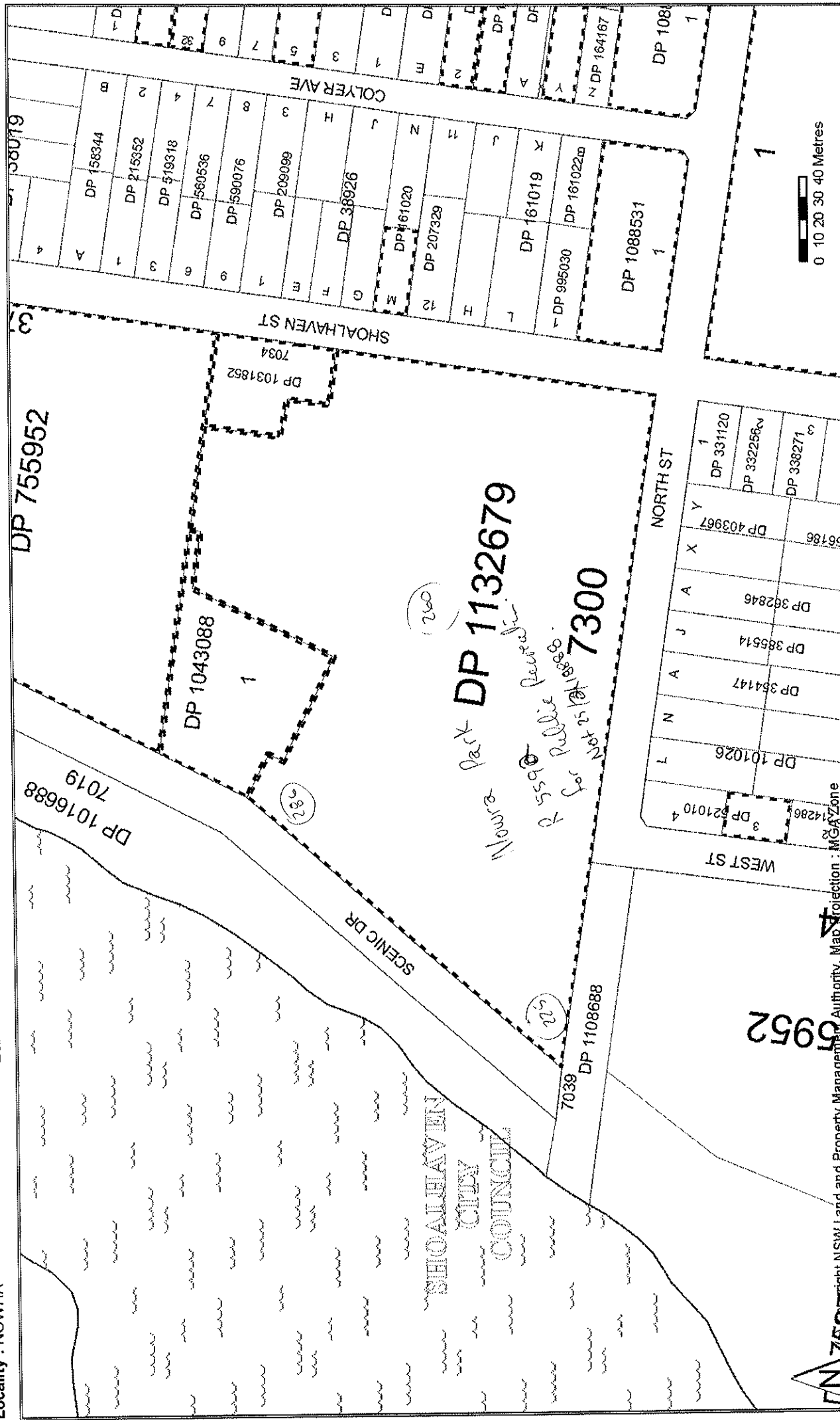
Identified Parcel : Lot 7300 DP 1132679

LGA: SHOALHAVEN

Parish : NOWRA

County: ST VINCENT

Locality: NOWRA



Copyright NSW Land and Property Management Authority. Map 475

Page 1 of 3

This information is provided as a searching aid only. While every endeavour is made to ensure the current cadastral pattern is accurately reflected, the Registrar General cannot guarantee the information provided. For all ACTIVITY PRIOR to SEPT 2002 you must refer to the RGs Charting and Reference Maps.

Report Generated 12:00:17 PM, 17 February, 2011



(Site History Documents – Council Records)

CH.

- 1 MAR 2011



City Administrative Centre
Bridge Road, Nowra NSW Australia 2541
Phone: (02) 4429 3111 • Fax: (02) 4422 1816 • DX 5323 Nowra
Address all correspondence to
The General Manager, PO Box 42, Nowra NSW Australia 2541

PLANNING CERTIFICATE UNDER SECTION 149
ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979
Certificate No:2011/00658

Issued to: Cameron Hollands
PO Box 976
NORTH RYDE BC 1670
□

Assessment number: 01084.64900
Receipt No.: 3593991
Date: 28/02/2011
Fee: \$100
Multiple Lot Fee: \$0
Urgency Fee: \$0.00

Applicants reference: EIS-E24682K

Owner(s):
SHOALHAVEN CITY COUNCIL PO BOX 42, NOWRA, NSW, 2541

Property:
Lot 7300 DP 1132679, Scenic Dr, NOWRA
Parish of NOWRA, County of ST. VINCENT

The above information is as recorded by Council.

DISCLAIMER AND CAUTION:

1. The information on zones, controls etc given below relates to the land for which the certificate was sought. If enquirers wish to know what zones, other controls, etc apply or are proposed on nearby land then they should make enquiries in person at Council's offices.
2. In providing this certificate Council has in good faith relied upon information provided to it or sourced from third parties. Where Council has obtained the information from third parties, either exclusively or in conjunction with information held by Council, the Certificate details the source of that third party information. Council cautions persons against relying upon information in the Certificate sourced from third parties as to its accuracy, applicability to specific lands and its currency without verification from the specified third party and, where appropriate, professional advice and the adoption of prudent land acquisition measures and appropriate professional advice. To the full extent permitted by law Council disclaims liability with respect to any information in this Certificate sourced from third parties.

The Environmental Planning and Assessment Amendment Act 1997 commenced operation on the 1st July 1998. As a consequence of this Act the information contained in this certificate needs to be read in conjunction with the provisions of the:
Environmental Planning Assessment (Amendment) Regulation 1998,
Environmental Planning Assessment (Further Amendment) Regulation 1998,
Environmental Planning Assessment (Saving and Transitional) Regulation 1998 and
Environmental Planning Assessment Regulation 2000.

PLANNING CERTIFICATE UNDER SECTION 149
Certificate No:2011/00658

DEVELOPMENT IN VICINITY OF ITEMS OF ENVIRONMENTAL HERITAGE.

Pursuant to clause 20G of Shoalhaven Local Environmental Plan 1985 (SLEP 1985), such clause being inserted by Amendment No. 212 to SLEP 1985, gazetted 13 April 2007, Council must assess the impact of proposed development on the heritage significance of a heritage item and of any heritage conservation area, if that proposed development is in the vicinity of a heritage item. *Vicinity of a heritage item* means the extent of land that has a physical or visual relationship to the heritage item and its setting or to the heritage conservation area. Shoalhaven LEP 1985 does require development consent for the demolition of a building which is identified as an item of environmental heritage.

STATE ENVIRONMENTAL PLANNING POLICY

No. 71 COASTAL PROTECTION - Gazetted 1st November 2002

The policy applies to land within the "coastal zone" and makes the NSW Minister for Planning the consent authority for nominated developments including structures greater than 13 metres in height and certain subdivisions. As well, applications for development that is two or more storeys in height, on or partly on, land within a ***sensitive coastal location*** must be referred to the Director-General of the NSW Department of Infrastructure, Planning and Natural Resources.

This land or part of this land is identified as being in an area defined as a ***sensitive coastal location***.

NEW SOUTH WALES COASTAL POLICY (89/1553)

POLICY EFFECTIVE 11/11/1997. MAPS APPROVED 4/8/1998.

This applies to land generally within 1km of the coastline and around bays, estuaries, and tidal limits of rivers.

Other provisions in the SLEP (as at 30 April 2010) may also apply to the development of this land. You can download a copy of the SLEP at Council's website at www.shoalhaven.nsw.gov.au/council/pubdocs/PlanningDocs/LEP1985.pdf or purchase a copy at Council's offices.

- 1(2) Proposed Environmental Planning Instruments that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Director-General has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved) and for each proposed environmental planning instrument (other than a proposed SEPP) that includes the land in any zone, the identity of the zone:

PLANNING CERTIFICATE UNDER SECTION 149
Certificate No:2011/00658

DEVELOPMENT CONTROL PLAN No. 82 (A SIGNAGE STRATEGY)
ADOPTED 28 AUGUST 2001. EFFECTIVE 29 OCTOBER 2001. (4102)

Amendment No. 1 (Section 2) Adopted 24/7/07

DEVELOPMENT CONTROL PLAN NO. 89 (EXEMPT & COMPLYING DEVELOPMENT)
ADOPTED 7 SEPTEMBER 1999. EFFECTIVE 20 NOVEMBER 1999. (8267)

Amendment No. 3 (Energy Efficiency Guidelines) Adopted 26/3/2002. Effective 1/06/2002.

Amendment No. 4 (Energy Rating) Adopted 26/11/2002. Effective 18/12/2002

DEVELOPMENT CONTROL PLAN No. 91- SINGLE DWELLING AND ANCILLARY
STRUCTURES (MINIMUM BUILDING REQUIREMENTS)
ADOPTED 25 JUNE 2007 EFFECTIVE 29 AUGUST 2007 (12856)

Amendment No. 1 Adopted 09/06/2009. Effective 24/06/2009

DEVELOPMENT CONTROL PLAN NO. 93 (CONTROLS FOR SITE WASTE MINIMISATION &
MANAGEMENT)

ADOPTED 23 MAY 2000. EFFECTIVE 7 JUNE 2000. (15930)

Amendment No. 1 (Waste Minimisation and Management)
Adopted 27/08/2002. Effective 10/02/2005.

DEVELOPMENT CONTROL PLAN NO. 100 (SUBDIVISION CODE)
ADOPTED 23 OCTOBER 2001 & 18 DECEMBER 2001, EFFECTIVE 18 FEBRUARY 2002.
(5034)

Amendment No. 1 adopted 30 October 2007 Effective 14 January 2008

Amendment No. 2 Adopted 19 October 2010 Effective 27 October 2010

DEVELOPMENT CONTROL PLAN NO. 109 (HOME ACTIVITY GUIDELINES)
ADOPTED 17 DECEMBER 2002. EFFECTIVE 14 MARCH 2003. (26752)

DEVELOPMENT CONTROL PLAN No. 120 (COMMERCIAL USE OF PUBLIC FOOTPATHS)
ADOPTED 8 DECEMBER 2009, EFFECTIVE 23 DECEMBER 2009 (39733E)

- 2(e) There is no development standard applying to the land fixing minimum land dimensions for the erection of a dwelling house on the land.

PLANNING CERTIFICATE UNDER SECTION 149
Certificate No:2011/00658

the General Development Code

Complying development under the General Development Code **MAY** be carried out on this land because of the provisions of clauses 1.17A (c) and (d) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 as amended.

the General Commercial and Industrial Code

Complying development under the General Commercial and Industrial Code **MAY** be carried out on this land because of the provisions of clauses 1.17A (c) and (d) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 as amended

the Subdivisions Code

Complying development under the Subdivisions Code **MAY** be carried out on this land because of the provisions of clauses 1.17A (c) and (d) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 as amended.

the Demolition Code

Complying development under the Demolition Code **MAY** be carried out on this land because of the provisions of clauses 1.17A (c) and (d) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 as amended.

- 4 The Council **has not** received any notification from the Department of Public Works that the land is affected by the operation of Sections 38 or 39 of the Coastal Protection Act, 1979.

4A **Certain information relating to beaches and coasts**

(1) an order **has not** been made under Part 4D of the Coastal Protection Act 1979 in relation to emergency coastal protection works (within the meaning of that Act) on the land (or on public land adjacent to that land), except where the council is satisfied that such an order has been fully complied with.

(2)(a) the council **has not** been notified under section 55X of the Coastal Protection Act 1979 that emergency coastal protection works (within the meaning of that Act) have been placed on the land (or on public land adjacent to that land)

(3) the council **has not** been notified of any information (if any) as is required by the regulations under section 56B of the Coastal Protection Act 1979 to be included in the planning certificate.

PLANNING CERTIFICATE UNDER SECTION 149
Certificate No:2011/00658

7a Flood related development controls information

(1) Development on the land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) **IS NOT** subject to flood related development controls.

(2) Development on the land or part of the land for any other purpose **IS NOT** subject to flood related development controls.

Note: Words and expressions in this clause have the same meanings as in the instrument set out in the Schedule to the Standard Instrument (Local Environmental Plans) Order 2006.

8 The land **IS NOT** reserved for acquisition by a public authority, as referred to in section 27 of the Act under any environmental planning instrument, or proposed environmental planning instrument referred to in clause 1.

9 SECTION 94 CONTRIBUTIONS PLAN 1993 (as amended) (File 91/2952)
ADOPTED BY COUNCIL ON 29 JUNE 1993 EFFECTIVE FROM 2 JULY 1993
Council has adopted section 94 Contributions Plan 1993 which provides for contributions to be made to Council when development of a property is approved and which involves a greater demand on public services.
This plan is being constantly amended and those amendments become part of this plan. New contributions may become applicable in accordance with the amendment. Contact Council for contributions applicable at a particular date.
(Note that where development of the lot involves an increased demand for water and/or sewerage services, an increased contribution for these are not included in the section 94 plan, but will be required under the Local Government Act and the Water Supply Authorities Act - contact Shoalhaven Water within Council for further details)

9a Biodiversity certified land

The land **is not** biodiversity certified land (within the meaning of Part 7AA of the Threatened Species Conservation Act 1995).

10 The council **has not** been notified by the Director-General of the Department of Environment, Climate Change and Water, of the existence of a biobanking agreement under Part 7A of the Threatened Species Conservation Act 1995, on this land.

11 Bush fire prone land

Part of the land the subject of this certificate **IS** identified as bushfire prone land on a Bushfire Prone Land map certified by the Commissioner of the NSW Rural Fire Service.

PLANNING CERTIFICATE UNDER SECTION 149
Certificate No:2011/00658

Information under Section 149(5)

As at the date of this certificate, the abovementioned land is also affected as follows:

(NOTE: SECTION 149(6) STATES THAT A COUNCIL SHALL NOT INCUR ANY LIABILITY IN RESPECT OF ANY ADVICE PROVIDED IN GOOD FAITH PURSUANT TO SECTION 149(5))

SHOALHAVEN DRAFT LOCAL ENVIRONMENTAL PLAN NO. LP200
COUNCIL RESOLVED TO PREPARE LEP 6 SEPTEMBER 1994 (94/2773)

Council resolved to prepare a draft Local Environmental Plan over land identified as the Nowra/Bomaderry Structure Plan area.

Council resolved on 22/8/00 to amend the draft concept plan and place the plan on public exhibition for a period of eight weeks. (File 1028) Plan on public exhibition 18 September until 8 November, 2000.

Council resolved on 2 November 2005 to prepare a new Draft Local Environmental Plan over the land to which the Draft Nowra-Bomaderry Structure Plan applies with the new DOP Planning Template. (29362-03,1028-03)

The Draft Nowra Bomaderry Structure Plan will be on public exhibition from 1 March 2006 until 28 April 2006 (inclusive) Extended to 19 May 2006

This Plan is the second stage in the process of determining and implementing a strategic planning framework for the future of this important urban area and follows on from the Nowra Bomaderry Concept Plan which was released by Council in 2000. The draft structure plan document is comprised of a 'Strategic Direction' and 'Background' component. The 'Strategic Direction' sets the development-conservation agenda for the 20-30 years. The 'Background' provides the analysis and justification for the direction taken. They are presented as one document including comprehensive mapping.

Council resolved on 27 February 2007 to give in principle support to the Regional Services Corridor being moved south utilising the North West corner of Lot 51 DP 1011824. Options be investigated and advertised to effected property owners then amend the Nowra Bomaderry Structure Plan accordingly. (1028-05)

SHOALHAVEN DRAFT LOCAL ENVIRONMENTAL PLAN NO. LP303
COUNCIL RESOLVED TO PREPARE LEP 29 FEBRUARY 2000 (17376)

Council resolved to prepare a LEP over Nowra CBD.

SHOALHAVEN DRAFT LOCAL ENVIRONMENTAL PLAN NO. LP341
COUNCIL RESOLVED TO PREPARE LEP 25 JUNE 2002 (26750)

The aim of the draft plan is to update the various provisions of Shoalhaven LEP 1985 that relate to flooding to ensure consistency with the NSW Government's Floodplain Management Manual.

PLANNING CERTIFICATE UNDER SECTION 149
Certificate No:2011/00658

DRAFT DEVELOPMENT CONTROL PLAN NO. 89 (EXEMPT AND COMPLYING DEVELOPMENT)

AMENDMENT NO. 2 PUBLICLY EXHIBITED 5 MARCH - 9 MAY 2003 (8267)

The aim of the draft plan is to require a Waste Minimisation Plan for complying development involving single dwellings. Affects land covered by Development Control Plan No. 89.

DRAFT DEVELOPMENT CONTROL PLAN NO. 89 (EXEMPT AND COMPLYING DEVELOPMENT)

AMENDMENT NO. 5 PUBLICLY EXHIBITED 31 OCTOBER - 30 NOVEMBER 2007 (35430)

The purpose of the draft amendment to DCP No. 89 is to provide additional information for proponents, include reference to bush fire prone land and provide additional land use activities within the provisions of the DCP.

DRAFT DEVELOPMENT CONTROL PLAN No. 89 (EXEMPT & COMPLYING DEVELOPMENT)

COUNCIL RESOLVED TO AMEND DCP 27 MAY 2008 (27563, 8267-03)

The aim of the amendment is allow for the use of portable jetties.

DRAFT DEVELOPMENT CONTROL PLAN NO. 93 (WASTE MINIMISATION & MANAGEMENT)

PUBLICLY EXHIBITED 3 DECEMBER 2001 - 15 FEBRUARY 2002 (15930)

The aim of the draft plan is to revise DCP093 in accordance with the Regional Waste Plan. As a result, this draft plan requires a Waste Minimisation and Management Plan to be submitted with all Development Applications and Construction Certificates. This draft plan has also been simplified and supported by Guidelines. The Guidelines contain sample Waste Minimisation and Management Plans and further information to assist the applicant.

DRAFT DEVELOPMENT CONTROL PLAN NO. 95 (NOWRA CBD)

COUNCIL RESOLVED TO PREPARE DCP 29 FEBRUARY 2000 (17377)

Council resolved to prepare a DCP over Nowra CBD.

PLANNING CERTIFICATE UNDER SECTION 149
Certificate No:2011/00658

S94 CONTRIBUTIONS PLAN 1993 (DRAFT AMENDMENT NO. 76)(28708) - Drainage
COUNCIL RESOLVED TO PREPARE AMENDMENT 18 JUNE 1996

The aim of the amendment is to review the section 94 contributions plan with respect to Drainage.

S94 CONTRIBUTIONS PLAN 1993 (DRAFT AMENDMENT No. 77) (28709) - Roads - Area 1
Projects (Amendment No. 2)
PUBLICLY EXHIBITED 5 JULY - 25 AUGUST 2006

The purpose of the Plan is to assist fund the provision of road infrastructure in the Nowra CBD, including the East Nowra Sub Arterial Road, by way of Section 94 contributions on future development.

S94 CONTRIBUTIONS PLAN 1993 (DRAFT AMENDMENT No. 92) (34749)
NORTHERN LEISURE CENTRE
COUNCIL RESOLVED TO PREPARE AMENDMENT 27 JUNE 2006

The aim of the amendment is to part-fund the costs for a Northern Leisure Centre by way of Section 94 levy within the benefit area. Affects Planning Area 1 and Planning Area 2.

DRAFT SHOALHAVEN PLANNING POLICY No. 002 (WHOLE CITY - HIGHER DENSITY HOUSING)
COUNCIL RESOLVED TO PREPARE SPP 28 JUNE 2005 (32607)

The aim of the plan is to set guidelines for higher density housing within the city.

MATTERS AFFECTING THIS LAND

Council resolved on 29 February 2000 to adopt the general planning principles underlying the strategic plan for Nowra Central Business District Review and initiate a program involving

- Provision for professional consulting rooms near the Shoalhaven District Hospital
- Provision for shop top housing within 3(a) zones
- The area bounded by Moss Street, North Street, O'Keefe Ave and the Princes Hwy being zoned 3(a)
- Provision in the 3(b) zone bounded by North St and Junction St east of the Hwy be restricted to bulky goods and non retail core activities
- The two properties west of Noahs Ark Centre allowing for Child Care Centres
- Zones relating to flood affected areas near the swimming pool being retained pending further investigations into flooding, stormwater and potentially contaminated land. (File 2537)

PLANNING CERTIFICATE UNDER SECTION 149
Certificate No:2011/00658

MATTERS AFFECTING THE WHOLE OF THE CITY

ACID SULFATE SOILS - Large areas of the coastal zone of NSW have the potential to be affected by acid sulfate soils which become problematic if exposed during excavations or similar activities. The Dept of Land & Water Conservation have maps which indicate the potential occurrence of acid sulfate soils. Prior to undertaking work which involves substantial soil disturbance, you should ascertain the possibility of acid sulfate soils existing on your property. Enquiries to Dept of Land & Water Conservation.

Council resolved on 27/10/1998 to adopt the draft policy for the subdivision of tourist related accommodation. The aim of the policy is to ensure that developments approved as tourist accommodation continue to operate for this purpose should the property be subdivided to allow separate ownership of units/dwellings. Affects the whole of the Shoalhaven. (71/2013)

Council resolved on the 1st September 2003 to adopt the amended "Water and Sewage Infrastructure - Rezoning, Major Developments and SEPP5 Developments" Policy. (12039)

CATS AND DOGS: IMPACTS ON NATIVE FAUNA

Council resolved on 20 Dec 05 in order to protect populations of native fauna, including threatened species, from impacts associated with the keeping of domestic cats and dogs within certain development, in accordance with the *Environmental Planning & Assessment Act, 1979* and the *Threatened Species Conservation Act, 1995*.

- "That Council not prohibit or restrict the keeping of companion animals eg (cats and dogs) for the purpose of imposing conditions of development consent; and
- That appropriate measures for the management of companion animals may be applied in sensitive environmental locations." (file 23139)

MATTERS AFFECTING LAND IN VARIOUS LOCALITIES (PS Div.)

The Department of Defence has informed Council that the Defence (Areas Control) Regulations to limit height of buildings/structures within approximately 15km of the Naval Air Station, Nowra were gazetted on December 7, 1989. This land is in an area where the consent of the Dept of Defence is required for any structure higher than 90m. Contact Facilities and Property Division, Department of Defence, Campbell Park Offices, Canberra ACT 2600 (062) 651240 for further information.

CITY OF SHOALHAVEN TREE PRESERVATION ORDER 2004 Gazetted 30 January, 2004

This land is affected either in whole or in part by a Tree Preservation Order which prohibits the removal or damage to trees greater than a certain size without the written consent of the Council. Details on the Order and any exemptions that may apply can be obtained from Council's Development and Environmental Services Group. A copy of the Order may be freely obtained from Council's website, www.shoalhaven.nsw.gov.au

Planning (Section 149) Certificate Number: 2011 / 00658
DUAL OCCUPANCY DEVELOPMENT IN SHOALHAVEN 92/2666

Dual Occupancy Development in Shoalhaven is basically governed by:

- Shoalhaven Local Environmental Plan 1985 (SLEP 1985)
- Interim Development Order No. 1 (IDO) (only certain areas)
- Development Control Plan No. 57 (DCP 57)

Subdivision

Subdivision of dual occupancy developments in certain zones (not in rural areas) was possible under State Environmental Planning Policy NO. 25 (SEPP 25) until 18 May 1995 (inclusive). The State Government on 19 May 1995, repealed these subdivision provisions although transitional provisions apply to development applications lodged between 1 January 1992 and 8 May 1995 and which were subsequently approved.

LEP 85

The LEP 85 defines dual occupancy development in Clause 6(1). Clause 9 of the LEP identifies within which zones dual occupancy development is permitted and in some cases only allows attached forms of dual occupancy. Clause 18 states the circumstances under which Council may approve dual occupancy development in zones 2(b1) and 2(b2).

DCP 57

The purpose of the plan is to implement Dual Occupancy development in Shoalhaven in appropriate zones, and to specify design guidelines. Affects land zoned Residential 2(a1), 2(a2), 2(a3), 2(b1), 2(b2), 2(c), 2(e) and Rural 1(a), 1(b), 1(c) and 1(d), areas zoned 1(c1), 1(c2) and 1(c3) deferred from Amendment No. 127 to SLEP 1985 and certain zones under IDO No. 1. The plan was adopted by Council on 1 June 1993, however, notification of the plan was delayed until gazettal on 19 November 1993 of LEP Amendment No. 73 regarding dual occupancy development.

Council resolved on 19 October 1993 to permit Dual Occupancy in urban areas only where a reticulated sewerage system is operational or under construction. Where such a scheme is not yet operational, compulsory scheduled pump-out systems will be required as an interim means of effluent disposal.

A copy of DCP 57 may be viewed at or acquired from the Council.

Interim Policy

As a result of SEPP 25 subdivision provisions being repealed, Council resolved on 16 May 1995 to process all subdivision applications for dual occupancies where the dual occupancy development was approved or lodged on or after 1 January 1992 and before 8 May 1995; and that a housing strategy be prepared for Shoalhaven (as resolved on 2 May 1995).

Council further resolved on 4 July 1995 to adopt the following interim policy for dual occupancy development:

- a) continue assessing dual occupancy applications under current provisions of DCP 57 until an interim housing strategy has been prepared; and
- b) not support any variation to Council's Subdivision Code to allow subdivision of dual occupancy development and advise relevant consultants accordingly. Council also resolved to review the number of applications for dual occupancy and the effectiveness of the DCP and interim housing policy.

If you require any clarification of the above please contact Council's Strategic Planning and Infrastructure Group or Development & Environmental Services Group.



APPENDIX D

(Sampling Protocols and QA/QC Definitions)

SOIL AND GROUNDWATER SAMPLING PROTOCOLS

These protocols specify the basic procedures to be used when sampling soils or groundwater for environmental site assessments undertaken by EIS. The purpose of these protocols is to provide standard methods for: sampling, decontamination procedures for sampling equipment, sample preservation, sample storage and sample handling. Deviations from these procedures must be recorded.

Soil Sampling

- a) Prepare a test pit/borehole log.
- b) Layout sampling equipment on clean plastic sheeting to prevent direct contact with ground surface. The work area should be at a distance from the drill/rig excavator such that the drill rig/excavator can operate in a safe manner.
- c) Ensure all sampling equipment has been decontaminated prior to use.
- d) Remove any surface debris from the immediate area of the sampling location.
- e) Collect samples and place in glass jar with a Teflon seal. This should be undertaken as quickly as possible to prevent the loss of volatiles. If possible, fill the glass jars completely.
- f) Collect samples for asbestos analysis and place in a zip-lock plastic bag.
- g) Label the jar and/or bag with the EIS job number, sample location (eg. BH1), sampling depth interval and date. If more than one sample container is used, this should also be indicated (eg. 2 = Sample jar 1 of 2 jars).
- h) Photoionisation detector (PID) screening of volatile organic compounds (VOCs) should be undertaken on samples using the soil sample headspace method. Headspace measurements are taken following equilibration of the headspace gasses in partly filled zip-lock plastic bags. PID headspace data is recorded on the borehole/test pit log and the chain of custody forms.
- i) Record the lithology of the sample and sample depth on the borehole/test pit log in accordance with AS1726-1993¹⁹.
- j) Store the sample in a sample container cooled with ice or chill packs. On completion of the sampling the sample container should be delivered to the lab immediately or stored in the refrigerator prior to delivery to the lab. All samples are preserved in accordance with AS 4482.1:2005, AS 4482.2:1999 and AS/NZS 5667.1:1998.
- k) Check for the presence of groundwater after completion of each borehole using an electronic dip metre or water whistle. Boreholes should be left open until the end of fieldwork. All groundwater levels in the boreholes should be rechecked on the completion of the fieldwork.

¹⁹ *Geotechnical Site Investigations*, Standards Australia 1993 (AS1726-1993)



- l) Backfill the boreholes/test pits with the excavation cuttings or clean sand prior to leaving the site.

Decontamination Procedures for Soil Sampling Equipment

- a) All of the equipment associated with the soil sampling procedure should be decontaminated between every sampling location.
- b) The following equipment and materials are required for the decontamination procedure:
 - Phosphate free detergent (Decon 90)
 - Potable water
 - Stiff brushes
 - Plastic sheets
- c) Ensure the decontamination materials are clean prior to proceeding with the decontamination.
- d) Fill both buckets with clean potable water and add phosphate free detergent to one bucket.
- e) In the bucket containing the detergent scrub the sampling equipment until all the material attached to the equipment has been removed.
- f) Rinse sampling equipment in the bucket containing potable water.
- g) Place cleaned equipment on clean plastic sheets.

If all materials are not removed by this procedure, high-pressure water cleaning is recommended. If any equipment is not completely decontaminated by both these processes that equipment should not be used until it has been thoroughly cleaned.

Groundwater Sampling

Groundwater samples are more sensitive to contamination than soil samples and therefore adherence to this protocol is particularly important to obtain reliable, reproducible results. The recommendations detailed in AS/NZS 5667.1:1998 are considered to form a minimum standard.

The basis of this protocol is to maintain the security of the borehole and obtain accurate and representative groundwater samples. The following procedure should be used for collection of groundwater samples from previously installed groundwater monitoring wells.

- a) After monitoring well installation, at least three bore volumes should be pumped from the monitoring wells (well development) to remove any water introduced during the drilling process and/or the water that is disturbed during installation of the monitoring well. This should be completed prior to purging and sampling.

- b) Groundwater monitoring wells should then be left to recharge for at least three days before purging and sampling. Prior to purging or sampling the condition of each well should be observed and any anomalies recorded on the field data sheets. The following information should be noted: the condition of the well, noting any signs of damage, tampering or complete destruction; the condition and operation of the well lock; the condition of the protective casing and the cement footing (raised or cracked); and, the presence of water between protective casing and well.
- c) Take the groundwater level from the collar of the piezometer/monitoring well using an electronic dip meter. The collar level should be taken (if required) during the site visit using a dumpy level and staff.
- d) Purging and sampling of piezometers/monitoring wells is done on the same site visit when using micro-purge (or low flow) techniques. Layout and organize all equipment associated with groundwater sampling in a location where they will not interfere with the sampling procedure and will not pose a risk of contaminating samples. Equipment generally required includes:
 - Micropore filtration system or Stericup single-use filters (for heavy metals samples).
 - Filter paper for Micropore filtration system.
 - Bucket with volume increments.
 - Sample containers: teflon bottles with 1 ml nitric acid, 75mL glass vials with 1 mL hydrochloric acid, 1 L amber glass bottles.
 - Bucket with volume increments.
 - Flow cell.
 - pH/EC/Eh/T meters.
 - Plastic drums used for transportation of purged water.
 - Esky and ice.
 - Nitrile gloves.
 - Distilled water (for cleaning).
 - Electronic dip meter.
 - Micro-purge pump pack and pump head.
 - Air and water tubing for Micro-purge.
 - Groundwater sampling forms.
- e) If single-use stericup filtration is not being used, clean the Micropore filtration system thoroughly with distilled water prior to use and between each sample. Filter paper should be changed between samples. 0.45um filter paper should be placed below the glass fibre filter paper in the filtration system.
- f) Ensure all non-disposable sampling equipment is decontaminated or that new disposable equipment is available prior to any work commencing at a new location. The procedure for decontamination of groundwater equipment is outlined at the end of this section.



- g) Disposable gloves should be used whenever samples are taken to protect the sampler and to assist in avoidance of contamination.
- h) Groundwater samples are obtained from the monitoring wells using low flow/micro-purge sampling equipment to reduce the disturbance of the water column and loss of volatiles.
- i) During pumping to purge the well, the pH, temperature, conductivity, dissolved oxygen, redox potential and groundwater levels are monitored (where possible) using calibrated field instruments to assess the development of steady state conditions. Steady state conditions are generally considered to have been achieved when the difference in the pH measurements was less than 0.2 units and the difference in conductivity was less than 10%.
- j) All measurements are recorded on specific data sheets.
- k) Once steady state conditions are considered to have been achieved, groundwater samples are obtained directly from the pump tubing and placed in appropriate glass bottles, BTEX vials or plastic bottles.
- l) All samples are preserved in accordance with water sampling requirements detailed in the NEPM 1999 and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice in accordance with AS/NZS 5667.1:1998.
- m) Record the sample on the appropriate log in accordance with AS1726:1993. At the end of each water sampling complete a chain of custody form.

Decontamination Procedures for Groundwater Sampling Equipment

- a) All of the equipment associated with the groundwater sampling procedure (other than single-use items) should be decontaminated between every sampling location.
- b) The following equipment and materials are required for the decontamination procedure:
 - Phosphate free detergent.
 - Potable water.
 - Distilled water
 - Plastic Sheets or bulk bags (plastic bags)
- c) Fill one bucket with clean potable water and phosphate free detergent, and one bucket with distilled water.
- d) Flush potable water and detergent through pump head. Wash sampling equipment and pump head using brushes in the bucket containing detergent until all materials attached to the equipment are removed.
- e) Flush pump head with distilled water.
- f) Change water and detergent solution after each sampling location.
- g) Rinse sampling equipment in the bucket containing distilled water.



- h) Place cleaned equipment on clean plastic sheets.
- i) If all materials are not removed by this procedure that equipment should not be used until it has been thoroughly cleaned



QA/QC DEFINITIONS

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994²⁰) methods and those described in *Environmental Sampling and Analysis, A Practical Guide*, (H. Keith 1991²¹).

Practical Quantitation Limit (PQL), Limit of Reporting (LOR) and Estimated Quantitation Limit (EQL)

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection limit (MDL) for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations. *"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit"* Keith 1991.

Precision

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD). Acceptable targets for precision in this report will be less than 50% RPD for concentrations greater than ten times the PQL, less than 75% RPD for concentrations between five and ten times the PQL and less than 100% RPD for concentrations that are less than five times the PQL.

Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured. The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes.

²⁰ SW-846: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, US EPA, 1994 (US EPA SW-846)

²¹ *Environmental Sampling and Analysis, A Practical Guide*, Keith, H, 1991 (Keith 1991)



The proximity of an averaged result to the true value, where all random errors have been statistically removed. Accuracy is measured by percent recovery. Acceptable limits for accuracy generally lie between 70% to 130% recoveries. Certain laboratory methods may allow for values that lie outside these limits.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handling and analysis protocols and use of proper chain-of-custody and documentation procedures.

Completeness

Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:

- Chain-of-custody forms;
- Sample receipt form;
- All sample results reported;
- All blank data reported;
- All laboratory duplicate and RPDs calculated;
- All surrogate spike data reported;
- All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
- Spike recovery acceptable limits reported; and
- NATA stamp on reports.

Comparability

Comparability is the evaluation of the similarity of conditions (eg. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:

- Collection and analysis of samples by different personnel;
- Use of different techniques;
- Collection and analysis by the same personnel using the same methods but at different times; and
- Spatial and temporal changes (due to environmental dynamics).



Blanks

The purpose of laboratory and field blanks is to check for artifacts and interferences that may arise during sampling and analysis.

Matrix Spikes

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula;

$$\frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Concentration of Spike Added}} \times 100$$

Acceptable recovery limits are 70% to 130%.

Surrogate Spikes

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

Duplicates

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula where D1 is the sample concentration and D2 is the duplicate sample concentration:

$$\frac{(D1 - D2)}{\{(D1 + D2)/2\}} \times 100$$