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PRELIMINARY CONTAMINATION GEOTECHNICAL AND MINE SUBSIDENCE ASSESSMENT

PROPOSED RESIDENTIAL SUBDIVISION NORDS WHARF

Prepared for

COAL & ALLIED INDUSTRIES LTD

Project 39662.06-02

OCTOBER 2010

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12 October 2010

PRELIMINARY CONTAMINATION, GEOTECHNICAL AND MINE SUBSIDENCE ASSESSMENT PROPOSED RESIDENTIAL SUBDIVISION NORDS WHARF

1. INTRODUCTION

This report presents the results of a preliminary contamination, geotechnical and mine subsidence assessment for a proposed residential subdivision at Nords Wharf. The assessment was carried out at the request of Coal & Allied Industries Ltd, (Coal & Allied) in consultation with Catylis Pty Ltd.

The assessment comprised the following components:

- Desktop review of regional geology, hydrogeology, and acid sulphate soils;
- Review of previous mining operations beneath the subject site;
- Site history review;
- Site walkover survey to describe the current site condition and surface features;
- Subsurface investigation by test pits;
- Soil sampling and chemical testing;
- Comments on actual and anticipated development constraints and opportunities including the following:
  - Potential contamination;
  - Depth, extent and nature of filling;
  - Presence of soft alluvial soils and acid sulphate soils;

  - Slope stability;
  - Likely founding conditions;
  - Presence of aggressive soil conditions with respect to buried structures;
  - Presence of shallow rock.
- General recommendations for further investigation.

The contamination assessment was being carried out in general accordance with the NSW EPA "Guidelines for Consultants Reporting on Contaminated Sites" (Ref 2) and SEPP 55 "Remediation of Land" (Ref 3).

In addition to the above, a Hazard Materials Survey was undertaken at the site by ESP Environmental (Ref 14). The purpose of the hazard materials survey was to identify potentially hazardous materials at the site (asbestos, synthetic mineral fibres, polychlorinated biphenyls and lead in paint) which may require remediation.

2. PROPOSED DEVELOPMENT

It is proposed that the entire Coal & Allied owned Nords Wharf site be rezoned/listed as a 'State Significant Site' in Schedule 3 of State Environmental Planning Policy (SEPP) (Major Development). A draft Schedule 3 listing will be prepared with the Concept Plan Application.

The Concept Plan for a residential subdivision and conservation land transfer of the Nords Wharf site will apply to the entire 127 ha Nords Wharf site. The key parameters for the proposed development of the site are as follows:

- Dedication of 116.6 ha of conservation land to the New South Wales Government (NSWG) that is identified in the Lower Hunter Regional Strategy and Lower Hunter Regional Conservation Plan, comprising approximately 92% of the Nords Wharf site;
- Maximum dwelling yield of 90 dwellings over 10.18 ha;
- Indicative development staging. Depending on market forces, it may be decided to release the lots in 3-4 stages of 25-30 lots each;
- The provision of associated infrastructure;

- Torrens title subdivision and boundary realignment of the Nords Wharf site. The Torrens title subdivision and boundary realignment of Coal & Allied land will enable land 116.6 ha in area that is owned by Coal & Allied to be excised and dedicated to NSWG for conservation purposes.

Approval will not be sought under the Concept Plan for a specific lot or road layout. An indicative lot layout will indicate how the maximum dwelling yield of 90 dwellings could be achieved on the site.

Similarly, approval will not be sought under the Concept Plan for subdivision or construction of individual houses. However, the desired future character of the proposed concept plan will be included in Urban Design Guidelines. Urban Design Guidelines will be prepared to inform the Concept Plan in respect of urban form, built form, open space and landscape, access and movement and visual impact for the site.

It is proposed to dedicate land for conservation purposes as part of the Major Project Application via a Voluntary Planning Agreement between Coal & Allied and the NSWG in accordance with s.93F of the Environmental Planning & Assessment Act, 1979.

The proposed Concept Plan and a Plan showing the proposed development areas and conservation areas are included in the Preliminary Environmental Assessment prepared by Urbis.

3. SITE IDENTIFICATION

This report comprises an assessment of the potentially developable portion of the site, identified as Part Lot 6 DP746077, within the Lake Macquarie City Council area. The Nords Wharf site is located south of Awabakal Drive and Branter Road, Nords Wharf. The subject site includes 'Camp Kanangra', occupied by the Scout Association of Australia under the terms of a licence agreement with Coal & Allied. The proposed development portion of the site is shown in Blue on Drawings 5 and 6 which also show that the scout amenities building and a large portion of the central fill pad are not located on the subject site.

The Nords Wharf development site comprises an irregular shaped portion of land, around 10 ha, as shown on Drawings 5 and 6.

Adjacent land use comprises the following:

- North – existing residential development, bushland, Branter Road and Awabakal Drive ;
- South– bushland;
- East – Pacific Highway; and
- West – Scout amenities building, foreshore and Crangan Bay, Lake Macquarie.

4. DESKTOP REVIEW

4.1 Regional Geology and Hydrogeology

The 1:100,000 scale Newcastle Coalfield Regional Geology map indicates the site is underlain by the Triassic Age Narrabeen Group, which typically comprise conglomerate, sandstone, siltstone and claystone. A weathered residual soil zone would be expected near the surface, with rock depths generally shallow.

Reference to the soil landscape map for Gosford-Lake Macquarie indicates the soils at the site fall into two typical landscapes as follows:

Doyalson: The majority of the site soils are mapped as the Doyalson Landscape and typical limitations include the following:

- High erosion hazard;
- Localised foundation hazard;
- Strongly acidic.

Wyong: Soils in the lower lying south-west corner are mapped as the Wyong Landscape and typical limitations include the following:

- Seasonal/permanent water logging;
- Foundation hazard;
- Stream bank erosion;
- Acid sulphate potential;
- Strongly acid;
- Saline subsoils.

Reference to the Catherine Hill Bay Acid Sulphate Soil Risk Map prepared by the Department of Land & Water Conservation indicates that there is an area of low probability potential acid sulphate soil (PASS) in the south-west corner of the site where surface levels are below about 5 m AHD. The PASS are within alluvial soils greater than 3 metres depth below the ground surface (indicated in purple on Drawing 6). The Risk Map indicates that there is no known occurrence of acid sulphate soil materials across the remainder of the site.

The regional groundwater flow regime is believed to be to the west of the site, towards Crangan Bay, Lake Macquarie, which is adjacent to the western boundary of the site and is considered to be the nearest sensitive receptor. It should be noted that groundwater levels are affected by factors such as climatic conditions and soil permeability and will therefore vary with time.

There are no registered groundwater wells in the vicinity of the site. The nearest registered wells are at Catherine Hill Bay, east and upgradient of the site.

4.2 Mine Workings

General

Review of record traces (RTs) obtained from the Department of Primary Industries – Minerals indicate that the site is underlain by abandoned workings in two seams, the Wallarah and the Great Northern Seams.

The RTs have been overlayed on the proposed development outline and are presented on Drawings 5 (Wallarah Seam) and 5A (Great Northern Seam). The workings are described as follows.

The Wallarah Seam workings underlie most of the site, with the Great Northern workings only encroaching on the south-east corner of the site. The depth of cover to the Wallarah Seam workings ranges from about 60 m to 80 m and extensive pillar extraction has been undertaken. The depth of cover to the Great Northern workings is in the range 105 m to 125 m and the workings comprise bord and pillar first workings (no pillar extraction).

Consultations

Consultations have been undertaken with Mr Greg Cole-Clark of the Mine Subsidence Board. Mr Cole-Clark indicated that where there is more than 50 m cover to mine workings, the traditional development guidelines have allowed two storey brick veneer style development, however, a detailed risk assessment would be required for this development.

If the assessment indicated that subsidence was likely, then it would be necessary to predict worst case subsidence parameters. For predicted subsidence parameters that exceed the following values, development would be restricted to single storey brick veneer or similar.

- Maximum subsidence = 400 mm;
- Strains = ± 3mm/m;
- Tilts = 4 mm/m.

5. SITE HISTORY

The brief review of site history comprised the following:

- Interview with Scout Association of Australia administrator Mr Craig Whitford;
- Review of historical aerial photos;

- Searches with NSW Department of Environment, Climate Change and Water (DECCW) and Lake Macquarie City Council Property Enquiry.

Interviews with Personnel Familiar with the Site

Discussions with Scout Association Hunter Area Administrator, Mr Craig Whitford, indicated the site has been used as a Scout Camp since the early 1960s. Mr Whitford was unable to provide details on historical sewer disposal or septic tank/transpiration bed location, if present.

Review of Historical Aerial Photos

The following historical aerial photos were reviewed:

Table 1 – Aerial Photo Review

Year	Approximate Scale	Black and White/Colour
1954	1:40000	Black and White
1966	1:38000	Black and White
1975	1:40000	Black and White
1984	1:40000	Black and White
1996	1:50000	Colour
2006	1:25000	Colour

1954 Aerial Photograph

- Nords Wharf township partially developed, north of site;
- Foreshore, adjacent to site, cleared with scattered trees;
- Vegetation across remainder of site comprises bushland;
- Easement running north-south bisecting site.

1966 Aerial Photograph

- Northern boundary of site cleared during residential construction north of Branter Road;
- Nords Wharf township developed south to Branter Road;
- Scout hut and small cleared area visible in south-west portion of site.

1975 Aerial Photograph

- Scout hall present in centre of site (Refer to Drawing 6);
- Scout huts/sheds present in south-west corner of site;
- Area cleared on northern boundary is now overgrown.

1984 Aerial Photograph

- Additional Scout huts/sheds on foreshore in south-west portion of site;
- Easement running north-south bisecting site is now just discernable.

1996 Aerial Photograph

- Increased density of bushland apparent across site;
- Scout structures present as noted above.

2006 Aerial Photograph

- Similar to 1996 aerial photo.

Information obtained from the aerial photos was limited by the relatively small scale and poor resolutions.

Lake Macquarie City Council Property Enquiry

A property enquiry search for Lot 6, DP746077 on Lake Macquarie City Council's website indicated the following:

- Two development applications for septic tanks were made in 2003, namely AWWTS System 2 Camp Amenities and AWWTS System 1 Caretakers;
- The entire parcel of Lot 6, DP 746077 comprises Bush Fire Prone Land;
- Presence of acid sulphate soils;
- Within a coastal zone;
- Within LEP 2004 Conservation Area,
- Foreshore building line – 36 m DHWM,
- Low lying land present; and
- Within Mine Subsidence District.

NSW Department of Environment and Climate Change

A property information inquiry with the NSW Department Environment & Climate Change and Water (DECCW) indicated that the site has no statutory notices issued under the provision of the Contaminated Land Management Act.

6. SITE CONDITION

A site walk over survey was undertaken by a senior engineer on 18 January 2007. The western strip of the site, adjacent to the lake foreshore is low lying with surface levels of less than 1 m AHD. There is a bank feature running parallel with the foreshore (Photo 9) on the northern portions of the site with localised slopes of up to about 25°. To the east of the bank surface levels rise gradually to the east and then north with surface levels in the order of 20 m AHD along the eastern portion of the northern boundary. The south-western corner of the site is low lying with surface levels less than 5 m AHD.

Much of the site comprises native bushland, however, the western parts of the site are used as a scout camp.

Existing development on the site includes the following:

- The undergrowth has typically been cleared on the western portions but numerous mature trees still remain (Photo 2);
- Scout hall of timber construction with a metal roof and brick pier foundations (Photo 3 and 4);
- Cleared/grassed area near the scout hall;
- Caretakers building (Photo 1);
- Several small accommodation huts of timber construction with metal roofs and concrete ground slabs;
- Gravel access road, with some concrete paving;
- Grassed fill platform with overall dimensions of about 55 m by 35 m and ranging up to about 2 m high on the southern side, blending into the natural grades along the northern edges. The fill appeared to contain bricks and concrete in places (Photos 5 and 6); Note: a large portion of this fill pad is not located on the proposed development area;
- Several smaller fill mounds, primarily soil, with some bricks and concrete (Photos 7 and 8);
- Amenities building on fill platform is located south west of the proposed development area. This is likely to include septic tanks and effluent disposal areas (located down gradient of the proposed development area);
- Scattered car wrecks;
- Possible filling along the foreshore strip.

Photo 1 – Caretakers house

Photo 2 – Typical cleared undergrowth on western portions

Photos 3 and 4 – Scout Hall

Photos 5 and 6 – Filled area


Photo 7 and 8 – Localised Fill Mounds


Photo 9 and 10 – Bank near Foreshore

7. POTENTIAL CONTAMINATION

The walk over and desk top assessments identified potential sources of contamination from the former site uses including the following:

- Fill materials (source unknown), may contain a range of contaminants including asbestos, hydrocarbons, heavy metals etc; Filling may be present as mounded filling (e.g. from unauthorised dumping) or disturbed ground and within cleared or developed areas;

- Fibro sheeting, possibly containing asbestos, used in construction of buildings on site, and also in fill materials at the site;
- Run-off from septic tanks and on-site effluent disposal, which may contain elevated nutrients and heavy metals. Such impact would only be expected to occur down slope (to south west) of the proposed development area;
- Abandoned car wrecks, which may be a source of hydrocarbon and heavy metal contamination.

8. FIELD WORK

8.1 Sampling Rationale

A systematic and judgemental sampling procedure was conducted for the current assessment to address the potential sources of contamination identified in the previous assessment (Ref 1). In addition, potential geotechnical constraints were also assessed at the sampling locations.

A total of 11 test pit locations (Pits N2 to N12) were sampled and analysed as part of the current assessment. Pit N1 was not excavated due to its proximity to potentially sensitive archaeological areas.

Samples were selected for analysis on the basis of the likely presence of contamination, based on material type, visual or olfactory evidence of possible contamination (i.e. odour or staining), proximity to a known source of contamination, and whether generally representative of soil/fill conditions.

8.2 Methods

The field work was undertaken on 6 August 2007 and comprised the following:

- Excavation of 11 test pits to depths of 0.7 m to 3.0 m by backhoe;
- Collection of soil samples for environmental testing;
- Sampling of material potentially containing asbestos.

The test locations were set out by an environmental engineer from DP who also logged the subsurface profile in the pits and collected samples for identification and testing purposes. The approximate locations of the pits and boreholes are shown on Drawing 3, Appendix D. A hand held GPS was used to obtain approximate borehole and test pit co-ordinates, which are shown in Table 3, Section 7.5.

Test locations were selected to further assess identified areas of potential contamination and geotechnical constraints, as summarised below:

- Pits N2, N3 & N12 – assessment of mounded fill materials (unauthorised dumping);
- Pit N4 – Possible shallow rock;
- Pits N5 to N10 – assessment of potential uncontrolled filling in cleared/developed areas;
- Pit N11 – assessment of possible soft alluvial soils/acid sulphate soils.

Samples for environmental purposes were generally collected from the near surface, and at regular depth intervals or changes in strata within each pit. Soil samples were collected directly from the side walls of the test pits or from the backhoe bucket using disposable gloves. Care was taken to remove any extraneous material deposited on the sample.

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

- Decontamination of all sampling equipment using a 3% solution of phosphate free detergent (Decon 90) and tap water prior to collecting each sample;
- The use of disposable gloves for each sampling event;
- Transfer of samples into laboratory-prepared glass jars, and capping immediately;
- Collection of 10% replicate samples for QA / QC purposes;
- Collection of replicate soil samples in zip-lock plastic bags at each depth for PID screening;
- Labelling of sample containers with individual and unique identification, including project number, sample location and sample depth;
- Placement of the sample jars and replicate sample bags into a cooled, insulated and sealed container for transport to the laboratory;

- Use of chain of custody (C-O-C) documentation ensuring that sample tracking and custody could be cross-checked at any point in the transfer of samples from the field to the laboratory.

The process of obtaining samples and their transportation, storage and delivery to laboratories for analysis was documented on a DP standard chain-of-custody form. Copies of completed forms are contained in Appendix C.

Replicate samples for each sample were screened for the presence of volatile organic compounds (VOCs), using a Photovac 2020 photo-ionisation detector (PID) with a 10.6 eV lamp, calibrated to 100 ppm Isobutylene. The PID is capable of detecting over 300 VOCs.

Samples collected for the assessment of acid sulphate soil conditions were wrapped in plastic wrap and plastic bags to exclude air, and stored and transported on ice. Samples were then refrigerated in the DP laboratory.

The work was undertaken in accordance with the DP quality system and procedures for contamination assessments as presented in the company's field procedures manual. A list of the procedures used and other information on quality assurance and quality control, including analysis of replicate samples, is found in Appendix D.

8.3 Data Quality Objectives (DQOs)

Table 2 summarises data quality objectives (DQOs) and the procedures designed to enable achievement of the DQOs.

Table 2 – Data Quality Objectives

DQO	Achievement Evaluation Procedure
Documentation completeness	Completion of field and laboratory chain of custody documentation, completion of test pit logs.
Data completeness	Analysis of appropriate determinants based on site history and on-site observation.
Data comparability	Use of NATA certified laboratory, use of consistent sampling technique.
Precision and accuracy for sampling and analysis	Achievement of 50% RPD for replicate analysis, acceptable levels for laboratory QC criteria.

8.4 Results

The subsurface conditions are presented in detail in the test pit logs, Appendix A. These should be read in conjunction with the general notes preceding them, which explain definitions of the classification methods and descriptive terms.

The following is a summary of the subsurface conditions encountered:

FILLING - encountered to depths of 0.35 m to 1.9 m in all pits except Pit N11, comprising sandy gravel filling, silty sand and clay filling, sand filling, clayey sand and gravel filling. Siltstone and coal filling was found in one location (Pit N7). Filling containing fibro fragments was found in Pits N8 and N9 and in stockpiled filling in Pit N12.

CLAY – encountered from depths of 1.0/2.1 m to depths of 1.3/2.7 m comprising very stiff slightly sandy clay.

CLAYEY SAND AND GRAVEL – clayey sand and gravel, sandy gravelly clay, clayey gravelly sand, clayey sand etc were encountered in all pits beneath filling to depths of between 1.8 m and termination depth. Clay materials were generally firm to very stiff. Soft to firm/loose conditions were encountered in Pit N11 from the surface to a depth of approximately 1.8 m.

CONGLOMERATE - encountered in Pits N2 and N3, generally comprising extremely low strength conglomerate.

Groundwater seepage was encountered in Pit N11 at a depth of between 0.3 m and 0.6 m. It is noted that groundwater levels are transient and may vary with climatic conditions.

8.5 Summary

A summary of the depth of filling, depth to rock and depth to groundwater is presented in Table 3 below.

Table 3 – Summary of Depth of Filling, Rock, Backhoe Refusal and Groundwater

Pit	MGA Easting	MGA Northing	Surface Level (AHD)	Depth of Fill (m)	Depth to Rock (m)	Refusal/Slow Progress Depth (m)	Groundwater Depth (m)
N2	369941	6331886	17.40	0.8	1.8	2.5	
N3	369962	6331884	17.60	1.9	2.3	2.9	
N4	370147	6331887	21.20	0.35	>2.8	-	
N5	369946	6331816	8.90	0.2	>2.9	-	
N6	369957	6331780	6.10	0.3	>3.0	-	
N7	369921	6331755	5.90	1.5	>3.0	-	
N8	369935	6331760	5.80	1.3	>3.0	-	
N9	369953	6331767	5.80	1.0	>3.0	-	
N10	369887	6331691	2.80	1.0	>3.0	-	
N11	370008	6331661	3.00	-	>2.8	-	0.3-0.6 (seepage)
N12	369974	6331880	16.60	0.5	>0.7	-	

Note to Table 3:

See Drawing 3 for pit locations

8.6 Contaminant Observations

Observations of potential contamination within the test pits are summarised in Table 4 below:

Table 4 – Contaminant Observations within Test Pits

Potential Contaminant	Test Pit / Depth (m)
Deleterious Materials (bricks, concrete slabs, glass, metal fragments, fibro)	N5/0.0-0.2
	N8/0.2-0.9
	N9/0.3-1.0
	N12/0.0-0.5
Coal/Coal reject	N7/0.7-1.0
Tyres (part of retaining wall construction)	N10/0.3-1.0

The results of PID screening on soil samples are shown on the test pit logs in Appendix A, and generally suggest the absence of gross volatile hydrocarbon impact.

There was no visual or olfactory evidence (i.e. staining or odours) to suggest the presence of gross contamination within the soils investigated.

Seepage water was observed in one test pit. There was no visual or olfactory evidence (i.e. staining or odours) to suggest the presence of gross contamination within seepage water.

It is noted, however, that groundwater was not sampled or analysed to confirm groundwater constituents.

9. LABORATORY TESTING

9.1 Contamination

9.1.1 Analytical Programme

Laboratory testing was undertaken by SGS Environmental, a National Association of Testing Authorities, Australia (NATA) registered laboratory.

A total of 10 soil samples from the pits were selected to provide an assessment of soil/fill conditions. The samples were selected to target the identified potential sources of contamination (Ref 1), namely uncontrolled filling.

The selected samples were analysed for the following potential contaminants:

- Total Recoverable Hydrocarbons (TRH);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Organochlorine Pesticides (OCPs);
- Organophosphorus Pesticides (OPPs);
- Polychlorinated Biphenyls (PCB);
- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Metals: Arsenic (As); Cadmium (Cd); Chromium (Cr); Copper (Cu); Lead (Pb); Mercury (Hg); Nickel (Ni); Zinc (Zn).

Quality Control/Quality Assurance (QA/QC) testing comprised one soil replicate.

In addition, three fibro samples and three soil samples from test pits were analysed for asbestos.

Three soil samples were analysed for full chromium suite as part of the acid sulphate soil assessment. The results of acid sulphate soil investigation is presented in Section 8.2.

Three soil samples were also analysed for sulphate, chloride and pH as part of aggressivity analysis of soil samples. The results of aggressivity testing is presented in Section 8.3.

9.1.2 Analytical Results

The results of chemical analysis of soil samples are presented in the laboratory report sheets (Appendix B), and are summarised in Tables 5 to 8 below.

Table 5 - Laboratory Results for Metals in Soil

Pit / Depth (m)	PID (ppm)	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
Pit N2/0.3	<1	4	0.1	10	5.1	4	<PQL	6.7	15
Pit N3/0.2	<1	<PQL	0.3	5.2	10	12	<PQL	3	38
Pit N5/0.1	<1	<PQL	0.1	3.4	7.6	26	0.06	1.2	46
Pit N6/0.1	<1	<PQL	0.4	8.4	3.2	9.1	<PQL	2.1	24
Pit N7/0.8	<1	<PQL	0.3	4.5	16	16	0.06	3.8	35
Pit N8/0.5	<1	<PQL	0.5	5	37	62	<PQL	4	130
D2	<1	<PQL	0.5	7.1	38	68	<PQL	4.3	140
Pit N9/0.6	<1	<PQL	0.4	4.2	18	**360**	<PQL	3	93
Pit N10/0.5	<1	<PQL	0.2	13	11	11	<PQL	8.6	75
Pit N12/0.2	<1	6	2.4	30	72	**260**	0.24	15	2600
PQL		3	0.1	0.3	0.5	1	0.05	0.5	0.3
NEHF A (Ref 4)		100	20	100	1000	300	15	600	7000
General Solid Waste (Ref 5)		100	20	100	NC	100	4	40	NC
Restricted Solid Waste (Ref 5)		400	80	400	NC	400	16	160	NC

Notes to Table 5:

All results expressed in mg/kg on a dry weight basis
NC – No Criteria
PQL – Laboratory Practical Quantitation Limit
D2 – Replicate sample of Pit N8/0.5
Shaded results exceed standard residential land use (NEHF A)
Bold results exceed NSW EPA General Solid Waste Guidelines

Table 6 - Laboratory Results for TRH and BTEX in Soil

Pit / Depth (m)	PID (ppm)	TRH				Benzene	Toluene	Ethyl Benzene	Total Xylene
		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}				
Pit N2/0.3	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N3/0.2	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N5/0.1	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N6/0.1	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N7/0.8	<1	<PQL	45	310	99	<PQL	<PQL	<PQL	<PQL
Pit N8/0.5	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
D2	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N9/0.6	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N10/0.5	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N12/0.2	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
PQL		20	50	50	50/100*	0.5	0.5	0.5	1.5
Service Station (Ref 6)		65	1000 total			1	1.4	3.1	14
General Solid Waste (Ref 5)		650	10000 total			10	288	600	1000
Restricted Solid Waste (Ref 5)		2600	40000 total			40	1152	2400	4000

Notes to Table 6:

All results expressed in mg/kg on a dry weight basis
PQL – Laboratory Practical Quantitation Limit
D2 – Replicate sample of Pit N8/0.5

Table 7 - Laboratory Results for OCP, OPP, PCB and PAH in Soil

Pit / Depth (m)	PID (ppm)	PCB	OPP	OCP				Total PAH	Benzo (a) pyrene
				Aldrin / Dieldrin	Chlordane	DDT	Heptachlor		
Pit N2/0.3	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N3/0.2	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N5/0.1	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.28	0.08
Pit N6/0.1	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N7/0.8	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	8.13	0.23
Pit N8/0.5	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	4.85	0.45
D2	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	4.21	0.41
Pit N9/0.6	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	5.56	0.56
Pit N10/0.5	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit N12/0.2	<1	<PQL	<PQL	<PQL	<PQL	0.2	<PQL	0.71	0.11
PQL		0.9	0.1	0.1	0.1	0.1	0.1	0.05	0.05
NEHF A (Ref 4)		10	NC	10	50	200	10	20	1
General Solid Waste (Ref 5)		50	NC	NC	NC	NC	NC	200	0.8
Restricted Solid Waste (Ref 5)		50	NC	NC	NC	NC	NC	800	3.2

Notes to Table 7:

All results expressed in mg/kg on a dry weight basis
PQL – Laboratory Practical Quantitation Limit
D2 – Replicate sample of Pit N8/0.5

Table 8 - Laboratory Results for Asbestos in Soil and Fibro Fragments

Sample Identification	Sample Type	Asbestos Detected
Pit N8/0.5	Filling	No asbestos detected
Pit N8/fibro	Fibro fragment	Amosite and Chrysotile asbestos detected
Pit N9/0.6	Filling	No asbestos detected
Pit N9/fibro	Fibro fragment	Amosite, Chrysotile and Crocidolite asbestos detected
Pit N12/0.2	Filling	Chrysotile asbestos detected
Pit N12/surface fibro	Fibro fragment	Amosite and Chrysotile asbestos detected

9.2 Acid Sulphate Soils

Laboratory testing initially comprised 11 acid sulphate screening tests. The results of the screening tests are presented in Table 9 below.

Table 9 – Results of Acid Sulphate Soil Screening Tests

Sample ID	Sample Depth [a] (m)	Sample Description	Screening Test Results			
			pH			Strength of Reaction [b]
			pH_F	pH_{FOX}	pH_F - pH_{FOX}	
N10	1.1	dark grey clayey silty sand	6.6	4.4	2.2	1
	1.5	light grey clayey sand and gravel	6.4	5.2	1.2	1
	2	light grey clayey sand and gravel	5.8	5.4	0.4	1
	2.5	light grey mottled orange clay	5.5	4.8	0.7	1
	2.9	light grey mottled orange sandy clay	5.7	4.9	0.8	1
N11	0.1	grey clayey sand, some rootlets	6	4.1	1.9	1
	0.5	light grey gravelly clayey sand	6	5.2	0.8	1
	0.9	light grey sandy clay and gravelly clayey sand	6	5.6	0.4	1
	1.2	light grey mottled yellow/orange sandy clay	6.1	5.5	0.6	1
	1.9	grey mottled orange sandy clay	5.5	5.3	0.2	1
	2.6	grey mottled orange sandy clay	5.8	5.1	0.7	1
Guideline		Sands to loamy sands	<4[d]	<3.5[e]	≥1[e]	-
		Sandy loams to light clays				
		Medium to heavy clays and silty clays				

Notes to Table 9:

a Depth below ground surface
b Strength of Reaction
- 1 denotes no or slight reaction
- 2 denotes moderate reaction
- 3 denotes high reaction
- 4 denotes very vigorous reaction
- F denotes bubbling/frothy reaction indicative of organics
- H denotes heat generated

d For actual acid sulphate soils (ASS)
e Indicative value only for Potential Acid Sulphate Soils (PASS)
Shaded results indicate an exceedence of QASSMAC criteria (Ref 8)

The QASSIT guidelines suggest that a soil pH<4 in water is an indicator of actual acid sulphate soils. The results of screening tests therefore suggest the absence of actual acid sulphate soils at the locations and depths tested.

The QASSIT guidelines also suggest that indicators of potential acid sulphate soils (PASS) include the following:

- Soil pH <3.5 in H_2O_2 (i.e. pH_{FOX});
- Drop of 1 pH unit or more between pH_F and pH_{FOX}.

Three samples exhibited a pH drop of greater than one unit, suggesting that potential acid sulphate soils may be present within upper clayey sands at the site.

It is noted that the above test method is a qualitative method only and gives an indication of the intensity of total acidification (pH). The ASSMAC guidelines indicate that peroxide may also oxidise organic matter (in addition to pyrite) to produce acids which are unlikely to form under natural conditions, thus giving falsely high indication of acid sulphate potential.

Based on the results of the screening tests and the identified ASS areas on the risk maps, three soil samples were selected for detailed laboratory testing, comprising the Full Chromium Suite in accordance with QASSIT guidelines (Ref 7 and 8).

Detailed test results are contained in the attached laboratory report sheets, and are summarised in Table 10 below.

Table 10 – Results of Detailed Acid Sulphate Soil Laboratory Testing

Sample ID	Sample Depth [a] (m)	Sample Description	Laboratory Results			
			pH_{KCL}	Scr %S	s-TAA %S	Net Acidity[c] %S
Pit N10	1.1	Dark grey clayey silty sand	4.8	<PQL	0.06	0.06
Pit N11	0.5	Light grey gravelly clayey sand	5.4	<PQL	<PQL	<PQL
Pit N11	2.6	Grey mottled orange sandy clay	4.6	<PQL	0.10	0.10
Guidelines		Sands to loamy sands	-	-	-	0.03
		Sandy loams to light clays				0.06[f]/0.03[g]
		Medium to heavy clays and silty clays				0.1[f]/0.03[g]

Notes to Table 10:

a Depth below ground surface
c Calculated from ABA equation in ASS Laboratory Methods Guidelines (Ref 8)
f QASSMAC Action Criteria for disturbance of 1-1000 tonnes of material
g QASSMAC Action Criteria for disturbance of more than 1000 tonnes of material
Shaded results indicate an exceedence of QASSMAC criteria (Ref 8)
Scr – Chromium reducible sulphur
TAA – Titratable actual acidity

The results indicate the presence of marginally actual acid sulphate soils in the samples from Pit N10/1.1 and Pit N11/2.6, with all of the net acidity attributed to TAA.

9.3 Soil Aggressivity

Laboratory testing was also undertaken by SGS Environmental for assessment of soil aggressivity. Five samples were submitted for analysis to assess the aggressiveness of the soil toward buried steel/concrete structures. The testing comprised the following analytes:

- Sulphate;
- Chloride;
- pH.

Detailed laboratory report sheets are attached and the results are summarised in Table 11, below:

Table 11 – Summary of Soil Aggressiveness

Pit/Depth (m)	Description	Laboratory Results			
		pH	FMC (%)	Sulphate SO_4 (mg/kg)	Chloride Cl (mg/kg)
Pit N4/0.6	Grey brown silty sandy gravel	6.3	9	<PQL	12
Pit N5/1.3	Light grey and light orange sandy clay	4.1	14	73	33
Pit N6/0.8	Grey sandy silt, moist	5.7	13	<PQL	7.8
Pit N9/1.3	Grey and light orange slightly sandy clay	5.4	15	54	20
Pit N11/0.9	Light grey mottled yellow sandy clay/clayey gravelly sand	5.7	10	20	12
PQL		0.1	1	20	0.5

Notes to Table 11:

FMC – field moisture content

The results are discussed in Section 11.6.

10. ASSESSMENT OF CONTAMINATION

10.1 Assessment Criteria

Results of the chemical analyses were compared to the following NSW EPA recommended guidelines:

- NSW EPA (1998). Contaminated Sites - Guidelines for the Site Auditor Scheme 2nd Edition, April 2006 (Ref 4);
- NSW EPA (1994). Contaminated Sites - Guidelines for Assessing Service Station Sites, December 1994, (Ref 6);
- NSW DECCW (2009). Waste Classification Guidelines – Part 1: Classifying Waste (Ref 5).

The NSW EPA Guidelines for the NSW Site Auditor Scheme (Ref 4) contain National Environmental Health Forum (NEHF) levels for various beneficial use scenarios including: low density residential (A), high density residential (D), recreational (E) and commercial/industrial (F). These criteria are applicable where aesthetic and ecological concerns are not an issue.

Health based criteria for standard residential uses with access to soil (NEHF A), are considered to be appropriate for the proposed residential development.

The NSW EPA Guidelines for Assessing Service Station Sites (Ref 6) were used to assess total TRH and BTEX contamination across the site. The criteria used are threshold concentrations for sensitive land use.

The NSW DECCW Waste Classification Guidelines (Ref 5) were used to assess soil conditions for possible off-site disposal to a licensed landfill.

10.2 Assessment of Contamination

Soil chemical analysis results were generally within the health based criteria for low density residential land use (i.e. NEHF A), and NSW EPA sensitive land use criteria for TRH and BTEX, with the exception of sample Pit N9/0.6, taken in fill material containing deleterious materials, which had lead levels in exceedence of the NEHF A guideline.

The results of laboratory analysis also indicated the presence of bonded asbestos in fibro sheet fragments found within filling containing deleterious materials in Pits N8 and N9, and within surface stockpile materials in Pit N12. Asbestos fibres were also found in stockpiled soil filling in Pit N12. It should be noted that the composition of filling across the site may be variable. The possible presence of further fibro fragments (possibly asbestos based) within fill across the site cannot therefore be discounted.

The ESP report (Ref 14) identified asbestos materials in several building across the site. The ESP report also noted the presence of additional dumped deleterious materials across the site which have the potential to contain asbestos.

The following slightly elevated chemical analysis results were observed, with results within the adopted NEHF A criteria:

- Slightly elevated C_{10}-C_{36} hydrocarbons in the sample N7/0.8;
- Slightly elevated heavy metals in the sample from Pit N12/0.2;
- Detectable levels of PAH and benzo(a)pyrene in filling from Pits N5, N7, N8, N9 and N12.

10.3 Conclusions

The results of the above investigation indicated the following with respect to potential contamination:

- Presence of lead levels in filling in the central portion of the site, with levels in exceedence of residential guidelines;
- Presence of fibro fragments containing asbestos within filling in the central portion of the site, and in a small stockpile in the northern portion of the site.

It is noted that unauthorised dumping has occurred at the site. It is likely that further asbestos materials are present at the site surface.

With respect to chemical contaminants, fill materials tested from the site are classified between General Solid Waste and Restricted Solid Waste (without leachability testing) for off-site disposal to a licensed landfill facility with reference to NSW DECCW guidelines (Ref 5).

Identified fibro fragments and fill containing asbestos materials are classified as 'Asbestos Waste' with reference to NSW DECCW guidelines (Ref 5). Asbestos containing materials within buildings(as identified in the ESP report, Ref 14) would also be classified as 'Asbestos Waste' following demolition of buildings.

The results of the PCA indicate that localised site remediation will be required. Remediation, where required, would include the preparation of a remediation action plan (RAP), appropriate excavation and removal/disposal/capping of contaminated soil, followed by validation sampling and analysis to the requirements of SEPP 55 and NSW DECCW.

Based on the known and potential contaminants in parts of the site and the ability to remediate the above listed contaminants, Douglas Partners is satisfied that the land will be suitable, after remediation, for residential purposes. The land is required to be remediated before the land is used for such a purpose and the following must be undertaken:

- Further delineate extent of contamination;
- Development of a Remediation Action Plan;
- Appropriate remediation conducted to remove identified contaminants exceeding the DECCW land use criteria;
- Deleterious materials and possible associated surface impact removed;
- Validation testing and verification;
- Validation of asbestos contamination should be conducted by a qualified asbestos consultant;
- Waste classification to DECCW guidelines of any materials destined for off-site disposal at a licensed landfill.

It is likely that the above localised remedial measures could be readily managed during the initial stages of earthworks and construction.

11. GEOTECHNICAL CONSTRAINTS

11.1 Founding Conditions

Ground conditions across the proposed development site are expected to comprise generally thin topsoil and surface filling overlying residual clay soils with weathered rock at depth. Soft/weak alluvial soils were encountered to the south west of the proposed development site, however these are not expected to encroach onto the development site.

Filling, where present on the site is typically less than 0.5 m, with the exception of a number of localised mounds as shown in red on Drawing 6 with filling up to about 2 m deep.

Conventional shallow footings, as per AS 2870-1996 (Ref 9), are expected to be suitable across most of the site. Footings should be founded in natural clay or rock and therefore in areas with filling deeper than about 0.4 m, deepening of the footings may be required. If the filling near Pits N6 to N9 is to remain on site, then piled footings may be required in this location.

The clay soils on site are expected to be reactive. Reactive soils shrink and swell with changing moisture conditions, leading to ground surface movements. Soil reactivity can be readily accommodated in design, and should be confirmed during future detailed investigations prior to development by classifying building sites in accordance with AS 2870-1996 (Ref 9).

11.2 Acid Sulphate Soils

A preliminary acid sulphate soil assessment was undertaken with reference to the ASSMAC "Acid Sulphate Soils Manual" (Ref 7) and QASSIT "Soil Management Guidelines" (Ref 8), and comprised the following:

- Review of available acid sulphate risk maps;
- 11 screening tests on selected soil samples for pH in water (pH_F) and pH in hydrocarbon peroxide (pH_{FOX});
- Three samples tested for the full chromium suite to assess acid sulphate potential.

Based on the results of this assessment, development in the southern portion of the site may disturb marginal acid sulphate soils, particularly during deeper excavation if required (depths greater than 1 m below current site levels).

It is noted that the acid sulphate soil risk map indicates a low probability of acid sulphate soils at a depth greater than 3 m below surface levels. The method of investigation (i.e. backhoe) precluded assessment of soils deeper than 3 m. It is unlikely, however, that the proposed residential development will require excavations to such depths.

In addition, the presence of acid sulphate soils to the west of the site (i.e. on the Lake foreshore) was not investigated. The foreshore area had been identified as a potentially sensitive archaeological area. In addition, it is understood that development is not proposed for this area.

It is noted that minimal development is proposed for southern portion of the site in the current development layout. If the proposed development layout changes, it is recommended that additional acid sulphate assessment is undertaken at the site to further delineate possible affected areas, and to confirm treatment requirements.

A general acid sulphate soil management procedure is presented below, which should be confirmed prior to construction (if development is proposed within the potentially affected areas).

Soil

- Any natural soils excavated below depths of approximately 1 m from the ground surface should be stockpiled separately prior to lime treatment in a bunded area to collect any leachate that may form;
- Lime treatment would involve mixing Agricultural Grade Lime into the stockpiled soil to neutralise any acid generated by the acid sulphate soils. Based on the laboratory test results the rate of lime application is estimated to be approximately 6 kg/m^3 soil;
- Further on-site screening tests by DP would then be required to verify that adequate neutralisation has occurred, and if necessary adjust the liming rate;
- The base of any excavation in the affected soils should be limed at a rate of approximately 1 kg/m^2.

Groundwater

- Groundwater extracted during dewatering (if required during construction) should be tested for pH prior to discharge;
- Dewatering monitoring would involve regular visits by DP personnel to measure dewatering pH. The frequency would depend on the construction programme and monitoring results, however it is likely to initially be daily, possibly reducing to weekly once excavations are complete and consistent results are being achieved;
- If the pH of discharge water is below natural levels, a lime slurry should be added to raise the pH to the natural range of groundwater pH.

Groundwater was not encountered in the majority of test pits during the investigation. It is noted that groundwater levels are transient and may vary with climatic conditions.

In summary, the treatment of acid sulphate soils and groundwater should be undertaken in a controlled manner to minimise the potential for generation and migration of acidic leachate. Monitoring of soil neutralisation and discharge water, should be undertaken during any disturbance of acid sulphate soils.

11.3 Slope Stability

There was generally no evidence of previous or incipient deep seated slope instability observed over the site. The site is generally considered to have a low to moderate risk of slope instability with respect to the natural topography.

There may be a localised medium to high risk of instability near the bank feature near the foreshore and if development is proposed in this area, additional investigation should be undertaken.

In the event that significant cuts or fills are proposed for the site, further geotechnical investigation to specifically assess the risk of slope instability due to cuts and fills, should be undertaken. Such risks are generally managed by limiting batter slopes, drainage measures or suitably designed support.

11.4 Erosion

There was no obvious soil erosion evident on the site during the walk-over, however, based on the Soil Landscape Sheet for Gosford – Lake Macquarie the soils on the slopes typically have high erosion potential.

Water quality may be impacted due to sediment laden run-off from the topsoil material occurring during construction. Such potential erosion and sedimentation are readily amenable to mitigation measures such as silt fences, revegetation/reshaping batters, drainage structures (catch drains), sediment traps and sedimentation basins.

11.5 Excavatability

The results of subsurface investigations indicated the depth to rock across the site was generally about 2 m or deeper, increasing on the western parts of the site. Backhoe refusal occurred at depths in the range 2.5 m to 2.9 m on the northern parts of the site.

Soil and weak rock encountered to the depth of backhoe/auger refusal as shown on Table 3 would be readily excavatable using hydraulic excavators or small bulldozers. Beyond the depth of backhoe / auger refusal large earthmoving equipment may be required for excavation, such as excavators with rock teeth or bulldozers with rippers. There is some risk that heavy ripping or pneumatic/hydraulic hammering may be required if medium or high strength rock occurs within the depth of excavation, especially for detailed excavation such as footings, service trenches and batter trimming.

11.6 Aggressive Soils

The soil landscape mapping suggest the possible presence of naturally acidic or saline soils which may be aggressive to buried structures or services.

The results of testing listed in Table 11 above indicate a non-aggressive exposure classification when compared to the requirements for steel/concrete piles presented in AS 2159-1995 (Ref 10).

It is recommended, however, to provide sufficient concrete cover and appropriate strength to accommodate for the environment and any changes in conditions.

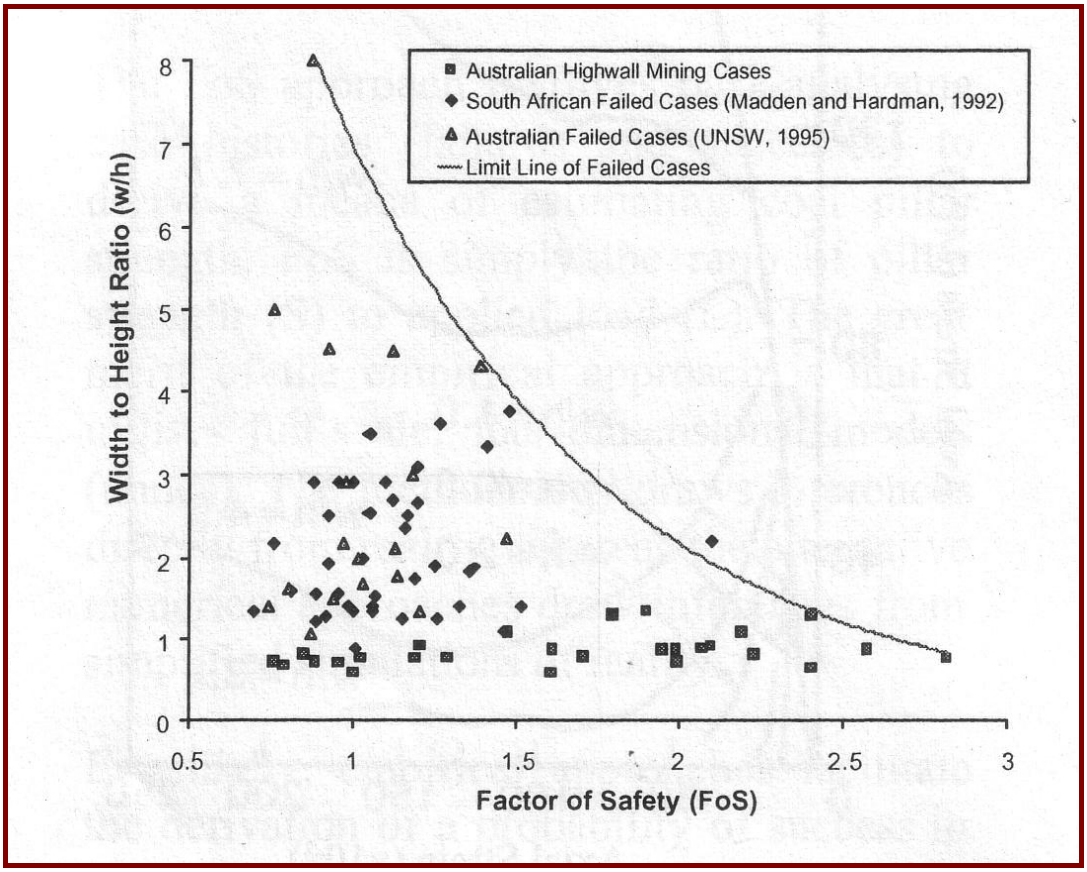
12. MINE SUBSIDENCE

12.1 Pillar Stability Assessment

12.1.1 General

Pillar stability analysis has been undertaken using the UNSW pillar stability formula. (Ref 12). The pillars have been split into separate representative panels for the analyses. The panels and individual pillar numbers are shown on Drawings 5 and 5a in Appendix D.

In assessment of the likelihood of pillar failure, consideration of the width to height ratio of the pillar is critical, as outlined by Hill and Buddery (Ref 11) who have compiled a data base of failed South African and Australian pillars and compared the FOS and pillar width to height ratio. The results are presented in Figure 1 below.



The results of the assessment have been compared to Figure 1, in the assessment of likelihood of pillar failure.

Hill and Buddery also note that the Great Northern Seam floor in the Lake Macquarie area often has a high smectite content and tends to swell and degrade in the presence of moisture and that specific consideration should be given to the presence of such extremely weak floor conditions.

12.1.2 Great Northern Seam

Wallarah Colliery Workings

Workings in the Great Northern Seam comprised bord and pillar first workings with no pillar extraction. A working section of 3.5 m was adopted, the typical seam thickness shown on the RT.

The results of pillar stability assessment are summarised in Table 12 below.

Table 12 – Pillar Factors of Safety for Great Northern Seam

Panel	Minimum Pillar FOS	Maximum Pillar FOS	Panel FOS	Typical Pillar Widths (m)
A	2.37	2.69	2.72	15-19 m
B	2.07	2.51	2.68	14-19

Based on the results of the assessment, it is considered that pillar instability in the Great Northern Seam workings is very unlikely, provided that weak floor conditions are not present, with panel factors of safety in the range 2.03 to 3.38. When the results are plotted against Figure 1, all individual pillars plot above the limit of failed cases, with the panels plotting well above the line. With a depth of cover of over 125 m, significant load spreading will occur and therefore panel factors of safety are considered much more representative of actual conditions.

There is historical evidence of weak claystone in the floor of the Great Northern Seam in the Gwandalan area, which can soften, leading to punching failure of the pillars. The width of the pillars is generally 17 m or wider, which will protect the floor below the centre of the pillars from softening to a large degree, however there is some risk of such a punching failure.

Estimates of maximum likely subsidence due to pillar failure in the Great Northern Seam have been undertaken using the methods outlines in Holla (Ref 13) and are summarised in Table 13 below.

Table 13 – Worst Case Estimated Subsidence in Great Northern Seam

Parameter	Panel A	Panel B
Maximum Subsidence	0.11	0.73
Maximum Tensile Strain (mm/m)	0.4-0.9	2.3
Maximum Compressive Strain (mm/m)	0.6-2.1	3.5
Maximum Tilt (mm/m)	1.6-2.1	10.5
Goaf Side Subsidence (m)	NA	0.12
Tilt 25 m Outside Goaf (mm/m)	NA	<4

Therefore, if a pillar failure were to occur in the Great Northern Seam, which would only be expected to occur if a weak floor was present, then the subsidence parameters would only exceed those allowable for two storey development in Panel B and extending 25 m to the north of the panel.

12.1.3 Wallarah Seam

The majority of the workings comprise pillar extraction with supercritical panels which will have collapsed. There are three main panels of abutment pillars remaining (Panels A to C as shown on Drawing 5a). The pillar stability assessment indicates panel factors of safety in the range 2.39 to 4.08 and therefore the workings are considered long term stable.

12.2 Mining Subsidence Constraints to Development

Based on the results of the assessment described the expected development restrictions have been plotted on Drawings 5 and 5a. In the absence of data suggesting otherwise it has been assumed that a weak floor could be present in the Great Northern Seam and therefore pillar instability is possible. Subsidence estimates indicate that only in the south eastern corner of the site would possible subsidence exceed the allowable parameters for two storey development and this area has been mapped in yellow. The remaining areas would be suitable for two storey development.

Reference to the NSW Department of Primary industries web site indicates that the site is not underlain by any existing coal or minerals titles, although the area below the lake to the immediate north west of the site is covered by Mining Lease ML1370 held by Centennial Coal. The proposed development would not preclude future mining. Any future mining, however would need to be undertaken in a manner which limits surface subsidence and this may require bord and pillar mining. Restrictions on development due to future mining are normally provided by the DARZL Committee and a formal application to the MSB is required for consideration by DARZL.

The general area is subject to petroleum exploration licence 461 held by Macquarie Energy Pty Ltd which expires in September 2012. Petroleum extraction, if proposed in the future, can generally be designed to be compatible with existing development.

13. GROUNDWATER DEPENDANT ECOSYSTEMS

13.1 Distribution

It is understood that Groundwater Dependant Ecosystem (GDE) communities have been identified in the vicinity of the proposed development by Harper Somers O'Sullivan in locations shown on Drawing 106 attached. The GDE communities in proximity to the site, as labelled on Drawing 106, are described as follows:

GDE 1 Strip of Swamp Oak along lake edge.

GDE 2 Redgum Roughbarked Apple Swamp Forest on steep batter between site and Lake.

GDE 3 Swamp Mahogany Paperbark Forest in low lying land to the south of the proposed development.

Alluvial Soils

Alluvial soils are mapped at the following locations as shown on Drawing 106:

- A strip of alluvial soils along the immediate lake edge following GDE1. The soils are expected to be shallow and underlain by clay and weathered rock;
- Geological mapping indicates the absence of alluvial soils on the remainder of the site, however acid sulphate soil mapping suggests the possibility of alluvial soils on low lying ground to the south east of the proposed development area. The results of subsurface investigation suggested that possible presence of alluvial soils to depths of up to 1.0 m. Slight seepage into the test pits was observed at depth from 0.3 m.

Residual Soils

The remainder of the site comprised residual clay soil overlying weathered rock. There was no free groundwater encountered within the 3 m depth of investigation in these areas.

Mine Workings

The site has been subject to bord and pillar workings and subsequent pillar extraction and many parts of the site have been subject to mine subsidence.

13.2 Conceptual Groundwater Model

Based on the results of the desktop assessment, the subsurface investigation and the site topography a conceptual groundwater model has been developed for the site as follows:

- Groundwater recharge on the parts of the site proposed for development is generally very limited due to the low permeability clay soil and weathered rock. The vast majority of rainfall is expected to either run off or be lost by evapo-transpiration;
- Some recharge may occur in these areas due to infiltration through mine subsidence induced cracks in the rock. This would be expected to infiltrate near vertically to a regional water table at depth;
- The alluvial soils along the lake edge are shallow and the water level will be controlled by water levels in the lake;
- The alluvial soils along the southern boundary of the site are expected to comprise unconfined aquifers perched above the less permeable underling residual soils and rock;
- The alluvial area along the southern boundary is in a locally low lying area and recharge to the aquifers occurs within these low lying areas. The source of the recharge water is from surface runoff from surrounding areas as well as direct rainfall within the areas. Groundwater recharge from the adjacent areas of residual soils will be very minor;

- Groundwater will flow within the alluvial areas, generally following the fall of the ground, towards the lake, as well as interact with the surface water ponding. In times high rainfall the aquifer will be recharged by flow and ponding and in times of low rainfall the groundwater may provide base-flow back to localised low areas and prolong surface water ponding;
- There may be minor salt water intrusion into the underlying fractured rock aquifer along the lake foreshore, however no saltwater intrusion effects would be expected to occur in the alluvial areas as they are inland of any possible salt water intrusion. This situation isn't expected to change post development.

13.3 Effect Of Development On Groundwater Levels

The footprint of the development is on residual soils or filling over residual soils. with no encroachment onto alluvial soils as shown on Drawing 106. Only the alluvial soils are expected to provide conditions for being perched aquifers to form as they have higher permeability soils and are essentially hydraulically isolated from the residual soils and rock.

Groundwater recharge to the aquifers is considered to be partly due to direct rainfall in the alluvial areas, however primarily from runoff from the surrounding residual soil areas and not due to groundwater recharge from the residual soil areas.

Potential interactions between the proposed development and the GDEs identified in Section 14.1 and shown on Drawing 106 are expected to be as follows:

GDE 1 **-** This area is directly associated with the lake and the development will have no effect on groundwater levels.

GDE 2 – This area is on a relatively steep bank immediately down slope of the site on residual soils. Groundwater is expected at depths of 2 m or more and would be within low permeability clay and rock. The groundwater levels would primarily be controlled by the lake water level and the development would be expected to have insignificant affect on groundwater levels.

GDE 3 – This is a low lying area to the south of the site. The groundwater will generally be controlled by recharge from the upslope areas, which will include the developed areas.

13.4 Summary

In summary it is considered that only groundwater levels in GDE 3 would be affected by the proposed development. Provided that the existing surface water flow rates / levels and fluctuations thereof within the low ling area to the south of the site are maintained there will be minimal impact on the groundwater levels and therefore GDEs. This can be achieved by appropriate water sensitive urban design, which would include the provision of surface water storage devices such as ponds or swales to limit peak flows.

The potential for adverse impacts on groundwater quality from the proposed development would most likely come from surface runoff. As with groundwater/surface water levels, the surface water quality and therefore groundwater quality can be managed by appropriate water sensitive urban design. It is proposed that the development of the site would incorporate water sensitive urban design measures including a detailed surface water management plan which will be prepared prior to any construction occurring on the site.

14. ADDITIONAL INVESTIGATIONS

Contamination

It is recommended that an assessment of surface fibro should be undertaken by a qualified asbestos consultant to confirm the presence of asbestos associated with existing structures, surface fibro fragments and possibly near surface soils.

Remediation and validation of identified contamination should be undertaken as described in Section 10.3.

Geotechnical

Additional geotechnical investigation is expected to be required prior to development, which may include the following:

- Specific investigation for proposed buildings footings or excavations, including maximum depths of cut and safe batter slopes;
- Site classifications to AS 2870;
- Earthworks procedures and specifications;
- Pavement thickness design for roads.

15. LIMITATIONS

Douglas Partners (DP) has prepared this report for this project at Nords Wharf in accordance with DP's proposals dated 22 June 2007 and 20 January 2010. The work was carried out under Rio Tinto Short Form General Conditions for Consultancy Services, August 2004 as amended by DP letter of 6 September 2007. This report is provided for the exclusive use of the Coal & Allied Industries Ltd and Catylis for the specific project and purpose as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party.

The results provided in the report are considered to be indicative of the sub-surface conditions on the site only to the depths investigated at the specific sampling and/or testing locations, and only at the time the work was carried out. DP's advice may be based on observations, measurements, tests or derived interpretations. The accuracy of the advice provided by DP in this report is limited by unobserved features and variations in ground conditions across the site in areas between test locations and beyond the site boundaries or by variations with time. The advice may be limited by restrictions in the sampling and testing which was able to be carried out, as well as by the amount of data that could be collected given the project and site constraints. Actual ground conditions and materials behaviour observed or inferred at the test locations may differ from those which may be encountered elsewhere on the site. Should variations in subsurface conditions be encountered, then additional advice should be sought from DP and, if required, amendments made.

It is noted that the site is within a proclaimed mine subsidence district. This report outlines the potential risks associated with mine subsidence and presents guidelines for managing the risk and obtaining Mine Subsidence Board consideration for the proposed development. It is noted that the guidelines presented are not intended to fully prevent damage to property or person, rather reduce the risks and Douglas Partners accept no liability with respect to such damage. The Mine Subsidence Board should be consulted with respect to the proposed development to obtain their consent of the proposal.

This report must be read in conjunction with the attached "Notes Relating to This Report" and any other attached explanatory notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

DOUGLAS PARTNERS PTY LTD

Reviewed by:

Patrick Heads
Associate

John Harvey
Principal

Will Wright
Principal

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APPENDIX A

NOTES RELATING TO THIS REPORT
TEST PIT LOGS – PITS N2 TO N12

Douglas Partners
Geotechnics · Environment · Groundwater

NOTES RELATING TO THIS REPORT

Introduction

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

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

Description and Classification Methods

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

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

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

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

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

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

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

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

Sampling

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

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

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

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

Drilling Methods.

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

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

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

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

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

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

Non-core Rotary Drilling — the hole is advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from 'feel' and rate of penetration.

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

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

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" — Test 6.3.1.

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

The test results are reported in the following form.

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

  as 4, 6, 7
  N = 13

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

  as 15, 30/40 mm.

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

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

Cone Penetrometer Testing and Interpretation

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

In the tests, a 35 mm diameter rod with a cone-tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20 mm per second) the information is plotted on a computer screen and at the end of the test is stored on the computer for later plotting of the results.

The information provided on the plotted results comprises: —

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

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

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

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

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

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

q_c = (12 to 18) c_u

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

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

Hand Penetrometers

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

Two relatively similar tests are used.

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

Laboratory Testing

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

Bore Logs

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

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

Ground Water

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

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

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

Engineering Reports

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

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

- unexpected variations in ground conditions — the potential for this will depend partly on bore spacing and sampling frequency
- changes in policy or interpretation of policy by statutory authorities
- the actions of contractors responding to commercial pressures.

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

Site Anomalies

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

Reproduction of Information for Contractual Purposes

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section

is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

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

AN ENGINEERING CLASSIFICATION OF SEDIMENTARY ROCKS IN THE SYDNEY AREA

This classification system provides a standardized terminology for the engineering description of the sandstone and shales in the Sydney area, but the terms and definitions may be used elsewhere when applicable.

Under this system rocks are classified by Rock Type, Degree of Weathering, Strength, Stratification Spacing, and Degree of Fracturing. These terms do not cover the full range of engineering properties. Descriptions of rock may also need to refer to other properties (e.g. durability, abrasiveness, etc.) where these are relevant.

ROCK TYPE DEFINITIONS

Rock Type	Definition
Conglomerate:	More than 50% of the rock consists of gravel sized (greater than 2mm) fragments
Sandstone:	More than 50% of the rock consists of sand sized (.06 to 2mm) fragments
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06mm) granular particles and the rock is not laminated
Claystone:	More than 50% of the rock consists of clay or sericitic material and the rock is not laminated
Shale:	More than 50% of the rock consists of silt or clay sized particles and the rock is laminated

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. clayey sandstone, sandy shale.

DEGREE OF WEATHERING

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

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly laminated	<6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	>2 m

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 Society of Rock Mechanics (Reference).

Strength Term	Is(50) MPa	Field Guide	Approx. qu MPa*
Extremely Low:	0.03	Easily remoulded by hand to a material with soil properties	0.7
Very Low:	0.1	May be crumbled in the hand. Sandstone is “sugary” and friable.	2.4
Low:	0.3	A piece of core 150 mm long x 50 mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	7
Medium:	1	A piece of core 150 mm long x 50 mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.	24
High:	3	A piece of core 150 mm long x 50 mm dia. cannot be broken by unaided hands, can be slightly scratched or scored with knife.	70
Very High:	10	A piece of core 150 mm long x 50 mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	240
Extremely High:		A piece of core 150 mm long x 50 mm dia. is difficult to break with hand held hammer. Rings when struck with a hammer.	

* The approximate unconfined compressive strength (qu) shownin the table is based on an assumed ratio to the point load index of 24:1. This ratio may vary widely.

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks

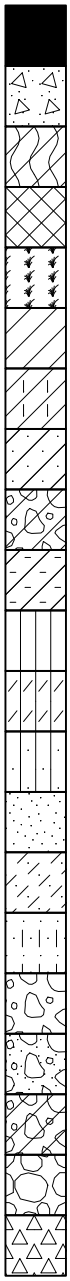
Term	Description
Fragmented:	The core is comprised primarily of fragments of length less than 20 mm, and mostly of width less than the core diameter.
Highly Fractured:	Core lengths are generally less than 20 mm - 40 mm with occasional fragments.
Fractured:	Core lengths are mainly 30 mm - 100 mm with occasional shorter and longer sections.
Slightly Fractured:	Core lengths are generally 300 mm - 1000 mm with occasional longer sections and occasional sections of 100 mm - 300 mm.
Unbroken:	The core does not contain any fracture.

REFERENCE

International Society of Rock Mechanics, Commission on Standardisation of Laboratory and Field Tests, Suggested Methods for Determining the Uniaxial Compressive Strength of Rock Materials and the Point Load Strength Index, Committee on Laboratory Tests Document No. 1 Final Draft October 1972

GRAPHIC SYMBOLS FOR SOIL & ROCK

SOIL



BITUMINOUS CONCRETE

CONCRETE

TOPSOIL

FILLING

PEAT

CLAY

SILTY CLAY

SANDY CLAY

GRAVELLY CLAY

SHALY CLAY

SILT

CLAYEY SILT

SANDY SILT

SAND

CLAYEY SAND

SILTY SAND

GRAVEL

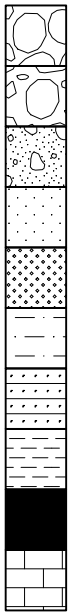
SANDY GRAVEL

CLAYEY GRAVEL

COBBLES/BOULDERS

TALUS

SEDIMENTARY ROCK



BOULDER CONGLOMERATE

CONGLOMERATE

CONGLOMERATIC SANDSTONE

SANDSTONE FINE GRAINED

SANDSTONE COARSE GRAINED

SILTSTONE

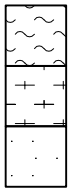
LAMINITE

MUDSTONE, CLAYSTONE, SHALE

COAL

LIMESTONE

METAMORPHIC ROCK

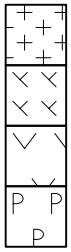


SLATE, PHYLITTE, SCHIST

GNEISS

QUARTZITE

IGNEOUS ROCK



GRANITE

DOLERITE, BASALT

TUFF

PORPHYRY

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369278
NORTHING: 6331889
DIP/AZIMUTH: 90°/--

PIT No: N2
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
		FILLING - Light grey to grey brown fine to coarse sand and fine to coarse gravel filling, some cement (sand / cement mix), dry		D, PID	0.3		<1ppm		
	0.8	TOPSOIL - Grey brown silty clayey fine to coarse sand and fine to coarse gravel, moist							
	1.1	CLAY - Very stiff light brown slightly sandy clay, some fine to coarse grained gravel, M>Wp		D,pp	1.2		350-400 kPa		
	1.3	CLAYEY SAND - Light orange brown fine to coarse grained clayey sand with some gravel, moist, grading to conglomerate		D	1.6				
	1.8	CONGLOMERATE - Extremely low strength, extremely weathered light orange brown conglomerate, strength increasing with depth							
	2.5	Pit discontinued at 2.5m, slow progress							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20; 1, 2, 3, 4

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Excavated in stockpile 800mm above surrounding levels

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369962
NORTHING: 6331884
DIP/AZIMUTH: 90°/--

PIT No: N3
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0	FILLING - Intermixed light grey clay and grey brown silty sand filling, some gravel, M<Wp		D, PID	0.2		<1 ppm		
				D, PID	0.7		<1 ppm		
	1								1
	1.2	FILLING ? - Grey brown fine to coarse grained sand and fine to medium grained gravel, damp to moist (possible topsoil) timber log at 1.2m		D, PID	1.3		<1 ppm		
	1.9	SANDY GRAVELLY CLAY - Very stiff light brown sandy gravelly clay, M<Wp							
	2			pp	2.1				2
	2.3	CONGLOMERATE - Extremely low strength, extremely weathered light orange brown conglomerate, strength increasing with depth							
	2.9	Pit discontinued at 2.9m, slow progress / extent of reach							
	3								3
	4								4

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Excavated in stockpile 1.5m-2m above surrounding levels

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 370147
NORTHING: 6331887
DIP/AZIMUTH: 90°/--

PIT No: N4
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
		FILLING/ COLLUVIUM - Light grey brown fine to coarse grained sand and fine to coarse gravel, some cobbles, damp							
	0.35	SILTY SAND and GRAVEL - Grey brown fine to coarse grained silty sand and fine to medium gravel, some clay, damp		D	0.6				
	1								1
	1.2	SANDY GRAVELLY CLAY - Stiff to very stiff light brown sandy gravelly clay (fine gravel), M>Wp		D,pp	1.5		150-200 kPa		
		From 1.7m, mottled orange, some cementing and medium gravel							
	2			pp	2.0		150-250 kPa		2
	2.2	CLAYEY SAND and GRAVEL - Light brown and orange fine to coarse clayey sand and fine to medium gravel grading to extremley low strength conglomerate							
	2.8	Pit discontinued at 2.8m, slow progress / hard access							
	3								3
	4								4

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369946
NORTHING: 6331816
DIP/AZIMUTH: 90°/--

PIT No: N5
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.2	FILLING / TOPSOIL - Dark grey-brown slightly clayey sand filling, trace bricks, moist		D,PID	0.1		<1 ppm		
		CLAYEY SAND - Dark grey fine to coarse grained clayey sand, damp		D	0.4				
		from 0.7m, gravelly							
	0.9	SANDY CLAY - Stiff, light grey and light orange sandy clay, M>Wp		D,pp	1.0		150 kPa		
		from 1.2m, some orange staining and cementing		D,pp	1.3		150-200 kPa		
	1.4	SANDY GRAVELLY CLAY - Hard, light grey mottled red sandy gravelly clay (iron-cemented gravel), M<Wp		D,pp	2.5		>400 kPa		
	2.9	Pit discontinued at 2.9m, extent of reach							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369957
NORTHING: 6331780
DIP/AZIMUTH: 90°/--

PIT No: N6
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
		FILLING - Intermixed light grey and grey-brown clayey sand, gravel and cobbles filling, moist		D,PID	0.1		<1 ppm		
	0.3	SILTY SAND - (Former topsoil), grey-brown fine to coarse grained silty sand, moist		D,PID	0.4		<1 ppm		
		from 0.3m to 0.6m, tree roots							
	0.6	SANDY SILT - Grey sandy silt, moist		D	0.8				
1	1.0	CLAY - Very stiff, grey and light orange slightly sandy clay, M>Wp		pp	1.2		350-400 kPa		1
	1.4	SANDY CLAY - Very stiff, light grey and orange sandy clay, M>Wp		pp	1.8		350-400 kPa		
2		from 2m, some cementing, grading to clayey sand in parts							2
				pp	2.5		200-250 kPa		
3	3.0	Pit discontinued at 3.0m							3
4									4

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369921
NORTHING: 6331755
DIP/AZIMUTH: 90°/--

PIT No: N7
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.0	FILLING - Grey-brown fine to coarse grained sand and fine to coarse gravel filling, damp to moist		D,PID	0.1		<1 ppm		
	0.3	FILLING - Grey-brown fine to medium grained sand filling, moist to wet		D,PID	0.4		<1 ppm		
	0.6	FILLING - Light brown clayey sand and gravel filling, moist							
	0.7	FILLING - Black fine to coarse sand filling (coal), and fine to coarse gravel (siltstone) and cobbles, filling, damp		D,PID	0.8		<1 ppm		
1	1.0	FILLING - Light grey-brown clayey sand and fine to medium gravel filling, moist		D,PID	1.3		<1 ppm		
	1.5	SANDY CLAYEY SILT - Dark grey sandy clayey silt, moist to wet							
2				D	2.0				
	2.3	SANDY CLAY - Very stiff, light grey mottled orange sandy clay, M>Wp		D,pp	2.5		250 kPa		
3	3.0	Pit discontinued at 3.0m							
4									

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369935
NORTHING: 6331760
DIP/AZIMUTH: 90°/--

PIT No: N8
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.2	FILLING - Grey gravelly sand filling, damp		D,PID	0.1		<1 ppm		
		FILLING - Dark grey silty sand filling with some bricks, concrete slab, fibro fragments, damp		D,PID	0.5		<1 ppm		
	0.9								
1		FILLING - Light grey-brown clayey sand and gravel filling, moist		D,PID	1.0		<1 ppm		1
	1.3	SANDY SILT - Grey sandy silt, moist to wet							
2	2.0	CLAY - Very stiff, grey and light orange slightly sandy clay, M>Wp		pp	2.1		350 kPa		2
	2.3	SANDY CLAY - Very stiff to hard, light grey-orange sandy clay		pp	2.5		350-450 kPa		
3	3.0	Pit discontinued at 3.0m							3
4									4

5 10 15 20

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369953
NORTHING: 6331767
DIP/AZIMUTH: 90°/--

PIT No: N9
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
		FILLING - Intermixed light grey and grey-brown clayey sand, gravel and cobbles filling, moist		D,PID	0.1		<1 ppm		
	0.3	FILLING - Dark grey fine to medium grained silty sand, trace glass, brick, fibro fragments, damp to moist		D,PID	0.6		<1 ppm		
1	1.0	CLAY - Very stiff, grey and light orange slightly sandy clay, M>Wp		D,pp	1.3		250 kPa		
	1.8	SANDY CLAY - Very stiff, light grey and orange sandy clay, M>Wp		D,pp	2.1		300 kPa		
2		from 2.4m, some cementing and gravel, clayey sand in parts							
3	3.0	Pit discontinued at 3.0m							
4									

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369887
NORTHING: 6331691
DIP/AZIMUTH: 90°/--

PIT No: N10
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
		FILLING - Light grey-brown clayey sand and gravel filling, damp		D,PID	0.1		<1 ppm		
	0.3	FILLING - Grey-brown fine to medium grained sand filling with some tyres, roots, cobbles, damp		D,PID	0.5		<1 ppm		
		from 0.7m to 1m, some clay nodulus							
1	1.0	CLAYEY SILTY SAND - Dark grey fine to medium grained clayey silty sand, moist		D	1.1				1
	1.4	CLAYEY SAND AND GRAVEL - Light grey fine to coarse grained clayey sand and fine gravel, wet		D	1.5				
2				D	2.0				2
	2.1	CLAY - Very stiff, light grey mottled orange slightly sandy clay, M<Wp		D,pp	2.5		250-350 kPa		
	2.7	SANDY CLAY - Stiff to very stiff, light grey mottled orange slightly sandy clay, M<Wp		D,pp	2.9		150-250 kPa		
3	3.0	Pit discontinued at 3.0m							3
4									4

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 370008
NORTHING: 6331661
DIP/AZIMUTH: 90°/--

PIT No: N11
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
		CLAYEY SAND - Grey fine to medium grained clayey sand, some rootlets to 0.2m, wet		D	0.1				
	0.3	GRAVELLY CLAYEY SAND - Light grey gravelly clayey fine to coarse grained sand (fine to medium gravel), saturated		D	0.5				
	0.6	SANDY CLAY and CLAYEY GRAVELLY SAND - Soft / firm, light grey mottled yellow interbedded sandy clay and fine to coarse clayey gravelly sand, wet		D,pp	0.9		50 kPa		
1									1
	1.1	SANDY CLAY - Firm, light grey mottled yellow-orange sandy clay, M>Wp		D,pp	1.2		70 kPa		
	1.8	SANDY CLAY - Stiff, grey mottled orange sandy clay, some iron cementing, M>Wp		D,pp	1.9		150-200 kPa		
2									2
		from 2.6m, very stiff		D,pp	2.6		250 kPa		
	2.8	Pit discontinued at 2.8m							
3									3
4									4

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Seepage from 0.3m to 0.6m

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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TEST PIT LOG

CLIENT: Coal & Allied Pty Ltd
PROJECT: Lower Hunter Lands Development
LOCATION: Branter Road, Nords Wharf

SURFACE LEVEL: --
EASTING: 369974
NORTHING: 6331880
DIP/AZIMUTH: 90°/--

PIT No: N12
PROJECT No: 39662C
DATE: 06 Aug 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
		FILLING - Dark grey-brown silty sand filling with glass, metal fragments, fibro fragments, roots, metal rope		D,PID	0.1 0.2		Fibro surface <1 ppm		
	0.5	CLAYEY GRAVELLY SAND - Grey fine to coarse grained clayey gravelly sand, damp							
	0.7	Pit discontinued at 0.7m							
	1								1
	2								2
	3								3
	4								4

RIG: Case 580 Super LE backhoe 450mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Stockpile = 0.5m above surrounding level

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials:
Date:

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APPENDIX B

LABORATORY TEST RESULTS

17 August 2007 **TEST REPORT**

Douglas Partners Pty Ltd
Box 324
Hunter Region Mail Centre
NSW 2310

Your Reference: 39662C, Nords Wharf
Report Number: 54406

Attention: Patrick Heads

Dear Patrick
The following samples were received from you on the date indicated.

Samples: Qty.	10 Soils
Date of Receipt of Samples:	10/08/07
Date of Receipt of Instructions:	10/08/07
Date Preliminary Report Emailed:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report. Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

Yours faithfully
SGS ENVIRONMENTAL SERVICES

Ly Kim Ha
Senior Organic Chemist

Edward Ibrahim
Laboratory Services Manager

Alexandra Stenta
Key Account Representative

SGS Australia Pty Ltd
ABN 44 000 964 278
Environmental Services Unit 16, 33 Maddox Street, Alexandria Australia
t (02) 8594 0400 f (02) 8594 0499
www.au.sgs.com
Member of the SGS Group

TRH/BTEX in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-1 PITN2/0.3 soil 6/08/2007	54406-2 PITN3/0.2 soil 6/08/2007	54406-3 PITN5/0.1 soil 6/08/2007	54406-4 PITN6/0.1 soil 6/08/2007	54406-5 PITN7/0.8 soil 6/08/2007
TRH C_6 - C_9 P&T	mg/kg	<20	<20	<20	<20	<20
TRH C_{10} - C_{14}	mg/kg	<20	<20	<20	<20	45
TRH C_{15} - C_{28}	mg/kg	<50	<50	<50	<50	310
TRH C_{29} - C_{36}	mg/kg	<50	<50	<50	<50	99
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	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	mg/kg	<1.5	<1.5	<1.5	<1.5	<1.5
BTEX Surrogate (%)	%	87	104	98	93	96

TRH/BTEX in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-6 PITN8/0.5 soil 6/08/2007	54406-7 PITN9/0.6 soil 6/08/2007	54406-8 PITN10/0.5 soil 6/08/2007	54406-9 PITN12/0.2 soil 6/08/2007	54406-10 D2 soil 6/08/2007
TRH C_6 - C_9 P&T	mg/kg	<20	<20	<20	<20	<20
TRH C_{10} - C_{14}	mg/kg	<20	<20	<20	<20	<20
TRH C_{15} - C_{28}	mg/kg	<50	<50	<50	<50	<50
TRH C_{29} - C_{36}	mg/kg	<50	<50	<50	<50	<50
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	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	mg/kg	<1.5	<1.5	<1.5	<1.5	<1.5
BTEX Surrogate (%)	%	105	97	88	93	96

PAHs in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-1 PITN2/0.3 soil 6/08/2007	54406-2 PITN3/0.2 soil 6/08/2007	54406-3 PITN5/0.1 soil 6/08/2007	54406-4 PITN6/0.1 soil 6/08/2007	54406-5 PITN7/0.8 soil 6/08/2007
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.7
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	<0.2
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	2.8
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.3
Fluoranthene	mg/kg	<0.1	<0.1	0.1	<0.1	1.4
Pyrene	mg/kg	<0.1	<0.1	0.1	<0.1	0.8
Benzo[*a*]anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.7
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.6
Benzo[*b,k*]fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	0.4
Benzo[*a*]pyrene	mg/kg	<0.05	<0.05	0.08	<0.05	0.23
Indeno[*123-cd*]pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Dibenzo[*ah*]anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[*ghi*]perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Total PAH's	mg/kg	<1.55	<1.55	<1.58	<1.55	<8.63
Nitrobenzene-d5	%	88	89	88	90	87
2-Fluorobiphenyl	%	91	89	91	92	86
p -Terphenyl-*d14*	%	103	105	106	102	96

PAHs in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-6 PITN8/0.5 soil 6/08/2007	54406-7 PITN9/0.6 soil 6/08/2007	54406-8 PITN10/0.5 soil 6/08/2007	54406-9 PITN12/0.2 soil 6/08/2007	54406-10 D2 soil 6/08/2007
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	0.5	0.3	<0.1	<0.1	0.4
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.9	1.1	<0.1	0.2	0.8
Pyrene	mg/kg	0.9	1.0	<0.1	0.2	0.8
Benzo[*a*]anthracene	mg/kg	0.4	0.4	<0.1	0.1	0.3
Chrysene	mg/kg	0.3	0.4	<0.1	0.1	0.3
Benzo[*b,k*]fluoranthene	mg/kg	0.7	0.9	<0.2	<0.2	0.6
Benzo[*a*]pyrene	mg/kg	0.45	0.56	<0.05	0.11	0.41
Indeno[*123-cd*]pyrene	mg/kg	0.3	0.4	<0.1	<0.1	0.3
Dibenzo[*ah*]anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[*ghi*]perylene	mg/kg	0.4	0.5	<0.1	<0.1	0.3
Total PAH's	mg/kg	<5.45	<6.16	<1.55	<1.81	<4.81
Nitrobenzene-d5	%	91	92	95	97	91
2-Fluorobiphenyl	%	89	89	93	100	88
p -Terphenyl-*d14*	%	99	96	106	105	97

OC Pesticides in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-1 PITN2/0.3 soil 6/08/2007	54406-2 PITN3/0.2 soil 6/08/2007	54406-3 PITN5/0.1 soil 6/08/2007	54406-4 PITN6/0.1 soil 6/08/2007	54406-5 PITN7/0.8 soil 6/08/2007
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 (Lindane)	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
Aldrin	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
delta-BHC	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
o,p'-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
cis-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-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
o,p'-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	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
Endrin Aldehyde	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
Endrin Ketone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5,6-Tetrachloro-m-xylene *(Surrogate*	%	105	106	108	109	112

OC Pesticides in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-6 PITN8/0.5 soil 6/08/2007	54406-7 PITN9/0.6 soil 6/08/2007	54406-8 PITN10/0.5 soil 6/08/2007	54406-9 PITN12/0.2 soil 6/08/2007	54406-10 D2 soil 6/08/2007
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 (Lindane)	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
Aldrin	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
delta-BHC	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
o,p'-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
cis-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-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
o,p'-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Endosulfan Sulphate	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
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5,6-Tetrachloro-m-xylene *(Surrogate*	%	109	104	108	118	109

OP Pesticides in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-1 PITN2/0.3 soil 6/08/2007	54406-2 PITN3/0.2 soil 6/08/2007	54406-3 PITN5/0.1 soil 6/08/2007	54406-4 PITN6/0.1 soil 6/08/2007	54406-5 PITN7/0.8 soil 6/08/2007
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
Bromofos 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
OP_Surrogate 1	%	105	106	108	109	112

OP Pesticides in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-6 PITN8/0.5 soil 6/08/2007	54406-7 PITN9/0.6 soil 6/08/2007	54406-8 PITN10/0.5 soil 6/08/2007	54406-9 PITN12/0.2 soil 6/08/2007	54406-10 D2 soil 6/08/2007
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
Bromofos 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
OP_Surrogate 1	%	109	104	108	118	109

PCBs in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-1 PITN2/0.3 soil 6/08/2007	54406-2 PITN3/0.2 soil 6/08/2007	54406-3 PITN5/0.1 soil 6/08/2007	54406-4 PITN6/0.1 soil 6/08/2007	54406-5 PITN7/0.8 soil 6/08/2007
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
Arochlor 1262	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1268	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total Positive PCB	mg/kg	<0.90	<0.90	<0.90	<0.90	<0.90
PCB_Surrogate 1	%	105	106	108	109	112

PCBs in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-6 PITN8/0.5 soil 6/08/2007	54406-7 PITN9/0.6 soil 6/08/2007	54406-8 PITN10/0.5 soil 6/08/2007	54406-9 PITN12/0.2 soil 6/08/2007	54406-10 D2 soil 6/08/2007
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
Arochlor 1262	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1268	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total Positive PCB	mg/kg	<0.90	<0.90	<0.90	<0.90	<0.90
PCB_Surrogate 1	%	109	104	108	118	109

Acid Extractable Metals in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-1 PITN2/0.3 soil 6/08/2007	54406-2 PITN3/0.2 soil 6/08/2007	54406-3 PITN5/0.1 soil 6/08/2007	54406-4 PITN6/0.1 soil 6/08/2007	54406-5 PITN7/0.8 soil 6/08/2007
Arsenic	mg/kg	4	<3	<3	<3	<3
Cadmium	mg/kg	0.1	0.3	0.1	0.4	0.3
Chromium	mg/kg	10	5.2	3.4	8.4	4.5
Copper	mg/kg	5.1	10	7.6	3.2	16
Lead	mg/kg	4	12	26	9.1	16
Mercury	mg/kg	<0.05	<0.05	0.06	<0.05	0.06
Nickel	mg/kg	6.7	3.0	1.2	2.1	3.8
Zinc	mg/kg	15	38	46	24	35

Acid Extractable Metals in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-6 PITN8/0.5 soil 6/08/2007	54406-7 PITN9/0.6 soil 6/08/2007	54406-8 PITN10/0.5 soil 6/08/2007	54406-9 PITN12/0.2 soil 6/08/2007	54406-10 D2 soil 6/08/2007
Arsenic	mg/kg	<3	<3	<3	6	<3
Cadmium	mg/kg	0.5	0.4	0.2	2.4	0.5
Chromium	mg/kg	5.0	4.2	13	30	7.1
Copper	mg/kg	37	18	11	72	38
Lead	mg/kg	62	360	11	260	68
Mercury	mg/kg	<0.05	<0.05	<0.05	0.24	<0.05
Nickel	mg/kg	4.0	3.0	8.6	15	4.3
Zinc	mg/kg	130	93	75	2,600	140

Moisture Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-1 PITN2/0.3 soil 6/08/2007	54406-2 PITN3/0.2 soil 6/08/2007	54406-3 PITN5/0.1 soil 6/08/2007	54406-4 PITN6/0.1 soil 6/08/2007	54406-5 PITN7/0.8 soil 6/08/2007
Moisture	%	11	15	17	11	19

Moisture Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54406-6 PITN8/0.5 soil 6/08/2007	54406-7 PITN9/0.6 soil 6/08/2007	54406-8 PITN10/0.5 soil 6/08/2007	54406-9 PITN12/0.2 soil 6/08/2007	54406-10 D2 soil 6/08/2007
Moisture	%	10	7	13	23	10

Method ID	Methodology Summary
SEO-017	BTEX/TRH C6-C9 - Determination by Purge and Trap Gas Chromatography with Flame Ionisation Detection (FID) and Photo Ionisation Detection (PID). The surrogate spike used is aaa-trifluorotoluene.
SEO-020	TRH - Determination of Total Recoverable Hydrocarbons by gas chromatography following extraction with DCM/Acetone for solids and DCM for liquids.
SEO-018	BTEX - Determination by purge and trap/ Gas Chromatography with MS Detection.
SEO-030	PAHs by GC/MS - Determination of Polynuclear Aromatic Hydrocarbons (PAH's) by Gas Chromatography / Mass Spectrometry following extraction with dichloromethane or dichloromethane/acetone. The surrogate spike used is p-Terphenyl-d14.
SEO-005	OC/OP/PCB - Determination of a suite of Organchlorine Pesticides, Chlorinated Organo-phosphorus Pesticides and Polychlorinated Biphenyls (PCB's) by sonication extraction using dichloromethane for waters or acetone / hexane for soils followed by Gas Chromatographic separation with Electron Capture Detection (GC/ECD). The surrogate spike used is 2,4,5,6-Tetrachloro-m-xylene.
SEM-010	Metals - Determination of various metals by ICP-AES following aqua regia digest.
SEM-005	Mercury - Determination of Mercury by Cold Vapour Generation Atomic Absorption Spectroscopy.
AN002	Preparation of soils, sediments and sludges undergo analysis by either air drying, compositing, subsampling and 1:5 soil water extraction where required. Moisture content is determined by drying the sample at 105 ± 5°C.

QUALITY CONTROL TRH/BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
TRH C_6 - C_9 P&T	mg/kg	20	SEO-017	<20	54406-1	<20 || <20	54406-2	96 || [N/T]
TRH C_{10} - C_{14}	mg/kg	20	SEO-020	<20	54406-1	<20 || <20	54406-2	99 || [N/T]
TRH C_{15} - C_{28}	mg/kg	50	SEO-020	<50	54406-1	<50 || <50	54406-2	104 || [N/T]
TRH C_{29} - C_{36}	mg/kg	50	SEO-020	<50	54406-1	<50 || <50	54406-2	99 || [N/T]
Benzene	mg/kg	0.5	SEO-018	<0.5	54406-1	<0.5 || <0.5	54406-2	78 || [N/T]
Toluene	mg/kg	0.5	SEO-018	<0.5	54406-1	<0.5 || <0.5	54406-2	78 || [N/T]
Ethylbenzene	mg/kg	0.5	SEO-018	<0.5	54406-1	<0.5 || <0.5	54406-2	80 || [N/T]
Total Xylenes	mg/kg	1.5	SEO-018	<1.5	54406-1	<1.5 || <1.5	54406-2	85 || [N/T]
BTEX Surrogate (%)	%	0	SEO-018	88	54406-1	87 || 92 || RPD: 6	54406-2	94 || [N/T]
QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Naphthalene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	54406-3	104 || [N/T]
Acenaphthylene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	54406-3	81 || [N/T]
Acenaphthene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	54406-3	120 || [N/T]
Fluorene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	[NR]	[NR]
Phenanthrene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	54406-3	117 || [N/T]
Anthracene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	54406-3	118 || [N/T]
Fluoranthene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	54406-3	117 || [N/T]
Pyrene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	54406-3	114 || [N/T]
Benzo[*a*]anthracene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	[NR]	[NR]
Benzo[*b,k*]fluoranthene	mg/kg	0.2	SEO-030	<0.2	54406-1	<0.2 || <0.2	[NR]	[NR]
Benzo[a]pyrene	mg/kg	0.05	SEO-030	<0.05	54406-1	<0.05 || <0.05	54406-3	126 || [N/T]
Indeno[*123-cd*]pyrene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo[*ah*]anthracene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	[NR]	[NR]
Benzo[*ghi*]perylene	mg/kg	0.1	SEO-030	<0.1	54406-1	<0.1 || <0.1	[NR]	[NR]
Total PAH's	mg/kg	1.55	SEO-030	1.55	54406-1	<1.55 || <1.55	[NR]	[NR]
Nitrobenzene-d5	%	0	SEO-030	92	54406-1	88 || 87 || RPD: 1	54406-3	90 || [N/T]
2-Fluorobiphenyl	%	0	SEO-030	95	54406-1	91 || 89 || RPD: 2	54406-3	93 || [N/T]
p -Terphenyl-*d* 14	%	0	SEO-030	110	54406-1	103 || 104 || RPD: 1	54406-3	105 || [N/T]

QUALITY CONTROL OC Pesticides in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
HCB	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
gamma-BHC (Lindane)	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Heptachlor	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	54406-1	93 || [N/T]
Aldrin	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	54406-1	89 || [N/T]
beta-BHC	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
delta-BHC	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	54406-1	89 || [N/T]
Heptachlor Epoxide	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
o,p'-DDE	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
alpha-Endosulfan	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
trans-Chlordane	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
cis-Chlordane	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
trans-Nonachlor	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
p,p'-DDE	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Dieldrin	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	54406-1	91 || [N/T]
Endrin	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	54406-1	95 || [N/T]
o,p'-DDD	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
o,p'-DDT	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
beta-Endosulfan	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
p,p'-DDD	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
p,p'-DDT	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	54406-1	94 || [N/T]
Endosulfan Sulphate	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Methoxychlor	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Endrin Ketone	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
2,4,5,6-Tetrachloro-m-xylene *(Surrogate*	%	0	SEO-005	103	54406-4	109 || 106 || RPD: 3	54406-1	104 || [N/T]

QUALITY CONTROL OP Pesticides in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Chlorpyrifos	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	54406-1	101 || [N/T]
Fenitrothion	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Bromofos Ethyl	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
OP_Surrogate 1	%	0	SEO-005	103	54406-4	109 || 106 || RPD: 3	54406-1	104 || [N/T]
QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Arochlor 1016	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1260	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	54406-2	119 || [N/T]
Arochlor 1262	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Arochlor 1268	mg/kg	0.1	SEO-005	<0.1	54406-4	<0.1 || <0.1	[NR]	[NR]
Total Positive PCB	mg/kg	0.9	SEO-005	0.90	54406-4	<0.90 || <0.90	[NR]	[NR]
PCB_Surrogate 1	%	0	SEO-005	103	54406-4	109 || 106 || RPD: 3	54406-2	114 || [N/T]
QUALITY CONTROL Acid Extractable Metals in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Arsenic	mg/kg	3	SEM-010	<3	54406-1	4 || 5 || RPD: 22	54406-2	77 || [N/T]
Cadmium	mg/kg	0.1	SEM-010	<0.1	54406-1	0.1 || 0.2 || RPD: 67	54406-2	79 || [N/T]
Chromium	mg/kg	0.3	SEM-010	<0.3	54406-1	10 || 6.5 || RPD: 42	54406-2	78 || [N/T]
Copper	mg/kg	0.5	SEM-010	<0.5	54406-1	5.1 || 6.9 || RPD: 30	54406-2	79 || [N/T]
Lead	mg/kg	1	SEM-010	<1	54406-1	4 || 5 || RPD: 22	54406-2	76 || [N/T]
Mercury	mg/kg	0.05	SEM-005	<0.05	54406-1	<0.05 || <0.05	54406-2	101 || [N/T]
Nickel	mg/kg	0.5	SEM-010	<0.5	54406-1	6.7 || 5.6 || RPD: 18	54406-2	77 || [N/T]
Zinc	mg/kg	0.3	SEM-010	<0.3	54406-1	15 || 18 || RPD: 18	54406-2	82 || [N/T]

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Moisture	%	1	AN002	<1

Result Codes

[INS]	:	Insufficient Sample for this test	[HBG]	:	Results not Reported due to High Background Interference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Result Comments

PAHs level of reporting has been raised due to the sample matrix interference.
Date Organics extraction commenced: 10/08/07
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Dioxins/Furans* and PAH in XAD and PUF).

Quality Control Protocol

Reagent Blank: Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.
Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 10 samples.
Matrix Spike Duplicates: Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.
Surrogate Spike: Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.
Control Standards: Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.
Additional QC Samples: A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

20 August 2007

TEST REPORT

Douglas Partners Pty Ltd
Box 324
Hunter Region Mail Centre
NSW 2310

Your Reference: 39662C, Nords Wharf
Report Number: 54459

Attention: Patrick Heads

Dear Patrick
The following samples were received from you on the date indicated.

Samples:	Qty.	3 Soils, 3 Fibrous Materials
Date of Receipt of Samples:		14/08/07
Date of Receipt of Instructions:		14/08/07
Date Preliminary Report Faxed:		Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report. Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

Yours faithfully
SGS ENVIRONMENTAL SERVICES

Ly Kim Ha
Senior Organic Chemist

Edward Ibrahim
Laboratory Services Manager

Alexandra Stenta
Key Account Representative

SGS Ref ---	Sample ID ---	Depth	Date Sampled	Sample Description	Asbestos ID in soil
54459-1	Pit N8/0.5		6/08/2007	44g soil, sand, rocks	No asbestos detected
54459-2	Pit N9/0.6		6/08/2007	46g soil, sand, rocks	No asbestos detected
54459-3	Pit N12/0.2		6/08/2007	40g soil, sand, rocks	Chrysotile asbestos detected

SGS Ref ---	Sample ID ---	Depth	Date Sampled	Sample Description	Asbestos ID in materials
54459-4	Pit N8/fibro		6/08/2007	fibreboard fragment 70x40x5mm	Chrysotile asbestos detected Amosite asbestos detected
54459-5	Pit N9/fibro		6/08/2007	fibreboard fragment 90x30x5mm	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected
54459-6	Pit N12/fibro surface		6/08/2007	fibreboard fragment 110x70x5mm	Chrysotile asbestos detected Amosite asbestos detected

Method ID	Methodology Summary
AN602	Qualitative identification of asbestos type fibres in bulk using Polarised Light Microscopy and Dispersion Staining Techniques. Accreditation does not cover the identification of Synthetic Mineral Fibre.

Result Codes

[INS]	:	Insufficient Sample for this test	[HBG]	:	Results not Reported due to High Background Interference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Result Comments

Sampled by the client

Even after disintegration it can be very difficult, or impossible, to detect the presence of asbestos in some asbestos-containing bulk materials using polarised light microscopy.
This is due to the low grade or small length or diameter of asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials.

Sample number #3: 2mm length fibre bundle, hand picked and found loose in sample.

Asbestos analysed by Wonnie Condos.

NATA Accreditation No. 2562, Site No. 4354

Quality Control Protocol

Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch.
A duplicate is prepared at least every 10 samples.

29 August 2007 **TEST REPORT**

Douglas Partners Pty Ltd
Box 324
Hunter Region Mail Centre
NSW 2310

Your Reference: 39662C, Nords Wharf
Report Number: 54679

Attention: Patrick Heads

Dear Patrick
The following samples were received from you on the date indicated.

Samples: Qty.	5 Soils
Date of Receipt of Samples:	23/08/07
Date of Receipt of Instructions:	23/08/07
Date Preliminary Report Emailed:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report. Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

Yours faithfully
SGS ENVIRONMENTAL SERVICES

Ly Kim Ha
Senior Organic Chemist

Edward Ibrahim
Laboratory Services Manager

Alexandra Stenta
Key Account Representative

SGS Australia Pty Ltd | Environmental Services Unit 16, 33 Maddox Street, Alexandria Australia

Inorganics Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54679-1 PITN4/0.6 soil 6/08/2007	54679-2 PITN5/1.3 soil 6/08/2007	54679-3 PITN6/0.8 soil 6/08/2007	54679-4 PITN9/1.3 soil 6/08/2007	54679-5 PITN11/0.9 soil 6/08/2007
Sulphate, SO4 1:5 soil:water	mg/kg	<20	73	<20	54	20
Chloride, Cl 1:5 soil:water	mg/kg	12	33	7.8	20	12
pH 1:5 soil:water	pH Units	6.3	4.1	5.7	5.4	5.7

Moisture Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	54679-1 PITN4/0.6 soil 6/08/2007	54679-2 PITN5/1.3 soil 6/08/2007	54679-3 PITN6/0.8 soil 6/08/2007	54679-4 PITN9/1.3 soil 6/08/2007	54679-5 PITN11/0.9 soil 6/08/2007
Moisture	%	9	14	13	15	10

Method ID	Methodology Summary
SEI-038	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 20th ED, 4110-B.
AN101	pH - Measured using pH meter and electrode in accordance with APHA 20th ED, 4500-H+.
AN002	Preparation of soils, sediments and sludges undergo analysis by either air drying, compositing, subsampling and 1:5 soil water extraction where required. Moisture content is determined by drying the sample at 105 ± 5°C.

QUALITY CONTROL Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Sulphate, SO4 1:5 soil:water	mg/kg	2	SEI-038	<2	54679-1	<20 || [N/T]	LCS	98 || [N/T]
Chloride, Cl 1:5 soil:water	mg/kg	0.5	SEI-038	<0.5	54679-1	12 || [N/T]	LCS	99 || [N/T]
pH 1:5 soil:water	pH Units		AN101	[NT]	54679-1	6.3 || 6.2 || RPD: 2	[NR]	[NR]

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Moisture	%	1	AN002	<1

Result Codes

[INS]	:	Insufficient Sample for this test	[HBG]	:	Results not Reported due to High Background Interference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Result Comments

Sulphate level of reporting has been raised due to the sample matrix interference.

Date Organics extraction commenced: N/A

NATA Corporate Accreditation No. 2562, Site No 4354

Note: Test results are not corrected for recovery (excluding Dioxins/Furans* and PAH in XAD and PUF).

Quality Control Protocol

Reagent Blank: Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.

Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 10 samples.

Matrix Spike Duplicates: Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.

Surrogate Spike: Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.

Internal Standard: Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.

Control Standards: Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.

Additional QC Samples: A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

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CERTIFICATE OF ANALYSIS

Client	: **DOUGLAS PARTNERS PTY LTD**	*Laboratory*	: **Environmental Division Brisbane**	*Page*	: **1 of 4**
Contact	: **MR PATRICK HEADS**	*Contact*	: **Tim Kilmister**	*Work Order*	: **EB0709670**
Address	: **PO BOX 324 HUNTER REGION MAIL CENTRE AUSTRALIA 2310**	*Address*	: **32 Shand Street Stafford QLD Australia 4053**		
E-mail	: **headsp@douglaspartners.com.au**	*E-mail*	: **Services.Brisbane@alsenviro.com**		
Telephone	: **49609600**	*Telephone*	: **+61-7-3243 7222**		
Facsimile	: **49609601**	*Facsimile*	: **+61-7-3243 7218**		
Project	: **39662C NORDS WHARF**	*Quote number*	: **EN/020/07**	*Date received*	: **28 Aug 2007**
Order number	: **67367**			*Date issued*	: **4 Sep 2007**
C-O-C number	: **- Not provided -**			*No. of samples*	- *Received* : **3**
Site	: **- Not provided -**				*Analysed* : **3**

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NATA Accredited Laboratory 825

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	*Position*	*Department*
Cass Sealby	**Senior Chemist - Acid Sulphate Soils**	**Inorganics - NATA 825 (818 - Brisbane)**

ALS Environmental

Comments

This report for the ALSE reference EB0709670 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical Results for Samples Submitted**
- **Surrogate Recovery Data**

The analytical procedures used by ALS Environmental have been developed from established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

Specific comments for Work Order **EB0709670**

Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from ‘kg/t dry weight’ to ‘kg/m3 in-situ soil’, multiply ‘reported results’ x ‘wet bulk density of soil in t/m3’.
ANC not required because pH KCl less than 6.5
Retained Acidity not required because pH KCl greater than or equal to 4.5

ALS Environmental

Analytical Results

	Client Sample ID :	PIT 10/1.1	PIT 11/0.5	PIT 11/2.6		
	Sample Matrix Type / Description :	SOIL	SOIL	SOIL		
	Sample Date / Time :	6 Aug 2007 15:00	6 Aug 2007 15:00	6 Aug 2007 15:00		
	Laboratory Sample ID :	EB0709670-001	EB0709670-002	EB0709670-003		
Analyte	*CAS number* / *LOR* / *Units*					
EA033-A: Actual Acidity						
pH KCl (23A)	0.1 pH Unit	4.8	5.4	4.6		
Titratable Actual Acidity (23F)	2 mole H+ / t	35	8	60		
sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	0.06	<0.02	0.10		
EA033-B: Potential Acidity						
Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	<0.02		
acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	<10		
EA033-E: Acid Base Accounting						
ANC Fineness Factor	0.5	1.5	1.5	1.5		
Net Acidity (sulfur units)	0.02 % S	0.06	<0.02	0.10		
Net Acidity (acidity units)	10 mole H+ / t	35	<10	60		
Liming Rate	1 kg CaCO3/t	3	<1	4		

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Surrogate Control Limits

- **No surrogates present on this report.**

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QUALITY CONTROL REPORT

Client	:	**DOUGLAS PARTNERS PTY LTD**	**Laboratory**	: Environmental Division Brisbane	**Page**	:	**1 of 4**
Contact	:	MR PATRICK HEADS	**Contact**	: Tim Kilmister			
Address	:	PO BOX 324 HUNTER REGION MAIL CENTRE AUSTRALIA 2310	**Address**	: 32 Shand Street Stafford QLD Australia 4053	**Work order**	:	**EB0709670**
					Amendment No.	:	
Project	:	39662C NORDS WHARF	**Quote number**	: EN/020/07	**Date received**	:	**28 Aug 2007**
Order number	:	67367			**Date issued**	:	**4 Sep 2007**
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	headsp@douglaspartners.com.au	**E-mail**	: Services.Brisbane@alsenviro.com	**No. of samples**		
Telephone	:	49609600	**Telephone**	: +61-7-3243 7222	**Received**	:	3
Facsimile	:	49609601	**Facsimile**	: +61-7-3243 7218	**Analysed**	:	3

This final report for the ALSE work order reference EB0709670 supersedes any previous reports with this reference.

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- Laboratory Duplicates (DUP); Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Samples (LCS); Recovery and Acceptance Limits
- Matrix Spikes (MS); Recovery and Acceptance Limits

Work order specific comments

Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
ANC not required because pH KCl less than 6.5
Retained Acidity not required because pH KCl greater than or equal to 4.5

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NATA

WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory - 825

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IED 17025

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Cass Sealby	Inorganics - NATA 825 (818 - Brisbane)

Quality Control Report - Laboratory Duplicates (DUP)

The quality control term **Laboratory Duplicate** refers to an intralaboratory split sample randomly selected from the sample batch. Laboratory duplicates provide information on method precision and sample heterogeneity.
- Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations:* ***LOR*** = *Limit of Reporting,* ***RPD*** = *Relative Percent Difference.*
* Indicates failed QC. The permitted ranges for the RPD of Laboratory Duplicates (relative percent deviation) are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting:- Result < 10 times LOR, no limit - Result between 10 and 20 times LOR, 0% - 50% - Result > 20 times LOR, 0% - 20%

Matrix Type: SOIL ***Laboratory Duplicates (DUP) Report***

Laboratory Sample ID	*Client Sample ID*	*Analyte name*	*LOR*	*Original Result*	*Duplicate Result*	*RPD*
EA033-A: Actual Acidity						
EA033-A: Actual Acidity - (QC Lot: 483162)				**pH Unit**	**pH Unit**	**%**
EB0709667-001	Anonymous	pH KCl (23A)	0.1 pH Unit	5.5	5.5	0.0
		Titratable Actual Acidity (23F)	2 mole H+ / t	11	8	25.7
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	<0.02	0.0
EB0709669-006	Anonymous	pH KCl (23A)	0.1 pH Unit	5.2	5.1	1.9
		Titratable Actual Acidity (23F)	2 mole H+ / t	16	13	16.1
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	0.02	0.02	0.0
EA033-B: Potential Acidity						
EA033-B: Potential Acidity - (QC Lot: 483162)				**% S**	**% S**	**%**
EB0709667-001	Anonymous	Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	0.0
EB0709669-006	Anonymous	Chromium Reducible Sulfur (22B)	0.02 % S	0.06	0.07	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	41	43	5.9

ALS Environmental

Quality Control Report - Method Blank (MB) and Laboratory Control Samples (LCS)

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC type is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a known, interference free matrix spiked with target analytes or certified reference material. The purpose of this QC type is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of actual laboratory data. Flagged outliers on control limits for inorganics tests may be within the NEPM specified data quality objective of recoveries in the range of 70 to 130%. Where this occurs, no corrective action is taken. Abbreviations: LOR = Limit of reporting.

Matrix Type: SOIL

Method Blank (MB) and Laboratory Control Samples (LCS) Report

		Method blank result	*Actual Results*		*Recovery Limits*	
			Spike concentration	*Spike Recovery*	*Dynamic Recovery Limits*	
Analyte name	*LOR*			*LCS*	*Low*	*High*
EA033-A: Actual Acidity						
EA033-A: Actual Acidity - (QC Lot: 483162)		% pyrite S	% pyrite S	%	%	%
sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	----	----	----	----
Titratable Actual Acidity (23F)	2 mole H+ / t	<2	----	----	----	----
EA033-B: Potential Acidity						
EA033-B: Potential Acidity - (QC Lot: 483162)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	----	----	----	----
Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	----	----	----	----
EA033-D: Retained Acidity						
EA033-D: Retained Acidity - (QC Lot: 483162)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Net Acid Soluble Sulfur (a-20J)	10 mole H+ / t	<10	----	----	----	----
HCl Extractable Sulfur (20Be)	0.02 % S	<0.02	----	----	----	----
KCl Extractable Sulfur (23Ce)	0.02 % S	<0.02	----	----	----	----
Net Acid Soluble Sulfur (20Je)	0.02 % S	<0.02	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	0.02 % pyrite S	<0.02	----	----	----	----

ALS Environmental

Quality Control Report - Matrix Spikes (MS)

The quality control term **Matrix Spike (MS)** refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC type is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQO's). 'Ideal' recovery ranges stated may be waived in the event of sample matrix interferences. - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations:* ***LOR*** *= Limit of Reporting,* ***RPD*** *= Relative Percent Difference.*

* Indicates failed QC

Matrix Spike (MS) Report

					Actual Results		*Recovery Limits*	
					Sample Result	*Spike Recovery*	*Static Limits*	
Analyte name	*Laboratory Sample ID*	*Client Sample ID*	*LOR*	*Spike Concentration*		*MS*	*Low*	*High*
- (QC Lot:)						%	%	%
					----			

l **No Matrix Spike (MS) carried out on this Work Order.**

ALS Environmental

INTERPRETIVE QUALITY CONTROL REPORT

Client	:	**DOUGLAS PARTNERS PTY LTD**	**Laboratory**	:	Environmental Division Brisbane	**Page**	: **1 of 5**
Contact	:	MR PATRICK HEADS	**Contact**	:	Tim Kilmister		
Address	:	PO BOX 324 HUNTER REGION MAIL CENTRE AUSTRALIA 2310	**Address**	:	32 Shand Street Stafford QLD Australia 4053	**Work order**	: **EB0709670**
						Amendment No.	:
Project	:	39662C NORDS WHARF	**Quote number**	:	EN/020/07	**Date received**	: 28 Aug 2007
Order number	:	67367				**Date issued**	: 4 Sep 2007
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	headsp@douglaspartners.com.au	**E-mail**	:	Services.Brisbane@alsenviro.com	**No. of samples**	
Telephone	:	49609600	**Telephone**	:	+61-7-3243 7222	**Received**	: 3
Facsimile	:	49609601	**Facsimile**	:	+61-7-3243 7218	**Analysed**	: 3

This Interpretive Quality Control Report was issued on 4 Sep 2007 for the ALS work order reference EB0709670 and supersedes any previous reports with this reference.
This report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Type Frequency Compliance
- Summary of all Quality Control Outliers
- Brief Method Summaries

ALS Environmental

Interpretive Quality Control Report - Analysis Holding Time

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the sample aliquot was taken. Elapsed time to analysis represents time from sampling where no extraction / digestion is involved or time from extraction / digestion where this is present. For composite samples, sampling date/time is taken as that of the oldest sample contributing to that composite. Sample date/time for laboratory produced leaches are taken from the completion date/time of the leaching process. Outliers for holding time are based on USEPA SW846, APHA, AS and NEPM (1999). Failed outliers, refer to the 'Summary of Outliers'.

Matrix Type: SOIL ***Analysis Holding Time and Preservation***

Method / **Container /** Client Sample ID(s)	**Date Sampled**	**Extraction / Preparation**			**Analysis**		
		Date extracted	Due for extraction	Pass?	Date analysed	Due for analysis	Pass?
EA033: Chromium Suite for Acid Sulphate Soils							
Snap Lock Bag - frozen PIT 10/1.1, PIT 11/0.5, PIT 11/2.6	**6 Aug 2007**	**28 Aug 2007**	5 Aug 2008	Pass	**3 Sep 2007**	2 Dec 2007	Pass

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Interpretive Quality Control Report - Frequency of Quality Control Samples

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which this work order was processed. Actual rate should be greater than or equal to the expected rate.

Matrix Type: SOIL

Frequency of Quality Control Samples

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	**Actual**	**Expected**	
Laboratory Duplicates (DUP)					
EA033: Chromium Suite for Acid Sulphate Soils	2	19	**10.5**	**10.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
Method Blanks (MB)					
EA033: Chromium Suite for Acid Sulphate Soils	1	19	**5.3**	**5.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement

Interpretive Quality Control Report - Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged on the 'Quality Control Report'. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). Flagged outliers on control limits for inorganics tests may be within the NEPM specified data quality objective of recoveries in the range of 70 to 130%. Where this occurs, no corrective action is taken. - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot.

Non-surrogates

- **For all matrices, no RPD recovery outliers occur for the duplicate analysis.**
- **For all matrices, no method blank result outliers occur.**
- **For all matrices, no laboratory spike recoveries breaches occur.**
- **For all matrices, no matrix spike recoveries breaches occur.**

Surrogates

- **For all matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time

The following report highlights outliers within this 'Interpretive Quality Control Report - Analysis Holding Time'.

- **No holding time outliers occur.**

Outliers : Frequency of Quality Control Samples

The following report highlights outliers within this 'Interpretive Quality Control Report - Frequency of Quality Control Samples'.

- **No frequency outliers occur.**

Method Reference Summary

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Matrix Type: SOIL ***Method Reference Summary***

Preparation Methods

EN020PR : Drying at 85 degrees, bagging and labelling (ASS) - In house

Analytical Methods

EA033 : Chromium Suite for Acid Sulphate Soils - Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

APPENDIX C

QA/QC

**QUALITY ASSURANCE/QUALITY CONTROL
FOR CONTAMINATION ASSESSMENT
BRANTER STREET, NORDS WHARF, NSW**

Quality Assurance (QA) was maintained by:

- compliance with a Project Quality Plan written for the objectives of the study;
- using qualified engineers to undertake the field supervision and sampling;
- following the Douglas Partners Pty Ltd (DP) operating procedures for sampling, field testing and decontamination as presented in Table 1;
- using NATA registered laboratories for sample testing that generally utilise standard laboratory methods of the US EPA, the APHA and NSW EPA.

Table 1 - Field Procedures

Abbreviation	Procedure Name
FPM LOG	Logging
FPM DECONT	Decontamination of Personnel and Equipment
FPM ENVID	Sample Identification, Handling, Transport and Storage of Contaminated Samples
FPM PIDETC	Operation of Field Analysers
FPM ENVSAMP	Sampling of Contaminated Soils

(from DP Field Procedures Manual)

Quality Control (QC) of the laboratory programme was achieved by the following means:

- check replicate - a specific sample was split in the field, placed in separate containers and labelled with different sample numbers, and sent to the laboratory for analysis;
- method blanks - the laboratory ran reagent blanks to confirm the equipment and standards used were uncontaminated;
- laboratory duplicates - the laboratory split samples internally and conducted tests on separate extracts;
- laboratory spikes - samples were spiked by the laboratory with a known concentration of contaminants and subsequently tested for percent recovery;

DISCUSSION

A. Check Replicate

The Relative Percent Difference (RPD) between replicate results is used as a measure of laboratory reproducibility and is given by the following:

$$\text{RPD} = \frac{\text{ABS}(\text{Replicate result 1} - \text{Replicate result 2})}{(\text{Replicate result 1} + \text{Replicate result 2})/2} \text{ x } 100$$

The RPD can have a value between 0% and 200%. An RPD data quality objective of up to 50% is generally considered to be acceptable for organic analysis, and 35% for inorganics (i.e. Metals).

A summary of the results of the soil replicate QA/QC testing is provided in Table 2.

Table 2 - Results of Quality Control Analysis

Analyte		Pit N8/0.5	D2	RPD (%)
Metals	As	<3	<3	N/A
	Cd	0.5	0.5	0
	Cr	5	7.1	35
	Cu	37	38	3
	Pb	62	68	9
	Hg	<PQL	<PQL	N/A
	Ni	4	4.3	7
	Zn	130	140	7
TRH	C_6 - C_9	<PQL	<PQL	N/A
	C_{10} - C_{14}	<PQL	<PQL	N/A
	C_{15} - C_{28}	<PQL	<PQL	N/A
	C_{29} - C_{36}	<PQL	<PQL	N/A
BTEX	Benzene	<PQL	<PQL	N/A
	Toluene	<PQL	<PQL	N/A
	Ethyl Benzene	<PQL	<PQL	N/A
	Xylene	<PQL	<PQL	N/A
PAH	Total PAHs	4.85	4.21	14
	Benzo(a)pyrene	0.45	0.41	9
OCPs	Total OCPs	<PQL	<PQL	N/A
	Aldrin + Dieldrin	<PQL	<PQL	N/A
	Chlordane	<PQL	<PQL	N/A
	DDT	<PQL	<PQL	N/A
	Heptachlor	<PQL	<PQL	N/A
OPPs		<PQL	<PQL	N/A
PCBs		<PQL	<PQL	N/A

Results expressed in mg/kg on dry weight basis
PQL - Practical Quantitation Limit
N/A - Not Applicable

RPDs ranged from 0% to 35%, with results within the acceptable limits.

B. Method Blanks

All method blanks returned results lower than the laboratory detection limit, therefore are acceptable.

C. Laboratory Duplicates

The average RPD for individual contaminants ranged from 1 to 67%. The slightly elevated upper result (for cadmium) can be attributed to relatively low contaminant concentrations in soil (i.e. small differences in concentrations) resulting in high RPDs. The results of replicate analysis are therefore generally considered acceptable.

D. Laboratory Spikes

Recoveries in the order of 70% to 130% are generally considered to be acceptable. The average percent recovery for individual organic contaminants ranged from 76% to 126% which is within the quality control objectives. The results should however be qualified and may slightly under-estimate or over-estimate contaminant concentrations in certain samples (i.e. biased low or high respectively).

CONCLUSIONS

The accuracy and precision of the soil testing procedures, as inferred by the QA/QC data is generally considered to be of sufficient standard to allow the data reported to be used to interpret site contamination conditions.

S160.16/

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: NORDS WHARF
Project No: 39662.2C DP Order No:
DP Contact Person: PATRICK HEADS
Prior Storage: esky / fridge / shelved (circle)

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Angela

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: TRH	BTEX	PAH	PCB	OCP	OPP	Metals #	Asbestos							TCLP	Notes
PitN2/0.3	6/8/07	S	1	✓	✓	✓	✓	✓	✓	✓									
PitN3/0.2			2	✓	✓	✓	✓	✓	✓	✓									
PitN5/0.1			3	✓	✓	✓	✓	✓	✓	✓									
PitN6/0.1			4	✓	✓	✓	✓	✓	✓	✓									
PitN7/0.8			5	✓	✓	✓	✓	✓	✓	✓									
PitN8/0.5			6	✓	✓	✓	✓	✓	✓	✓	✓								
PitN9/0.6			7	✓	✓	✓	✓	✓	✓	✓	✓								
PitN10/0.5			8	✓	✓	✓	✓	✓	✓	✓									
PitN12/0.2			9	✓	✓	✓	✓	✓	✓	✓									
D2		↓	10	✓	✓	✓	✓	✓	✓	✓									
PitN8fibro		fibro	11								✓								
PitN9fibro	↓	fibro	12								✓								
PQL (S)		mg/kg																	
PQL (W)		mg/L																	

SGS
Received 10/8/07
By
Time 1230 am/pm
Samples intact yes/no
Ice/Cooler Pack yes/no
Comments 54406

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 9/8/07
Total number of samples in container: 13
Results required by: 17/8/07
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature:
Date: 10/8/07 Lab Ref: 54406

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

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: NORDS WHARF
Project No: 39662C DP Order No: 6732
DP Contact Person: PATRICK HOADS
Prior Storage: esky / fridge / shelved (circle)

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Angela

	Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: Asbestos												TCLP	Notes
1	PitN8/0-5	6/8/07	S		✓													
2	PitN9/0-6				✓													
3	PitN12/0-2				✓													
4	PitN8/Fibro		Fibro		✓													
5	PitN9/Fibro				✓													
6	PitN12/Fibro surface				✓													
PQL (S)			mg/kg															
PQL (W)			mg/L															

SGS
Signature ... 14/08/07
By ... Sam
Time ... 9 am ... am/pm
Ice ... yes/no
Ice/Coolerpack ...
54459.

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 13/8/07
Total number of samples in container: 6
Results required by:
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature: Sam
Date: 14/8/07 Lab Ref: SA459

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

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: NORDS WHARF
Project No: 39662C DP Order No:
DP Contact Person: PATRICK HEADS
Prior Storage: esky / fridge / shelved (circle)

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Angela

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes															Notes
				TRH	BTEX	PAH	PCB	ocp	opp	metals #	Asbestos							TCLP	
PITNIZ fibro surface	6/8/07	fibro	13								✓								
PQL (S)		mg/kg																	
PQL (W)		mg/L																	

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 9/8/07
Total number of samples in container: 13
Results required by: 17/8/07
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax

Signature:

Date: Lab Ref:

Send results to:
Douglas Partners Pty Ltd
Address:
BOX 324 Hunter Region Mail Centre
NSW 2310

Fax: (02) 4960 9601

Douglas Partners
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CHAIN OF CUSTODY DESPATCH SHEET

Project Name: NORDS WHARF
Project No: 39602C DP Order No: 67360
DP Contact Person: PATRICK HEADS
Prior Storage: esky / fridge / shelved (circle)

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Angela

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: Sulphate SO_4	Chloride Cl^-	pH												TCLP	Notes
PtN4/0·6	6/8/07	S	1	✓	✓	✓													
PtN5/1·3	↓	↓	2	✓	✓	✓													
PtN6/0·8			3	✓	✓	✓													
PtN9/1·3			4	✓	✓	✓													
PtN11/0·9			5	✓	✓	✓													
PQL (S)		mg/kg																	
PQL (W)		mg/L																	

SGS
Received 23/8/07
By Sam
Time 9am 3pm
Samples Intact (Yes) No
Esky/Cooler Pack Yes (No)
Comments: 54679

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 22/8/07
Total number of samples in container: 5
Results required by: 30/8/07
TAT (Circle): (Standard) 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature: Sam
Date: 23/8/07 Lab Ref: 54679

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

Douglas Partners
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CHAIN OF CUSTODY FIELD SHEET

Client: COAL + ALLIED

Project: LOWER HUNTER LANDS DEVEL. Project No: 37662C

Location: BRUNTER ROAD, NORDS WHARF

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling By	Sampling Date	Sampling Time	Received by: [illegible] Date: 9/8/07 Storage Location*	☑ SAS Date: 9/8/07	
Pit 2	0.3		S	G/P	PH	6/8/07	am	fridge	✓	
Pit 3	0.2								✓	
	0.7									
	1.3									
Pit 5	0.1								✓	
Pit 6	0.1	D1							✓	
	0.4									
Pit 9	0.1									
	0.6		S, fibro						✓ + fibro	
Pit 8	0.1		S							
	0.5	D2	S, fibro						✓ + D2 + fibro	
	1.0		S							
Pit 7	0.1									
	0.4									
	0.8								✓	
	1.3									
Pit 10	0.1						pm			
	0.5								✓	
Pit 12	Surface		fibro						✓	
	0.2		S						✓	

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

SGS Environmental Services
Unit 16, 33 Maddox St. Alexandria NSW 2015
Telephone Number : (+61 2) 8594 0400
Fax Number : (+61 2) 8594 0499

SAMPLE RECEIPT CONFIRMATION

COMPANY	:	Douglas Partners Pty Ltd	FAX NO.	:	02 4960 9601
ATTENTION	:	Patrick Heads	PAGES	:	1
FROM	:	Sample Receipt	DATE	:	10/08/07

This is to confirm that samples for Project **39662C, Nords Wharf** were received on **10/08/07** the results are expected to be ready on **17/08/2007** . Please quote SGS Reference: **54406** when making enquiries regarding this project. Please refer to below which details information about the integrity of the samples and other useful information.

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

Samples received in good order:	YES
Samples received in correct containers:	YES
Samples received without headspace:	YES
Sufficient quantity supplied:	YES
Upon receipt sample temperature:	Cool
Cooling Method:	Ice Pack
Sample containers provided by:	SGS
Samples Clearly Labelled:	YES
Turnaround time requested:	Standard
Completed documentation received:	YES

Comments:

No Asbestos analysis will be performed as per client's email.
Terms and conditions are available from www.au.sgs.com

The signed chain of custody will be returned to you with the original report.

SGS Environmental Services
Unit 16, 33 Maddox St. Alexandria NSW 2015
Telephone Number : (+61 2) 8594 0400
Fax Number : (+61 2) 8594 0499

SAMPLE RECEIPT CONFIRMATION

COMPANY	:	Douglas Partners Pty Ltd	FAX NO.	:	02 4960 9601
ATTENTION	:	Patrick Heads	PAGES	:	1
FROM	:	Sample Receipt	DATE	:	15/08/07

This is to confirm that samples for Project **39662C, Nords Wharf** were received on **14/08/07** the results are expected to be ready on **21/08/2007** . Please quote SGS Reference: **54459** when making enquiries regarding this project. Please refer to below which details information about the integrity of the samples and other useful information.

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

Samples received in good order:	YES
Samples received in correct containers:	YES
Samples received without headspace:	N/A
Sufficient quantity supplied:	YES
Upon receipt sample temperature:	Cool
Cooling Method:	Ice
Sample containers provided by:	Customer
Samples Clearly Labelled:	YES
Turnaround time requested:	Standard
Completed documentation received:	YES

Comments:

Terms and conditions are available from www.au.sgs.com

The signed chain of custody will be returned to you with the original report.

SGS Environmental Services
Unit 16, 33 Maddox St. Alexandria NSW 2015
Telephone Number : (+61 2) 8594 0400
Fax Number : (+61 2) 8594 0499

SAMPLE RECEIPT CONFIRMATION

COMPANY	:	Douglas Partners Pty Ltd	FAX NO.	:	02 4960 9601
ATTENTION	:	Patrick Heads	PAGES	:	1
FROM	:	Sample Receipt	DATE	:	24/08/07

This is to confirm that samples for Project **39662C, Nords Wharf** were received on **23/08/07** the results are expected to be ready on **30/08/2007** . Please quote SGS Reference: **54679** when making enquiries regarding this project. Please refer to below which details information about the integrity of the samples and other useful information.

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

Samples received in good order:	YES
Samples received in correct containers:	YES
Samples received without headspace:	N/A
Sufficient quantity supplied:	YES
Upon receipt sample temperature:	Cool
Cooling Method:	Ice
Sample containers provided by:	Customer
Samples Clearly Labelled:	YES
Turnaround time requested:	Standard
Completed documentation received:	YES

Comments:

Terms and conditions are available from www.au.sgs.com

The signed chain of custody will be returned to you with the original report.

AUSTRALIAN LABORATORY SERVICES PTY LTD ABN 84 009 936 029
32 Shand Street Stafford QLD 4053 Australia
Telephone: +61-7-3243 7222 Facsimile: +61-7-3243 7218 http://www.alsenviro.com/

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive report

Client Details

Client	:	**DOUGLAS PARTNERS PTY LTD**
Contact	:	**MR PATRICK HEADS**
Address	:	PO BOX 324 HUNTER REGION MAIL CENTRE AUSTRALIA 2310
Project	:	**39662C NORDS WHARF**
Order number	:	**67367**
C-O-C Number	:	**- Not provided -**
Site	:	**- Not provided -**
Sampler	:	**- Not provided -**
E-mail	:	headsp@douglaspartners.com.au
Telephone	:	49609600
Facsimile	:	49609601

Laboratory Details

Laboratory	:	**Environmental Division Brisbane**
Manager	:	**Tim Kilmister**
Address	:	32 Shand Street Stafford QLD Australia 4053
Quote number	:	EP20070013
Work order	:	**EB0709670**
E-mail	:	Services.Brisbane@alsenviro.com
Telephone	:	+61-7-3243 7222
Facsimile	:	+61-7-3243 7218

Dates

Date Samples Received	:	28 Aug 2007	**SRA Issue Date**	:	29 Aug 2007
Scheduled Reporting Date	:	**4 Sep 2007**	**Client Requested Date**	:	31 Aug 2007

Delivery Details

Mode of Delivery	:	Carrier.	**Temperature**		:	1.4 C - Ice bricks present
No. of coolers/boxes	:	3 MEDIUM	**No. of samples**	**- Received**		3
Security Seal	:	Intact.		**- Analysed**		3

Comments

- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**

- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALSE Brisbane.
- When the sampling time is not supplied on the COC documentation, ALSE defaults the sampling time to that of the COC 'relinquishment' time (if supplied). If this also is not supplied, ALSE defaults the sampling time to the 'time of receipt at Laboratory'.

Client	: DOUGLAS PARTNERS PTY LTD	**Work Order**	: EB0709670
Project	: 39662C NORDS WHARF	**ALS Quote Reference**	: EP20070013

Summary of Sample(s) / Container(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as moisture and preparation tasks, that form an implicit part of that package.

ALS Sample ID.	Client Sample ID - Sample Date	**Requested Analysis**									
		EA033 - SOIL Chromium Suite for Acid Sulphate Soils									
EB0709670-001	**PIT 10/1.1 - 6 Aug 2007**	]									
EB0709670-002	**PIT 11/0.5 - 6 Aug 2007**	]									
EB0709670-003	**PIT 11/2.6 - 6 Aug 2007**	]									
	Total(s) :	**3**									

Client	: DOUGLAS PARTNERS PTY LTD	**Work Order**	: EB0709670
Project	: 39662C NORDS WHARF	**ALS Quote Reference**	: EP20070013

ALS Environmental

Requested Reports

l **MR PATRICK HEADS**

-	A4 - AU Certificate of Analysis - NEPM format	Email	headsp@douglaspartners.com.au
-	A4 - AU Quality Control Report - NEPM format	Email	headsp@douglaspartners.com.au
-	A4 - AU Interpretive Quality Control Report - NEPM format	Email	headsp@douglaspartners.com.au
-	EDI Format - ENMRG	Email	headsp@douglaspartners.com.au
-	EDI Format - XTab	Email	headsp@douglaspartners.com.au
-	Default - Chain of Custody	Email	headsp@douglaspartners.com.au
-	A4 - AU Sample Receipt Notification - Comprehensive format	Email	headsp@douglaspartners.com.au
-	A4 - AU Tax Invoice	Email	headsp@douglaspartners.com.au

Sample Container(s) / Preservation Non-Compliance Log

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

l **No sample container / preservation non-compliance exist.**

APPENDIX D

DRAWING 5 – MINING CONSTRAINTS OVER RT295 WALLARAH SEAM WORKINGS
DRAWING 5A – MINING CONSTRAINTS OVERLAIN ON GREAT NORTHERN SEAM WORKINGS
DRAWING 6 – TEST PIT LOCATIONS, SURFACE FEATURES AND GEOLOGY
DRAWING 106 – GROUNDWATER DEPENDANT ECOSYSTEMS