

Project Name: MUDGEE
Project No: 86091.00 Sampler: LS
Project Mgr: Peter Oitmaa Mob. Phone: 0412 574 518
Email: peter.oitmaa@douglaspartners.com.au
Date Required: STO Lab Quote No.

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2067
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth	Lab ID	Sampling Date	Sample Type S - soil W - water	Container type	Analytes				Notes
BH1	0-0.1	1	17/8	S	Jar	PH EC	Combo			
BH1	0.5-0.6	2				CL SO4	8a			
BH1	4.0-4.35	3				CEC				
BH2	0-0.1	4								
BH3	0.4-0.5	5	18/8							
BH3	2.4-2.5	6								
BH4	0-0.1	7	17/8							
BH5	0.4-0.5	8								
BH6	0-0.1	9	18/8							
BH7	0.4-0.5	10								
BH8	0-0.1	11	17/8							
BH9	0.4-0.5	12								



Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 174352

Date Received: 28/8

Time Received: 17:10

Received by: AZ

Temp: Cool/Ambient

Cooling: Ice/Repack

Security: Intact/Broken/None

Lab Report No:
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114
Relinquished by: PMO Signed: PLD Date & Time: 28/8
Relinquished by: Signed: Date & Time: 28/8 17:10

Phone: (02) 9809 0666
Fax: (02) 9809 4095

Date & Time: 28/8 17:10

Appendix H

QA/QC Results

Quality Assurance/Quality Control Procedures and Results

Field QA/QC for Soil Samples

The field QA/QC procedures for sampling described in the Douglas Partners *Field Procedures Manual* were followed at all times during the field work.

Laboratory-prepared Trip Blank and Trip Spike soil samples were taken to site during the field work, stored in the same container used to store the field samples, and transported to the laboratory with the field samples selected for analysis. The purpose of the Trip Blank was to determine whether cross-contamination of the samples was likely to have occurred. The purpose of the Trip Spike was to determine whether the significant loss of volatile contaminants may have occurred.

The results for the Trip Blank and Trip Spike soil samples are provided in Table H1.

Table H1: Trip Blank and Trip Spike QA/QC Results for Hydrocarbons in Soils

Sample ID	Total Concentration (mg/kg) or % Recovery			
	Benzene	Toluene	Ethyl-benzene	Xylene
TB	<0.2	<0.5	<1	<3
TS	129%	130%	133%	132%

The concentrations of analytes in the Trip Blank were below the laboratory detection limits which indicates that cross-contamination is unlikely to have occurred. The recovery rates for the Trip Spike analytes were within an acceptable range which indicates that the significant loss of volatile contaminants is unlikely to have occurred. The field sampling protocols are therefore considered appropriate.

Intra-Laboratory QA/QC Analysis on Soil Samples

Intra-laboratory analysis of soil samples was conducted as an internal check of the reproducibility of the results from the primary laboratory and as a measure of consistency of sampling techniques. The 'A' series of the triplicate QA/QC samples were analysed by the primary laboratory (EnviroLab). The results were compared between the primary and 'A' samples to determine the relative percentage difference (RPD) between the samples. The RPD was then used to determine whether unacceptable errors may be present in the sample data.

Selected comparative results of the analysis of the intra-laboratory soil samples are summarised in Tables H2 to H4.

Table H2: Intra-Laboratory QA/QC Results for BTEX in Soil

Sample ID	Total Concentration (mg/kg)				
	Benzene	Toluene	Ethylbenzene	m + p xylene	o xylene
BH4/0-0.1	<0.2	<0.5	<1	<2	<1
T5	<0.2	<0.5	<1	<2	<1
RPD	0%	0%	0%	0%	0%
BH10/0-0.1	<0.2	<0.5	<1	<2	<1
T6	<0.2	<0.5	<1	<2	<1
RPD	0%	0%	0%	0%	0%
BH104/0-0.1	<0.2	<0.5	<1	<2	<1
BT7	<0.2	<0.5	<1	<2	<1
RPD	0%	0%	0%	0%	0%
BH108/0-0.1	<0.2	<0.5	<1	<2	<1
BT13	<0.2	<0.5	<1	<2	<1
RPD	0%	0%	0%	0%	0%

Table H3: Intra-Laboratory QA/QC Results for TRH in Soil

Sample ID	Total Concentration (mg/kg)			
	C ₆ – C ₉	C ₁₀ – C ₁₄	C ₁₅ – C ₂₈	C ₂₉ – C ₃₆
BH4/0-0.1	<25	<50	<100	<100
T5	<25	<50	<100	<100
RPD	0%	0%	0%	0%
BH10/0-0.1	<25	<50	<100	<100
T6	<25	<50	<100	<100
RPD	0%	0%	0%	0%
BH104/0-0.1	<25	<50	<100	<100
BT7	<25	<50	<100	110
RPD	0%	0%	0%	10%
BH108/0-0.1	<25	<50	<100	<100
BT13	<25	<50	<100	<100
RPD	0%	0%	0%	0%

Table H4: Intra-Laboratory QA/QC Results for Heavy Metals in Soil

Sample ID	Total Concentration (mg/kg)							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
BH4/0-0.1	5	<0.4	17	20	24	<0.1	10	59
T5	9	<0.4	13	17	42	<0.1	10	65
RPD	57%	0%	27%	16%	55%	0%	0%	10%
BH10/0-0.1	5	<0.4	11	18	40	<0.1	10	59
T6	5	<0.4	12	18	45	<0.1	11	62
RPD	0%	0%	9%	0%	12%	0%	10%	5%
BH104/0-0.1	7	<0.4	13	26	57	0.2	10	110
BT7	7	<0.4	13	27	60	0.2	11	120
RPD	0%	0%	0%	4%	5%	0%	10%	9%
BH108/0-0.1	7	<0.4	14	17	14	<0.1	15	45
BT13	6	<0.4	17	17	16	<0.1	15	42
RPD	15%	0%	19%	0%	13%	0%	0%	7%

Notes: As = Arsenic; Cd = Cadmium; Cr = Chromium; Cu = Copper; Pb = Lead; Hg = Mercury; Ni = Nickel; Zn = Zinc

A RPD of $\pm 30\%$ is generally considered acceptable for inorganic analytes and a wider range may be acceptable for organic analytes. The RPD values outside the generally acceptable range of $\pm 30\%$ are indicated by yellow shading in Table H4. These values are not considered significant due to the relatively small actual differences between the sample pairs and, in the case of filling, the heterogeneous nature of the samples.

It is therefore considered that the results indicate acceptable consistency between the primary and 'A' soil samples, that suitable field sampling methodology was adopted and that adequate laboratory precision was achieved.

Inter-Laboratory QA/QC Analysis on Soil Samples

Inter-laboratory analysis of soil samples was conducted as an internal check of the reproducibility of the results from the laboratories and as a measure of consistency of sampling techniques. The 'B' series of the triplicate QA/QC samples were analysed by the secondary laboratory (Eurofins). The results were compared between the primary and 'B' samples to determine the relative percentage difference (RPD) between the samples. The RPD was then used to determine whether unacceptable errors may be present in the sample data.

Selected comparative results of the analysis of the inter-laboratory soil samples are summarised in Tables H5 to H7.

Table H5: Inter-Laboratory QA/QC Results for BTEX in Soil

Sample ID	Total Concentration (mg/kg)				
	Benzene	Toluene	Ethylbenzene	m + p xylene	o xylene
BH104/0-0.1	<0.2	<0.5	<1	<2	<1
BT8	<0.1	<0.1	<0.1	<0.2	<0.1
RPD	0%	0%	0%	0%	0%
BH108/0-0.1	<0.2	<0.5	<1	<2	<1
BT14	<0.1	<0.1	<0.1	<0.2	<0.1
RPD	0%	0%	0%	0%	0%

Table H6: Inter-Laboratory QA/QC Results for TRH in Soil

Sample ID	Total Concentration (mg/kg)			
	C ₆ – C ₉	C ₁₀ – C ₁₄	C ₁₅ – C ₂₈	C ₂₉ – C ₃₆
BH104/0-0.1	<25	<50	<100	<100
BT8	<20	<20	89	170
RPD	0%	0%	0%	52%
BH108/0-0.1	<25	<50	<100	<100
BT14	<20	<20	<50	<50
RPD	0%	0%	0%	0%

Table H7: Inter-Laboratory QA/QC Results for Heavy Metals in Soil

Sample ID	Total Concentration (mg/kg)							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
BH104/0-0.1	7	<0.4	13	26	57	0.2	10	110
BT8	8.6	<0.4	12	17	39	<0.1	8.6	85
RPD	21%	0%	8%	42%	38%	67%	15%	26%
BH108/0-0.1	7	<0.4	14	17	14	<0.1	15	45
BT14	12	<0.4	18	20	21	<0.1	18	63
RPD	53%	0%	25%	16%	40%	0%	18%	33%

Notes: As = Arsenic; Cd = Cadmium; Cr = Chromium; Cu = Copper; Pb = Lead; Hg = Mercury; Ni = Nickel; Zn = Zinc

A RPD of $\pm 30\%$ is generally considered acceptable for inorganic analytes and a wider range may be acceptable for organic analytes. The RPD values outside the generally acceptable range of $\pm 30\%$ are indicated by yellow shading in Tables H6 and H7. These values are not considered significant due to the relatively small actual differences between the sample pairs and, in the case of filling, the heterogeneous nature of the samples.

It is therefore considered that the results indicate acceptable consistency between the primary and 'B' soil samples, that suitable field sampling methodology was adopted and that adequate laboratory precision was achieved.

Laboratory QA/QC Procedures

Quality control procedures used during the analyses include:

Reagent Blank

A reagent blank sample is prepared and analysed at the beginning of every analytical run, following calibration of the analytical apparatus. The laboratory results for reagent blanks indicated that concentrations of all analytes were below respective laboratory practical quantitation limits.

Duplicate

This is the complete duplicate of a sample from the process batch. The results of the two samples are compared to laboratory acceptance criteria and exceedances highlighted. Exceedances were detected for Cu, Pb and Zn, and therefore a triplicate result was reported as per laboratory guidelines.

Matrix Spike

A portion of a sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and determine whether matrix interference exists. The matrix spike recovery is compared to laboratory acceptance criteria. No exceedances were noted.

Laboratory Control Sample

This is a standard reference sample or control matrix used to check the analytical process. The results were within acceptable limits.

Surrogate Spike

Surrogates are known additions of known compounds to each sample, blank, matrix spike and laboratory control sample. The surrogates are similar to the analyte of interest, however are not expected to be detected in real samples. The results were acceptable.