Appendix A
Existing Monitoring Well Borelogs

coffey environments

Borehole No. **MW 01**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Engineering Log - Piezometer

Client: ***TRUenergy***

Date started: ***4.3.2010***

Principal:

Date completed: ***4.3.2010***

Project: ***Geotechnical, Contamination & Groundwater Invest.***

Logged by: ***DJD***

Borehole Location: ***Zone 4 (a) Tallawarra Lands, Yallah, NSW***

Checked by: ***CCQ/SM***

drill model & mounting: GEOPROBE TRACK | Easting: 297731.9 | slope: -90° | R.L. Surface: 2.82

hole diameter: 150 | Northing: 6176080.12 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
HOLLOW FLIGHTS		N	12.36pm - 25/06/10			2 1 0 -1 -2 -3	1 2 3 4 5 6			**FILL; Sandy GRAVEL:** Fine to coarse grained, black/dark grey (coal and shale), fine to coarse grained sand.	D/M	MD	FILL/COALWASH No odour
										...Becoming Sandy GRAVEL: Medium to coarse grained, fine to coarse grained sand, with a trace of cobbles to to 100mm diameter at 1.0m to 1.9m.		D	
										...Becoming Sandy GRAVEL: Fine to coarse grained, fine to coarse grained sand at 1.9m to 2.5m.	M/W	MD/D	
									SM	**Silty SAND:** Fine to coarse grained, dark grey/grey.			ALLUVIAL/ESTUARINE? No odour
									CL	**CLAY:** Medium plasticity, dark grey, with some fine to coarse grained sand and silt.	>Wp/>Wl		ALLUVIAL/ESTUARINE? No odour
									CL	**CLAY:** Medium plasticity, grey-brown/grey, with some shells and shell fragments up to 20mm diameter (bivalve shells) and silt.	>Wp	S/F VS/S	ESTUARINE No odour
						-4 -5	7 8			Borehole terminated at 6m			

PIEZOMETER ENVIWOLL00250AB - LOGS.GPJ COFFEY.GDT 20.7.10

Form GEO 5.10 Issue 3 Rev.0

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex
*bit shown by suffix e.g.	ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW 02**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Client: ***TRUenergy***

Date started: ***4.3.2010***

Principal:

Date completed: ***4.3.2010***

Project: ***Geotechnical, Contamination & Groundwater Invest.***

Logged by: ***DJD***

Borehole Location: ***Zone 3 (a) Tallawarra Lands, Yallah, NSW***

Checked by: ***CCQ/SM***

drill model & mounting: GEOPROBE TRACK | Easting: 297791.28 | slope: -90° | R.L. Surface: 3.05

hole diameter: 150 | Northing: 6176388.22 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
HOLLOW FLIGHT		N	11.13am-25/06/10			2	1			**FILL; Sandy GRAVEL:** Fine to coarse grained, sub-angular, black (coal and shale), fine to coarse grained sand.	M	MD/D	FILL/COALWASH No odour
						1	2				M/W		
						0	3		SW	**SAND:** Fine to coarse grained, brown/grey, with a trace of silt. ...Becoming grey/pale yellow at 3.0m.	M		ALLUVIAL No odour
						-1	4		SM	**Silty SAND:** Fine to medium grained, grey/pale grey.	W M/W		ALLUVIAL/ESTUARINE? No odour
						-2	5		CL	**CLAY:** Medium plasticity, dark grey, with some shell fragments, shells up to 20mm diameter (bivalves) and silt.	>Wp	S/F	ESTUARINE No odour
						-3	6			Borehole terminated at 5.8m			
						-4	7						
							8						

PIEZOMETER ENVIWOLL00250AB - LOGS.GPJ COFFEY.GDT 20.7.10

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method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex
*bit shown by suffix e.g.	ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW 03**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Client: **TRUenergy**

Date started: **3.3.2010**

Principal:

Date completed: **3.3.2010**

Project: **Geotechnical, Contamination & Groundwater Invest.**

Logged by: **DJD**

Borehole Location: **Zone 3 (a) Tallawarra Lands, Yallah, NSW**

Checked by: **CCQ/SM**

drill model & mounting: GEOPROBE TRACK | Easting: 297545.01 | slope: -90° | R.L. Surface: 3.98

hole diameter: 150 | Northing: 6176690.48 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
HOLLOW FLIGHT		N	8.35am - 25/06/10			3	1			**FILL; Gravelly SAND:** Fine to coarse grained, black, fine to coarse grained sub-angular gravel (coal and shale).	M	MD	FILL/COALWASH
										FILL; SILT: Low to medium plasticity, pale grey/grey, with a trace of fine grained sand. ...Fill behaving as liquid due to moisture at 0.3m.	W/Wl	S/F	FILL/ASH No odour
						2	2			...Clayey SILT at 1.6m to 2.4m.			
						1	3		CL	**CLAY:** Medium plasticity, brown/grey, with a trace of fine grained sand and silt.	Wp	F/St	ALLUVIAL No odour
						0	4		CL	**CLAY:** Medium plasticity, orange/brown, with some fine to medium grained sand and silt.	>Wp		RESIDUAL No odour
						-1	5		CL	**CLAY:** Medium plasticity, brown/pale yellow, with a trace of silt.	>Wp		XW SANDSTONE No odour
									CL	**CLAY:** Medium plasticity, grey/pale green with orange/yellow patches, with a trace of fine to medium grained sand and silt.	Wp		XW/HW SANDSTONE No odour
						-2	6			Borehole terminated at 5.8m			MW 03 Terminated at 5.8m on highly weathered sandstone
						-3	7						
						-4	8						

PIEZOMETER ENVIWOLL00250AB - LOGS.GPJ COFFEY.GDT 20.7.10

Form GEO 5.10 Issue 3 Rev.0

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex
*bit shown by suffix e.g.	ADT

support

C casing N nil

penetration

1 2 3 4 no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW 04**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Client: ***TRUenergy***

Date started: ***3.3.2010***

Principal:

Date completed: ***3.3.2010***

Project: ***Geotechnical, Contamination & Groundwater Invest.***

Logged by: ***DJD***

Borehole Location: ***Zone 3 (a) Tallawarra Lands, Yallah, NSW***

Checked by: ***CCQ/SM***

drill model & mounting: GEOPROBE TRACK | Easting: 297590.91 | slope: -90° | R.L. Surface: 3.33

hole diameter: 150 | Northing: 6176299.76 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
HOLLOW FLIGHT		N	9.52am - 25/06/10			3	1			**FILL; Gravelly SAND:** Fine to coarse grained, black, fine to coarse grained, sub-angular coal and shale gravel.	M / M/W / W/>Wl	L/MD / MD	FILL - COALWASH No odour FILL-ASH No odour
						2	2			**FILL; Clayey SILT:** Low to medium plasticity, pale grey to grey. ...Fill behaving as liquid at 0.25m.			
						1			CL	**CLAY:** Medium plasticity, dark grey/brown, with some silt, with a trace of fine to medium grained sand.	>Wp	S/F	ALLUVIAL/ESTUARINE? No odour
						0	3		CL	**CLAY:** Medium plasticity, grey/orange/brown, with some silt, with a trace of fine to medium grained sand.	Wp	F/St	ALLUVIAL No odour
						-1	4		CL/CH	**CLAY:** Medium to high plasticity, dark grey, wtih some silt, with some shell fragments (bivalves).	>Wp	VS/S	ESTUARINE No odour
						-2	5		CL/CH	**CLAY:** Medium to high plasticity, dark grey, with some silt, with some shell fragments (bivalves).			
						-3	6			Borehole terminated at 6.2m			
						-4	7						
							8						

PIEZOMETER ENVIWOLL00250AB - LOGS.GPJ COFFEY.GDT 20.7.10

Form GEO 5.10 Issue 3 Rev.0

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex
*bit shown by suffix e.g.	ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW 05**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Client: ***TRUenergy***

Date started: ***5.3.2010***

Principal:

Date completed: ***5.3.2010***

Project: ***Geotechnical, Contamination & Groundwater Invest.***

Logged by: ***DJD***

Borehole Location: ***Zone 2 (a) Tallawarra Lands, Yallah, NSW***

Checked by: ***CCQ/SM***

drill model & mounting: GEOPROBE TRACK | Easting: 298381.41 | slope: -90° | R.L. Surface: 4.70

hole diameter: 100 | Northing: 6176516.39 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADT		N	2.06pm - 24/06/10			4	1			**FILL; Silty SAND:** Fine to coarse grained, dark grey/grey.	M	MD	FILL/TOPSOIL No odour
										FILL; Clayey SILT: Low plasticity, pale grey/grey, with a trace of fine to medium grained sand.	D/M	F/St	FILL/ASH No odour
										FILL; CLAY: Low to medium plasticity, pale brown/white/pale yellow mottled, with a trace of fine to medium grained sub-angular to sub-rounded gravel and silt.	Wp		FILL No odour
						3	2			**FILL; CLAY:** Medium to high plasticity, red/brown with pale orange mottling, with a trace of fine ot medium grained, sub-rounded gravel, sub-rounded sandstone gravel and silt. (Hard to distinguish as residual or fill duw to mixed up cuttings.		St/VSt	FILL/ALLUVIAL? No odour
						2	3		CL	**CLAY:** Medium plasticity, pale brown/pale yellow mottled, with some fine to medium grained sand, with a trace of fine to medium grained sub-rounded sandstone gravel and silt.		VSt	ALLUVIAL No odour
						1	4						
						0	5		CL	**CLAY:** Medium plasticity, pale brown/grey, with a trace of fine to medium grained sand and silt.	>Wp	S	ALLUVIAL/ESTUARINE? No odour
						-1	6		CL	**CLAY:** Medium plasticity, dark grey, with a trace of rootlets, shell fragments and silt.			ESTUARINE Brackish/organic odour
						-2	7		CL	**CLAY:** Medium plasticity, brown, with some medium to coarse grained sand, fine grained sub-angular gravel and shell fragments, with a trace of silt.	Wp	F	
						-3	8		CL	**CLAY;** Low to medium plasticity, dark grey, with some fine to medium grained sand, with a trace of silt.	>Wp	S/F	
										Borehole terminated at 7.5m			

PIEZOMETER ENVIWOLL00250AB - LOGS.GPJ COFFEY.GDT 20.7.10

Form GEO 5.10 Issue 3 Rev.0

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW 06**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Client: ***TRUenergy***

Date started: ***11.6.2010***

Principal:

Date completed: ***11.6.2010***

Project: ***Geotechnical, Contamination & Groundwater Invest.***

Logged by: ***DJD***

Borehole Location: ***Zone 2 (a) Tallawarra Lands, Yallah, NSW***

Checked by: ***CCQ/SM***

drill model & mounting: GEOPROBE TRACK | Easting: 298481.42 | slope: -90° | R.L. Surface: 10.92

hole diameter: 50 | Northing: 6176739.28 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
PUSH TUBE		N				10	1			**FILL; Gravelly SAND:** Fine to coarse grained, dark grey/black, fine to medium grained, sub-angular to sub-rounded gravel.	D/M	L/MD	FILL - COALWASH No odour
										FILL; Clayey SILT: Low plasticity. pale grey.	M	VSt/Fb	FILL - ASH No odour
										FILL; SAND: Fine grained, grey, with some silt.	D	MD	
										FILL; SILT: Low plasticity, pale grey, with a trace of clay.	M	VL/L	
						9	2			**FILL; Clayey SILT:** Low plasticity, grey.	D/M	St/Fb	
										FILL; SILT: Low plasticity, pale grey, with a trace of clay.	D	VL/L	
										FILL; Clayey SILT: Low plasticity, grey.	D/M	F/Fb	
						8	3			**FILL; SAND:** Fine grained, grey/dark grey, with some silt.	M	MD	
										FILL; Clayey SILT: Low plasticity, grey.		VSt-H/Fb	
						7	4			**FILL; SAND:** Fine grained, grey/dark grey, with some silt.	D/M	L/MD	
										FILL; Clayey SILT: Low plasticity, grey, with a trace of fine grained sand.	M	VSt	
										...Liquification of soil from 4.4m to 4.5m.	W		
						6	5			**FILL; SAND:** Fine grained, dark grey, with some silt.	M	D	
										FILL; Sandy SILT: Low plasticity, grey, fine grained sand, with a trace of clay.		VSt	
						5	6			**FILL; SAND:** Fine to medium grained, grey, with some silt.	W	L/MD	
										FILL; Sandy SILT: Low plasticity, grey/dark grey, fine ot medium grained sand.	M/W	St	
						4	7			**FILL; SAND:** Fine to medium grained, grey, with some silt.	M	D	
										FILL; Sandy SILT: Low plasticity, grey/dark grey, fine grained sand.		VSt	
						3	8			Borehole terminated at 7.2m		St	

PIEZOMETER ENVIWOLL00250AB - LOGS.GPJ COFFEY.GDT 20.7.10

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method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW 07**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Client: ***TRUenergy***

Date started: ***5.3.2010***

Principal:

Date completed: ***5.3.2010***

Project: ***Geotechnical, Contamination & Groundwater Invest.***

Logged by: ***DJD***

Borehole Location: ***Zone 2 (a) Tallawarra Lands, Yallah, NSW***

Checked by: ***CCQ/SM***

drill model & mounting: GEOPROBE TRACK | Easting: 298872.57 | slope: -90° | R.L. Surface: 8.51

hole diameter: 100 | Northing: 6176432.36 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADT		N	NO WATER OBSERVED 24/06/10			8	1		SP	**FILL; CLAY:** Low to medium plasticity, dark brown, with some fine to coarse grained sand and fine to coarse grained sub-rounded gravel (coal and shale) and silt.	<Wp	F	FILL No odour
									SP	**Gravelly SAND:** Fine to coarse grained, pale brown/yellow, fine to coare grained sub-rounded to sub-angular sandstone gravel, with a trace of silt.	D/M	MD	RESIDUAL No odour
						7				**Gravelly SAND:** Fine to coarse grained, pale brown/yellow, fine to coare grained sub-rounded to sub-angular sandstone gravel, with some low to medium plasticity clay.	D	D	XW/HW SANDSTONE No odour
							2			**SANDSTONE:** Fine grained, pale brown/pale yellow.			HW SANDSTONE (BERRY SILTSTONE) No odour
						6				...Becoming pale brown/pale grey at 2.3m.			
							3						
						5				...Becoming pale grey/white at 3.85m.			
							4						
						4				...Becoming brown/grey at 5.0m.			
							5						
						3							
							6			Borehole terminated at 6m			
						2							
							7						
						1							
							8						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex
*bit shown by suffix e.g.	ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW 08**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Client: ***TRUenergy***

Date started: ***10.3.2010***

Principal:

Date completed: ***10.3.2010***

Project: ***Geotechnical, Contamination & Groundwater Invest.***

Logged by: ***DJD***

Borehole Location: ***Zone 2 (a) Tallawarra Lands, Yallah, NSW***

Checked by: ***CCQ/SM***

drill model & mounting: GEOPROBE TRACK | Easting: 298836.96 | slope: -90° | R.L. Surface: 6.51

hole diameter: 100 | Northing: 6176677.11 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADT		N	11.15am - 24/06/10			6	1			**FILL; Clayey SILT:** Low to medium plasticity, pale grey/grey.	D/M	F	FILL/ASH No odour
						5	2			...With some fine to medium grained sand	M D >Wl		
						4	3			...Becoming Sandy SILT: Low to medium plasticity, pale grey, fine to medium grained sand at 2.5m to 3.5m.			
						3				**SANDSTONE:** Fine grained, brown/orange/grey.	M		HW SANDSTONE No odour
						2	4			Borehole terminated at 3.6m			
						1	5						
						0	6						
						-1	7						
							8						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW 09**

Sheet 1 of 1

Office Job No.: **ENVIWOLL00250AB**

Client: ***TRUenergy***

Date started: ***5.3.2010***

Principal:

Date completed: ***5.3.2010***

Project: ***Geotechnical, Contamination & Groundwater Invest.***

Logged by: ***DJD***

Borehole Location: ***Zone 2 (a) Tallawarra Lands, Yallah, NSW***

Checked by: ***CCQ/SM***

drill model & mounting: GEOPROBE TRACK | Easting: 298827.33 | slope: -90° | R.L. Surface: 3.07

hole diameter: 100 | Northing: 6177103.43 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADT		N	12.00pm - 24/06/10			3 / 2 / 1 / 0 / -1 / -2 / -3 / -4	1 / 2 / 3 / 4 / 5 / 6 / 7 / 8			**FILL; Silty SAND:** Fine to coarse grained, dark brown/dark grey, with some fine to coarse grained sub-rounded to sub-angular gravel (coal and sandstone).	M	MD	FILL No odour
										FILL; CLAY: Medium plasticity, black/dark grey, with some fine to medium grained sand, with a trace of rootlets and silt.	>Wp	F	FILL/ALLUVIAL No odour
									CL	**CLAY:** Medium plasticity, red-brown/orange, with some fine to coarse grained sand, with a trace of fine to medium grained sub-rounded sandstone gravel and silt.		F/St	ALLUVIAL/ESTUARINE? Brackish/organic odour
									CL	**CLAY:** Medium plasticity, pale grey/pale brown, with a trace of fine to coarse grained pale brown sand and fine to medium grained sub-rounded sandstone gravel and silt.			
									CL	**CLAY:** Medium plasticity, pale grey, with a trace of fine to coarse grained sand and silt.	Wp	F	
									CL	**CLAY:** Medium plasticity, pale grey/pale yellow mottled, with a trace of fine to coarse grained sand and fine to medium grained sub-rounded gravel (possibly jarosite?) and silt.	>Wp	F/St	
									SC	**Clayey SAND:** Fine to coarse grained, pale grey with some pale yellow mottling, low to medium plasticity clay.	W	L/MD	
										Borehole terminated at 6m			

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

PIEZOMETER ENVIWOLL00250AB - LOGS.GPJ COFFEY.GDT 20.7.10

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coffey environments

Engineering Log - Piezometer

Borehole No. **MW10**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AB**

Client: ***TRUenery Tallawarra***

Date started: ***17.8.2010***

Principal:

Date completed: ***17.8.2010***

Project: ***Further Assessment Of Groundwater Quality - Ash Pond***

Logged by: ***DJD***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***JMF***

drill model & mounting: Gemco 210B, Trailer | Easting: | slope: -90° | R.L. Surface: Not Measured

hole diameter: 100 | Northing: | bearing: | datum: Not Measured

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADV		N					0.0			**TOPSOIL; CLAY:** Medium plasticity, dark brown, with some silt.	Wp	F	TOPSOIL No odour
			24/08/10				0.5		CL	**CLAY:** Medium plasticity, brown/yellow, with a trace of silt.	W	F/St	ALLUVIAL No odour
									SC	**Clayey SAND:** Fine to coarse grained, pale brown, medium plasticity clay.		L/MD	
							1.0		CL	**CLAY:** Medium plasticity, orange/brown, with some silt, with a trace of fine to coarse grained sand.	Wp	F/St	
									GC	**Clayey GRAVEL:** Fine to medium grained, orange/brown, medium plasticity clay.	W	L/MD	
							1.5		SC	**Clayey SAND:** Fine to coarse grained, pale grey, medium plasticity clay. ...Becoming orange-clay at 1.65m.	M/W	MD	ALLUVIAL/ESTUARINE Slight organic/brackish odour
							2.0						
							2.5		SC	**Clayey SAND:** Fine to coarse grained, grey, medium plasticity clay.	W	L/MD	
									SC	**Clayey SAND:** Fine to coarse grained, dark grey, medium plasticity clay.			
							3.0		CL	**Sandy CLAY:** Low to medium plasticity, dark grey, fine to coarse grained sand, with a trace of rootlets. ...Note: Observations past 3.25m limited due to groundwater inflows. Auger not raised to check end of bit due to wet clayey/sandy soils in the hole.	>Wp	S/F	ESTUARINE Organic/brackish odour
							3.5						
							4.0						
							4.5			Borehole terminated at 4.5m			
							5.0						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex
*bit shown by suffix e.g.	ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Appendix B
New Monitoring Well Borelogs

coffey environments

Engineering Log - Piezometer

Borehole No. **MW11**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***1.2.2011***

Principal:

Date completed: ***1.2.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***CA***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model & mounting: Gemco 210B, Trailer | Easting: 298321.84 | slope: -90° | R.L. Surface: 11.10

hole diameter: 125mm | Northing: 6177203.74 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
DT		C				10	2			**FILL; Clayey SILT:** Dark grey/black, low plasticity clay.	<Wp	VSt	FILL/ASH
			▶			8	4			**FILL; Clayey SILT:** Dark grey/black, low plasticity clay.	>Wp	F	
						6	6						
						4	8						
						2	10			Borehole terminated at 10m			
						0	12						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW12**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***1.2.2011***

Principal:

Date completed: ***1.2.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***CA***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model & mounting: Gemco 210B, Trailer | Easting: 298321.98 | slope: -90° | R.L. Surface: 11.15

hole diameter: 125mm | Northing: 6177206.72 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
DT		C				10	2			**FILL; Clayey SILT:** Dark grey/black, low plasticity clay.	<Wp	VSt	FILL/ASH
						8	4			**FILL; Clayey SILT:** Dark grey/black, low plasticity clay.	>Wp	F	
						6	6						
						4	8						
						2	10			Borehole terminated at 10m			
						0	12						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex
*bit shown by suffix e.g.	ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

PIEZOMETER ENAUWOLL04009AE - LOGS.GPJ COFFEY.GDT 13.4.11

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coffey environments

Engineering Log - Piezometer

Borehole No. ***MW13***

Sheet 1 of 1

Office Job No.: ***ENAUWOLL04009AE***

Client: ***TRUenery Tallawarra***

Date started: ***1.2.2011***

Principal:

Date completed: ***1.2.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***CA***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model & mounting: Gemco 210B, Trailer | Easting: 298319.19 | slope: -90° | R.L. Surface: 11.11

hole diameter: 125mm | Northing: 6177205.41 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
DT		C	▶			10 8 6 4 2 0	2 4 6 8 10 12			**FILL; Clayey SILT:** Dark grey/black, low plasticity clay.	<Wp	VSt	FILL/ASH
										Borehole terminated at 7m			

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method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex
*bit shown by suffix e.g.	ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW14**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***1.2.2011***

Principal:

Date completed: ***1.2.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***CA***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model & mounting: Gemco 210B, Trailer | Easting: 298093.35 | slope: -90° | R.L. Surface: 2.07

hole diameter: 125mm | Northing: 6146938.44 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
HAMMER		C	▼			0	2		CL	**Sandy CLAY:** Medium plasticity, black/dark grey, fine to medium grained sand, with some silt and shells, with trace roots.	<Wp	St/VSt	ALLUVIAL
											>Wp	S	
						-2	4			Borehole terminated at 4m			
						-4	6						
						-6	8						
						-8	10						
							12						

PIEZOMETER ENAUWOLL04009AE - LOGS.GPJ COFFEY.GDT 13.4.11

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method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. ***MW15***

Sheet 1 of 1

Office Job No.: ***ENAUWOLL04009AE***

Client: ***TRUenery Tallawarra***

Date started: ***4.2.2011***

Principal:

Date completed: ***4.2.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***CA***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model & mounting: HAND AUGER | Easting: 298379.07 | slope: -90° | R.L. Surface: 0.62

hole diameter: 100 | Northing: 6176480.34 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
HA		N	▼			0			CH	**FILL; Clayey SILT:** Dark grey/brown, low plasticity clay, with some roots.	<Wp	F	FILL; FLYASH
									CL	**CLAY:** High plasticity, dark grey, with some sand and roots.	>Wp		ALLUVIAL
										Sandy CLAY: Medium plasticity, dark grey/brown, fine to medium grained sand.			
						-2	2			Borehole terminated at 1.5m			
						-4	4						
						-6	6						
						-8	8						
						-10	10						
							12						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

PIEZOMETER ENAUWOLL04009AE - LOGS.GPJ COFFEY.GDT 13.4.11

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coffey environments

Engineering Log - Piezometer

Borehole No. ***MW16***

Sheet 1 of 1

Office Job No.: ***ENAUWOLL04009AE***

Client: ***TRUenery Tallawarra***

Date started: ***31.1.2011***

Principal:

Date completed: ***31.1.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***CA***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model & mounting: Gemco 210B, Trailer | Easting: 297878.68 | slope: -90° | R.L. Surface: 1.30

hole diameter: 125mm | Northing: 6176242.93 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADV		C	▼			0	2		CH	**CLAY:** High plasticity, dark grey/grey, with some silt, fine grained sand and shells.	>Wp	S/F	ALLUVIAL
						-2	4						
						-4	6						Well installed to 5.50m
						-6	8			Borehole terminated at 6m			
						-8	10						
						-10	12						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

PIEZOMETER ENAUWOLL04009AE - LOGS.GPJ COFFEY.GDT 13.4.11

Form GEO 5.10 Issue 3 Rev.0

coffey environments

Engineering Log - Piezometer

Borehole No. ***MW17***

Sheet 1 of 1

Office Job No.: ***ENAUWOLL04009AE***

Client: ***TRUenery Tallawarra***

Date started: ***31.1.2011***

Principal:

Date completed: ***31.1.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***CA***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model & mounting: Gemco 210B, Trailer | Easting: 297773.55 | slope: -90° | R.L. Surface: 1.38

hole diameter: 125mm | Northing: 6176163.14 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADV		C	▼			0	2		CL	**Sandy CLAY:** Medium plasticity, dark grey/grey, with some silt and broken shells, with trace roots.	>Wp	S	ALLUVIAL
						-2	4						
						-4	6			Borehole terminated at 5m			
						-6	8						
						-8	10						
						-10	12						

PIEZOMETER ENAUWOLL04009AE - LOGS.GPJ COFFEY.GDT 13.4.11

Form GEO 5.10 Issue 3 Rev.0

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Piezometer

Borehole No. **MW18**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***31.1.2011***

Principal:

Date completed: ***31.1.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***CA***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model & mounting: Gemco 210B, Trailer | Easting: 297113.35 | slope: -90° | R.L. Surface: 4.89

hole diameter: 125mm | Northing: 6176542.02 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADT		N				4	2		CL	**CLAY:** Medium plasticity, orange/brown, with some silt, roots and fine grained sand.	<Wp	VSt	RESIDUAL SOIL
						2			CL	**Sandy CLAY:** Medium plasticity, orange/brown, with some silt, with a trace of fine grained angular gravel.		H	
						0	4				Wp	F	
						-2	6			**SANDSTONE:** Extremely to highly weathered rock, orange/brown with grey, with some fine to coarse grained angular sandstone gravel.	D/M	H	XW/HW SANDSTONE (BERRY SILTSTONE)
						-4	8			Borehole terminated at 6m			Well installed to 5.8m
						-6	10						
							12						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
DT	diatube
B	blank bit
V	V bit
T	TC bit
TBX	Tubex

*bit shown by suffix e.g. ADT

support

C casing N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer
ALT	air lift test

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

PIEZOMETER ENAUWOLL04009AE - LOGS.GPJ COFFEY.GDT 13.4.11

Form GEO 5.10 Issue 3 Rev.0

Appendix C
Test Pit Logs

coffey environments

Engineering Log - Excavation

Excavation No. ***CTP87***

Sheet 1 of 1

Office Job No.: ***ENAUWOLL04009AE***

Client: ***TRUenery Tallawarra***

Date started: ***18.4.2011***

Principal:

Date completed: ***18.4.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Test pit location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

equipment type and model: BACKHOE | Pit Orientation: | Easting: 298747 m | R.L. Surface: NOT MEASURED

excavation dimensions: 2m long 0.45m wide | Northing: 6176662 m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N	NONE OBSERVED	E		0.5			**FILL; GRAVEL:** Fine to coarse grained, black, sub-angular to angular gravel, with a trace of coarse grained sand and silt. ...Increasing coarse grained sand component	M	MD		COALWASH
						1.0							
				E		1.5			...Traces of red clay clumps observed at 1.4m - 1.6m.				
									Test pit CTP87 terminated at 1.6m				
						2.0							
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration
1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Excavation

Excavation No. **CTP88**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***18.4.2011***

Principal:

Date completed: ***18.4.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Test pit location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

equipment type and model: BACKHOE | Pit Orientation: | Easting: 298549 m | R.L. Surface: NOT MEASURED

excavation dimensions: 2m long 0.45m wide | Northing: 6126798 m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N				0.5			**FILL; CLAY:** Medium plasticity, orange/brown, with some organics (rootlets), with a trace of fine to medium grained sand.	>Wp	St		FILL - Grass cover No odour
											MD		COALWASH No odour
				E		1.0			**FILL; GRAVEL:** Fine to coarse grained, black, sub-angular to angular, with some coarse grained sand.	M	L/MD		ASH No odour
						1.5			**FILL; SILT:** Grey, with a trace of fine grained sand.				
						2.0							
						2.5							
						3.0							
			▶			3.5							
				E						W			...Wet ash observed at 3.5m. No odour in saturated zone
						4.0			Test pit CTP88 terminated at 3.7m				
						4.5							
						5.0							

Sketch

method

N	natural exposure
X	existing excavation
BH	backhoe bucket
B	bulldozer blade
R	ripper
E	excavator

support

S shoring N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
V	vane shear (kPa)
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Excavation

Excavation No. ***CTP89***

Sheet 1 of 1

Office Job No.: ***ENAUWOLL04009AE***

Client: ***TRUenery Tallawarra***

Date started: ***18.4.2011***

Principal:

Date completed: ***18.4.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Test pit location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

equipment type and model: BACKHOE | Pit Orientation: | Easting: 297729 m | R.L. Surface: NOT MEASURED

excavation dimensions: 2m long 0.45m wide | Northing: 6176086 m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N	NONE OBSERVED	E		0.5			**FILL; Sandy GRAVEL:** Fine to coarse grained, black, sub-angular to angular, medium to coarse grained sand, with some silt. ...Cobbles (60-150mm) observed from 0.3m - 2.0m.	M	MD		COALWASH Some grass cover and rootlets to 0.6m
						1.0							
						1.5							
				E		2.0							
						2.5			Test pit CTP89 terminated at 2m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration
1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Excavation

Excavation No. ***CTP90***

Sheet 1 of 1

Office Job No.: ***ENAUWOLL04009AE***

Client: ***TRUenery Tallawarra***

Date started: ***18.4.2011***

Principal:

Date completed: ***18.4.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Test pit location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

equipment type and model: BACKHOE | Pit Orientation: | Easting: 297785 m | R.L. Surface: NOT MEASURED

excavation dimensions: 2m long 0.45m wide | Northing: 6176394 m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N	NONE OBSERVED	E		0.5			**FILL; Sandy GRAVEL:** Fine to medium grained, black, angular, fine to coarse grained sand, with some silt, and cobbles.	M	MD		COALWASH Some grass cover, rootlets to depth of 0.6m.
						1.0			...Increasing coarse grained gravel and cobbles (60-200mm) with depth from 1.0m.				
				E		1.5							
						2.0							
						2.5			Test pit CTP90 terminated at 2m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration
1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Excavation

Excavation No. ***CTP91***

Sheet 1 of 1

Office Job No.: ***ENAUWOLL04009AE***

Client: ***TRUenery Tallawarra***

Date started: ***18.4.2011***

Principal:

Date completed: ***18.4.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Test pit location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

equipment type and model: BACKHOE | Pit Orientation: | Easting: 297591 m | R.L. Surface: NOT MEASURED

excavation dimensions: 2m long 0.45m wide | Northing: 6176314 m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N				0.0			**FILL; Silty GRAVEL:** Fine to medium grained, angular to sub-angular gravel, with some fine to coarse grained sand and organics (rootlets to 0.1m).	M	D		COALWASH Grassed cover
									FILL; Sandy SILT: Pale grey, fine grained sand, with some clay.		D/St		FILL/ASH
				E		0.5							
						1.0							
			▶			1.5				W			Saturated at 1.5m
				E									
								CL/CH	**CLAY:** Medium to high plasticity, black, with a trace of fine grained sand.	>Wp	S/F		ALLUVIAL/ESTUARINE Strong organic odour
						2.0		CL/CH	**CLAY:** Medium to high plasticity, brown/orange.				
									Test pit CTP91 terminated at 2.1m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration
1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Excavation

Excavation No. **CTP92**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***18.4.2011***

Principal:

Date completed: ***18.4.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Test pit location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

equipment type and model: BACKHOE | Pit Orientation: | Easting: 297541 m | R.L. Surface: NOT MEASURED

excavation dimensions: 2m long 0.45m wide | Northing: 6176705 m | datum:

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa (100 200 300 400)	structure and additional observations
BH		N			0.5			**FILL; Sandy SILT:** Pale grey, fine grained sand, with some clay.	M	D		ASH No odour
				E								
			▶		1.0				W			...Saturated at 0.9m
				E								
							CL/CH	**CLAY:** Medium to high plasticity, dark grey/brown, wiht some fine to coarse grained sand.	>Wp	St		ALLUVIAL/ESTUARINE
					1.5			Test pit CTP92 terminated at 1.5m				
					2.0							
					2.5							

Sketch

method

N	natural exposure
X	existing excavation
BH	backhoe bucket
B	bulldozer blade
R	ripper
E	excavator

support

S shoring N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
V	vane shear (kPa)
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Excavation

Excavation No. **CTP93**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***18.4.2011***

Principal:

Date completed: ***18.4.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Test pit location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

equipment type and model: HAND SHOVEL | Pit Orientation: | Easting: 298371 m | R.L. Surface: NOT MEASURED

excavation dimensions: 0.5m long 0.5m wide | Northing: 6176489 m | datum:

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa (100 200 300 400)	structure and additional observations
HAND SHOVEL		N					CL	**TOPSOIL:** Mostly organic matter (leaves and rootlets)	M	L		TOPSOIL
								Sandy CLAY: Medium plasticity, dark grey/red/brown, medium to coarse grained sand, with some grey ash from 0.1-0.2m.	>Wp	F/St		ALLUVIAL/ESTUARINE Organic odour
					0.5		SC	**Clayey SAND:** Medium to coarse grained, dark grey.	M/W	L/MD		
				E					W			
								Test pit CTP93 terminated at 0.7m				
					1.0							
					1.5							
					2.0							
					2.5							

Sketch

method

N	natural exposure
X	existing excavation
BH	backhoe bucket
B	bulldozer blade
R	ripper
E	excavator

support

S shoring N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
V	vane shear (kPa)
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Excavation

Excavation No. **CTP94**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***18.4.2011***

Principal:

Date completed: ***18.4.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Test pit location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

equipment type and model: BACKHOE | Pit Orientation: | Easting: 297776 m | R.L. Surface: NOT MEASURED

excavation dimensions: 2m long 0.45m wide | Northing: 6176176 m | datum:

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa (100 200 300 400)	structure and additional observations
BH		N			0.0		CL/CH	**CLAY:** Medium to high plasticity, dark brown, with some organics from 0.0-0.3m (rootlets and fibres)	>Wp	S/F		ALLUVIAL/ESTUARINE Grassed cover, rootlets to 0.3m New testpit to retrieve shallower sample (0.4-0.5m)
				E	0.5							
			▶	E	1.0		CL	**Sandy CLAY:** Low to medium plasticity, pale grey, fine to medium grained sand, with some silt.				ALLUVIAL/ESTUARINE Moderate organic odour
								Test pit CTP94 terminated at 1m				
					1.5							
					2.0							
					2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration
1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

TESTPIT ENAUWOLL04009AE - LOGS.GPJ COFFEY.GDT 2.5.11

Form GEO 5.2 Issue 3 Rev.2

Appendix D
Hand Auger Logs

coffey environments

Engineering Log - Borehole

Borehole No.	***HA1***
Sheet	1 of 1
Office Job No.:	***ENAUWOLL04009AE***
Client:	***TRUenery Tallawarra***
Date started:	***23.8.2011***
Principal:	
Date completed:	***23.8.2011***
Project:	***Groundwater Modelling Assessment***
Logged by:	***AJW***
Borehole Location:	***Yallah Bay Road, Yallah NSW***
Checked by:	***CDC***

drill model and mounting:	Hand Auger	Easting:	297759	slope:	-90°	R.L. Surface:	NOT MEASURED
hole diameter:	100 mm	Northing	6176176	bearing:		datum:	

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
HA		N	▶						**TOPSOIL; Sandy CLAY:** Low plasticity, dark brown, fine to coarse grained sand, with some silt and organic matter (leaf litter).	M/W	S		TOPSOIL Grassed surface
										W	MD		FILL
								CH	**FILL; Sandy GRAVEL:** Fine to coarse grained, black, sub-angular to sub-rounded gravel comprises of coalwash, fine to coarse grained sand. **CLAY:** High plasticity, dark brown/grey, with a trace of fine to medium grained sand.	>Wp	F/St		ALLUVIAL/ESTUARINE Moderate organic odour
						0.5							
								CL	**Sandy CLAY:** Low to medium plasticity, grey, fine to medium grained sand. ...Becoming yellow sandy clay in parts from 0.8m.				ALLUVIAL/ESTUARINE
				E+QC1		1.0							
									Borehole HA1 terminated at 1m				
						1.5							
						2.0							
						2.5							
						3.0							
						3.5							
						4.0							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Borehole

Borehole No.	***HA2***
Sheet	1 of 1
Office Job No.:	***ENAUWOLL04009AE***
Client: ***TRUenery Tallawarra***	Date started: ***23.8.2011***
Principal:	Date completed: ***23.8.2011***
Project: ***Groundwater Modelling Assessment***	Logged by: ***AJW***
Borehole Location: ***Yallah Bay Road, Yallah NSW***	Checked by: ***CDC***

drill model and mounting: Hand Auger | Easting: 297813 | slope: -90° | R.L. Surface: NOT MEASURED

hole diameter: 100 mm | Northing 6176170 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
HA		N				0.0			**TOPSOIL; CLAY:** Low to medium plasticity, dark brown/black, with some silt and some organic matter (rootlets).	>Wp	S		TOPSOIL Grassed surface Moderate to strong organic odour
						0.5		CL/CH	**CLAY:** Medium to high plasticity, dark grey/dark brown, with a trace of silt.		F/St		ALLUVIAL/ESTUARINE Moderate organic odour
								CL	**Sandy CLAY:** Low to medium plasticity, pale grey/yellow, fine to medium grained sand.		F		Weak organic odour
				E					...Wet sandy clay observed from 0.8m. ...Becoming clayey sand, (low plasticity clay and medium to coarse grained sand), pale grey from 0.85m	W			
						1.0			Borehole HA2 terminated at 0.95m				
						1.5							
						2.0							
						2.5							
						3.0							
						3.5							
						4.0							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

BOREHOLE ENAUWOLL04009AE - LOGS.GPJ COFFEY.GDT 3.20.12

Form GEO 5.3 Issue 3 Rev.2

coffey environments

Engineering Log - Borehole

Borehole No.	***HA3***
Sheet	1 of 1
Office Job No.:	***ENAUWOLL04009AE***
Client:	***TRUenery Tallawarra***
Date started:	***23.8.2011***
Principal:	
Date completed:	***23.8.2011***
Project:	***Groundwater Modelling Assessment***
Logged by:	***AJW***
Borehole Location:	***Yallah Bay Road, Yallah NSW***
Checked by:	***CDC***

drill model and mounting: Hand Auger | Easting: 297871 | slope: -90° | R.L. Surface: NOT MEASURED

hole diameter: 100 mm | Northing 6176149 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
HA		N	▶						**TOPSOIL; CLAY:** Low to medium plasticity, dark brown/black, with some silt and organic matter (grass rootlets).	W	S		TOPSOIL Grassed surface Moderate organic odour
				E				CL	**Sandy CLAY:** Low to medium plasticity, pale grey/yellow, fine to medium grained sand.	>Wp	F		ALLUVIAL/ESTUARINE No odour
						0.5		SP	...Becoming clayey sand at 0.4m.	W	D		
				E					**SAND:** Medium to coarse grained, pale grey/pale brown, with some clay.				
									Borehole HA3 terminated at 0.7m				
						1.0							
						1.5							
						2.0							
						2.5							
						3.0							
						3.5							
						4.0							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey environments

Engineering Log - Borehole

Borehole No. **HA4**

Sheet 1 of 1

Office Job No.: **ENAUWOLL04009AE**

Client: ***TRUenery Tallawarra***

Date started: ***23.8.2011***

Principal:

Date completed: ***23.8.2011***

Project: ***Groundwater Modelling Assessment***

Logged by: ***AJW***

Borehole Location: ***Yallah Bay Road, Yallah NSW***

Checked by: ***CDC***

drill model and mounting: Hand Auger | Easting: 297778 | slope: -90° | R.L. Surface: NOT MEASURED

hole diameter: 100 mm | Northing 6176175 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
HA		N	▶						**TOPSOIL; CLAY:** Low to medium plasticity, dark brown/black, with some organic matter (grass rootlets) and some silt.	>Wp	S		TOPSOIL Moderate organic odour
				E		0.5		CL/CH	**Sandy CLAY:** Medium to high plasticity, pale grey/pale yellow in parts, fine to medium grained sand.		St		ALLUVIAL/ESTUARINE
				E		1.0		CL	**Sandy CLAY:** Low to medium plasticity, grey (yellow mottled in parts), fine to medium grained sand.		F/St		
									Borehole HA4 terminated at 1m				
						1.5							
						2.0							
						2.5							
						3.0							
						3.5							
						4.0							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Appendix E
Chain of Custody Documentation

coffey

Chain of Custody

Laboratory Quotation / Order No: ENAUWOLL04009AE

Job No:

No: 27895

Sheet of

Dispatch to: (Address & Phone No.) SGS ENVIRONMENTAL 16/33 Maddox Street, Alexandria 2015	Sampled by: Chris Appelkamp	Consigning Officer: Date Dispatched:
Attention: Sample Receipt	Project Manager: (report results to) Corrina Decastro	Courier Service: M+B Consignment Note No: 358438

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			CP	16/2/11	1pm

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analyses Required: PAHs	TPHs	MAHs = BTEX	Metals: *	Total Nitrogen	TKN	Nitrate	Nitrite	Ammonia	Sample Condition on Receipt
	A	1 x 1L unpreserved	MW09 1	15/2/11										
		1 x Metals	QC01 2											
			MW11 3											
	water		SW7 4											
			MW14 5											
			MW15 6											
			MW05 7											

SGS
Received 16/2/11 CP
Time 1pm
Samples intact
Cooler Pack
Temperature on Receipt 4
Storage Location W077
SE35496

Special Laboratory Instructions: * Dissolved metals (7 - As, Cd, Cr, Cu, Ni, Pb, Zn + Molybdenum (Mo))

Detection Limits:

Turnaround Required:

JOB NUMBER **MUST** BE REFERENCED ON ALL SUBSEQUENT PAGES

6422009-06

coffey

Chain of Custody

Laboratory Quotation / Order No:

ENAUWOLL04009AE

No: 27896

Job No:

Sheet of

Dispatch to (Address & Phone No.): SGS 16/33 Maddox St Alexandria	Sampled by: CHRIS APPLEKAMP	Consigning Officer: / Date Dispatched:
Attention: Sample receipt	Project Manager: (report results to) Corrina Decastro	Courier Service: M+B / Consignment Note No: 367004

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Chris Applekamp	16/2/2011	5pm	[illegible]	17/2/11	230pm

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	PAHs	TPHs	MAHs = BTEX	Metals: *	Total Nitrogen	TKN	Nitrate	Nitrite	Ammonia	Sample Condition on Receipt
	Water	1x1L unpreserved 1x metals	1 MW18	16/2/11				/	/	/	/	/	/	
			2 TA6M-DUP					/	/	/	/	/	/	
			3 MW3					/	/	/	/	/	/	
			4 SW8					/	/	/	/	/	/	
			5 MW04					/	/	/	/	/	/	
			6 MW17					/	/	/	/	/	/	
			7 MW16					/	/	/	/	/	/	
			8 MW01					/	/	/	/	/	/	
			9 MW02					/	/	/	/	/	/	
			10 QC03					/	/	/	/	/	/	

SGS
Received 17/2/11
By GP
Time 230
Samples Intact (Y)
Esky/Cooler Pack (Y)
Temperature on Receipt 4°C
Storage Location W088-089
SE-85547

Special Laboratory Instructions: * Dissolved metals (7 - As, Cd, Cr, Cu, Ni, Pb, Zn + Molybdenum(Mo))

Detection Limits:

Turnaround Required:

JOB NUMBER **MUST** BE REFERENCED ON ALL SUBSEQUENT PAGES

8422/09-06

Copies: **WHITE:** Sign on release. **YELLOW:** If dispatched to interstate Lab, Lab to sign on receipt and fax back to Coffey. **BLUE:** To be returned with results.

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Chain of Custody

Laboratory Quotation / Order No: ENAWOLL04009AE

NO: 27897

Job No:

Sheet of

Dispatch to: (Address & Phone No.) SGS ENVIRONMENTAL 16/33 Maddox St, Alexandria NSW	Sampled by: CHRIS APPELKAMP / CORINNA DECASTRO	Consigning Officer: Date Dispatched: 24/2/2011
Attention: Sample Receipt	Project Manager: (report results to) CORINNA DECASTRO	Courier Service: M+B Consignment Note No: 359727

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
CHRIS APPELKAMP	24/2/2011	4pm	CP	25/2/11	9am

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analyses Required: PAHs	TPHs	MAHs = BTEX	Metals: *	Total Nitrogen	TKN	Nitrate	Nitrite	Ammonia	Sample Condition on Receipt
2 locations, NO QA	Water	1x 250ml Unpres. & 1x Nitric acid Pres.	MW06 1	24/2/2011				/	/	/	/	/	/	
	"	"	MW08 2					/	/	/	/	/	/	

SGS
Received 25/2/11
By CP
Time 9
Samples Intact
Ice/Cooler Pack
Temperature on Receipt 4°
Storage Location W123-124
SGS Ref No. SE-85743

Special Laboratory Instructions: * Dissolved Metals (7 - As, Cd, Cr, Cu, Ni, Pb, Zn & Molybdenum (Mo))

Detection Limits:

Turnaround Required:

JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGES

Copies: WHITE: Sign on release. YELLOW: If dispatched to interstate Lab, Lab to sign on receipt and fax back to Coffey. BLUE: To be returned with results.

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Chain of Custody

No: 27898

Laboratory Quotation / Order No:

Job No: EW04009AE Sheet of

Dispatch to: (Address & Phone No.) SGS ENVIRONMENTAL 1633 Maddox St, Alexandria	Sampled by: CHRIS Appelkamp	Consigning Officer: / Date Dispatched:
Attention: Sample receipt	Project Manager: (report results to) Corinna Decastro	Courier Service: M and B / Consignment Note No: 367011

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
CHRIS Appelkamp	8/3/2011	2pm	CP	9/3/11	1130am

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	PAHs	TPHs	MAHs = BTEX	Metals: *	Total Nitrogen	TKN	Nitrate	Nitrite	Ammonia	Sample Condition on Receipt
	Water	1x 1L unpreserved 1x metals	MW10	8/3/2011										

SGS
Received 9/3/11
By CP
Time 1130
Samples Intact
Ice/Cooler Pack
Temperature on Receipt 5
Storage Location WH77
SGS Ref No. SE86052

Special Laboratory Instructions: * Dissolved metals ((7-As, Cd, Cr, Cu, Ni, Pb, Zn + Molybdenum (Mo)))

Detection Limits:

Turnaround Required:

JOB NUMBER **MUST** BE REFERENCED ON ALL SUBSEQUENT PAGES

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Copies: WHITE: Sign on release. YELLOW: If dispatched to interstate Lab, Lab to sign on receipt and fax back to Coffey. BLUE: To be returned with results.

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Chain of Custody

No: 28873

Laboratory Quotation / Order No:

Job No: ENAWOLL04009AE

Sheet 1 of

Dispatch to: (Address & Phone No.) SGS Laboratory 16/33 Maddox Street ALEXANDRIA NSW 2015	Sampled by: Alexander Williams	Consigning Officer: A. Williams Date Dispatched: 19/4/11
Attention: Sample Receipt	Project Manager: (report results to) Corinna De Castro	Courier Service: ME B Couriers Consignment Note No: 367027

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
A-Williams	7:00AM	19/4/11		19/4/11	11:50 am

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	PAHs	TPHs	MAHs = BTEX	Metals: *	Nitrogen **	ASLP ***	Sample Condition on Receipt
	SOIL	Ice; 250ml Jar	1 CTP87/0.5-0.6	18/4/11				✓	✓	✓	
			2 CTP87/1.4-1.6								
			3 CTP88/0.6-0.8								
			4 CTP88/3.5-3.7								
			5 CTP89/0.5-0.6								
			6 CTP89/1.8-2.0								
			7 CTP90/0.5-0.6								
			8 CTP90/1.8-2.0								
			9 CTP91/0.6-0.8								
			10 CTP91/1.6-1.8								
			11 CTP92/0.6-0.8								
			12 CTP92/1.0-1.1								
			13 ~~CTP93~~/QC2								
			14 QC3								

SGS
Received 19/4/11
Time 11:50
Cooler Pack
Temperature on receipt
SE87114
SO18-019

Special Laboratory Instructions: * Metals (As, Cd, Cr, Cu, Pb, Mo, Ni, Zn) ** Nitrogen suite (Ammonium, Nitrate, Nitrite, TKN, Total Nitrogen)
*** ASLP (Australian Standard Leachate Procedure) - Use deionised water - Analysis for both metals & nitrogen suite.

Detection Limits: Use Del.

Turnaround Required: (5 days)

JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGES

Copies: WHITE: Sign on release. YELLOW: If dispatched to interstate Lab, Lab to sign on receipt and fax back to Coffey. BLUE: To be returned with results.

64220/9-06

coffey

Chain of Custody

No: 28875

Laboratory Quotation / Order No:

Job No: ENAUWOLL00400AE Sheet of

Dispatch to: (Address & Phone No.) SGS Laboratory 16/33 Maddox Street ALEXANDRIA NSW 2015	Sampled by: Alexander Williams	Consigning Officer: A. Williams Date Dispatched: 19/4/11
Attention: Sample Receipt	Project Manager: (report results to) Corinna De Castro	Courier Service: ME B Courier Consignment Note No: 367027

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
A. Williams	7:00AM	19/4/11	K. L	19/4/11	11:50

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analyses Required: PAHs	TPHs	MAHs = BTEX	Metals: *	Nitrogen **	ASLP ***	Sample Condition on Receipt
	SOIL	Ice; 250mL Jar	15 CTP93/0.6-0.7	18/4/11				✓	✓	✓	
			16 CTP94/0.4-0.5					✓	✓	✓	
			17 CTP94/0.8-1.0					✓	✓	✓	
			18 QC1					✓	✓	✓	

SGS
Received 19/4/11
Time 11.30 am
Samples intact ✓
Cool/Ice Pack ✓
Temperature on Receipt 4
Storage Location 5018-19
SE071147A

Special Laboratory Instructions: * Metals (As, Cd, Cr, Cu, Pb, Mo, Ni, Zn) ** Nitrogen suite (Ammonium, Nitrate, Nitrite, TKN, Total Nitrogen)
*** Australian Standard Leachate Procedure - Use deionised water - Analysis for both metals & nitrogen suite.

Detection Limits:

Turnaround Required: 5 days

JOB NUMBER **MUST** BE REFERENCED ON ALL SUBSEQUENT PAGES

64220/9.06

Copies: WHITE: Sign on release YELLOW: If dispatched to interstate Lab, Lab to sign on receipt and fax back to Coffey BLUE: To be returned with results

coffey

Chain of Custody

No: 28892

Laboratory Quotation / Order No:

Job No: ENAWOLL04009AE

Sheet 1 of 1

Dispatch to: (Address & Phone No.) SGS Laboratory 16/33 Maddox St ALEXANDRIA NSW 2015	Sampled by: Alexander Williams	Consigning Officer: A. Williams Date Dispatched: 24/8/11
Attention: Sample Receipt	Project Manager: (report results to) Corinna DeCastro	Courier Service: M & B Couriers Consignment Note No: 400636

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
A. Williams	24/8/11	7:00AM		24/08	9.00

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	PAHs	TPHs	MAHs = BTEX	Metals:	TOC	CEC *	Nitrogen **								HOLD	Sample Condition on Receipt
1	SOIL	Ice; 250mL jar	HA1/0.8-1.0	23/8/11					X	X	X									
2			HA2/0.8-0.9						X	X	X									
3			HA3/0.3-0.4																X	
4			HA3/0.6-0.7						X	X	X									
5			HA4/0.45-0.55																X	
6			HA4/0.8-1.0						X	X	X									
7			QC1						X	X	X									
8			QC2																X	

Received 24/08/11
By SS
Time 9.00 am
Samples Intact
Esky/Cooler Pack
Temperature on Receipt 4°C
Sensor SG675
SE 89563

Special Laboratory Instructions: * CEC - Cation Exchange Capacity
** Nitrogen (Ammonium, Nitrate, Nitrite, TKN, Total Nitrogen)

Detection Limits: Standard

Turnaround Required: (5 day)

Analysis TBA

Please refer to analysis in red above.

JOB NUMBER **MUST** BE REFERENCED ON ALL SUBSEQUENT PAGES

Copies: **WHITE:** Sign on release. **YELLOW:** If dispatched to interstate Lab, Lab to sign on receipt and fax back to Coffey. **BLUE:** To be returned with results.

8402/09-06

Appendix F
Laboratory Reports

ANALYTICAL REPORT

1 March 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna de Castro**

Your Reference: ENAUWOLL04009AE

Our Reference: SE85496-R

Samples: 7 Waters
Received: 16/2/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

This report cancels and supersedes report No. SE85496 issued on 23/02/11 by SGS Environmental Services due to the addtion of report comment.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Dong Liang
Quality Manager

Snezana Kostoka
Chemist

SGS Australia Pty Ltd
ABN 44 000 964 278
Environmental Services Unit 16/33 Maddox Street Alexandria NSW 2015 Australia
t +61 (0)2 8594 0400 f + 61 (0)2 8594 0499 www.au.sgs.com

Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85496-R -1 MW09 Water 15/02/2011	SE85496-R -2 QC01 Water 15/02/2011	SE85496-R -3 MW11 Water 15/02/2011	SE85496-R -4 SW7 Water 15/02/2011	SE85496-R -5 MW14 Water 15/02/2011
Date Extracted		17/02/2011	17/02/2011	17/02/2011	17/02/2011	17/02/2011
Date Analysed		21/02/2011	21/02/2011	21/02/2011	21/02/2011	21/02/2011
Nitrate as N	mg/L	<0.25	<0.25	<0.025	<0.025	<0.25

Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85496-R -6 MW15 Water 15/02/2011	SE85496-R -7 MW05 Water 15/02/2011
Date Extracted		17/02/2011	17/02/2011
Date Analysed		21/02/2011	21/02/2011
Nitrate as N	mg/L	<0.25	<0.25

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85496-R-1 MW09 Water 15/02/2011	SE85496-R-2 QC01 Water 15/02/2011	SE85496-R-3 MW11 Water 15/02/2011	SE85496-R-4 SW7 Water 15/02/2011	SE85496-R-5 MW14 Water 15/02/2011
Date Extracted (Ammonia)		17/02/2011	17/02/2011	17/02/2011	17/02/2011	17/02/2011
Date Analysed (Ammonia)		17/02/2011	17/02/2011	17/02/2011	17/02/2011	17/02/2011
Ammonia as N	mg/L	1.3	10	0.33	0.08	15
Date Extracted (NO_2)		17/02/2011	17/02/2011	17/02/2011	17/02/2011	17/02/2011
Date Analysed (NO_2)		17/02/2011	17/02/2011	17/02/2011	17/02/2011	17/02/2011
Nitrite as N	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Date Extracted (TKN)		21/02/2011	21/02/2011	21/02/2011	21/02/2011	21/02/2011
Date Analysed (TKN)		21/02/2011	21/02/2011	21/02/2011	21/02/2011	21/02/2011
Total Kjeldahl Nitrogen	mg/L	2.60	10.5	0.810	4.80	17.0
Total Nitrogen (by calc.)	mg/L	2.60	10.5	0.810	4.80	17.0

Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85496-R-6 MW15 Water 15/02/2011	SE85496-R-7 MW05 Water 15/02/2011
Date Extracted (Ammonia)		17/02/2011	17/02/2011
Date Analysed (Ammonia)		17/02/2011	17/02/2011
Ammonia as N	mg/L	20	9.2
Date Extracted (NO_2)		17/02/2011	17/02/2011
Date Analysed (NO_2)		17/02/2011	17/02/2011
Nitrite as N	mg/L	<0.005	<0.005
Date Extracted (TKN)		21/02/2011	21/02/2011
Date Analysed (TKN)		21/02/2011	21/02/2011
Total Kjeldahl Nitrogen	mg/L	42.0	12.0
Total Nitrogen (by calc.)	mg/L	42.0	12.0

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Trace HM (ICP-MS)-Dissolved Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85496-R -1 MW09 Water 15/02/2011	SE85496-R -2 QC01 Water 15/02/2011	SE85496-R -3 MW11 Water 15/02/2011	SE85496-R -4 SW7 Water 15/02/2011	SE85496-R -5 MW14 Water 15/02/2011
Date Extracted (Metals-ICPMS)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Date Analysed (Metals-ICPMS)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Arsenic	µg/L	52	49	4	1	1
Cadmium	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/L	<5	<5	<5	<5	<5
Copper	µg/L	33	38	<1	<1	<1
Nickel	µg/L	<5	6	<5	<5	<5
Lead	µg/L	9	6	5	<1	<1
Zinc	µg/L	160	69	19	30	30
Molybdenum	µg/L	<1	<1	27	<1	4

Trace HM (ICP-MS)-Dissolved Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85496-R -6 MW15 Water 15/02/2011	SE85496-R -7 MW05 Water 15/02/2011
Date Extracted (Metals-ICPMS)		18/02/2011	18/02/2011
Date Analysed (Metals-ICPMS)		18/02/2011	18/02/2011
Arsenic	µg/L	3	55
Cadmium	µg/L	<0.5	<0.5
Chromium	µg/L	<5	<5
Copper	µg/L	<1	50
Nickel	µg/L	<5	5
Lead	µg/L	<1	7
Zinc	µg/L	40	73
Molybdenum	µg/L	2	1

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Method ID	Methodology Summary
SEI-038	Water Soluble Chloride After carrying out a 1:5 soil:water extraction, an aliquot of the extract is reacted with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference NEPM, Schedule B(3), 401 and APHA 4500Cl- Water Soluble Sulphate After carrying out a 1:5 soil:water extraction ,sulphate in the extract is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulphate concentration in the sample. Reference NEPM, Schedule B(3), 401 and APHA 4500-SO42-.
SEI-037	Ammonia - Determined by salicylate colourimetric method using Discrete Analyser.
AN277	Nitrite as N - determined by colourimetric technique using discrete analyser. Based on APHA 21st Edition, 4500-NO2-B.
AN292	Total Kjeldahl Nitrogen (TKN) - Determined by colourimetric technique using discrete analyser following digestion with Sulphuric Acid, K2SO4 and CuSO4. Based on APHA 21st Edition, 4500-Norg D / USEPA 351.2.
SEI-103	Total Nitrogen - The sum of Nitrate, Nitrite and Total Kjeldahl Nitrogen.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				17/02/11	SE85496-1	17/02/2011 || 17/02/2011	LCS	17/02/11
Date Analysed				21/02/11	SE85496-1	21/02/2011 || 21/02/2011	LCS	21/02/11
Nitrate as N	mg/L	0.005	SEI-038	<0.005	SE85496-1	<0.25 || <0.25	LCS	98%

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N	mg/L	0.01	SEI-037	<0.01	SE85496-1	1.3 || 1.3 || RPD: 0	LCS	106%
Date Extracted (NO_2)				17/02/2011	SE85496-1	17/02/2011 || 17/02/2011	LCS	17/02/2011
Date Analysed (NO_2)				17/02/2011	SE85496-1	17/02/2011 || 17/02/2011	LCS	17/02/2011
Nitrite as N	mg/L	0.005	AN277	<0.005	SE85496-1	<0.005 || <0.005	LCS	103%
Date Extracted (TKN)				21/02/2011	SE85496-1	21/02/2011 || [N/T]	LCS	21/02/2011
Date Analysed (TKN)				21/02/2011	SE85496-1	21/02/2011 || [N/T]	LCS	21/02/2011
Total Kjeldahl Nitrogen	mg/L	0.2	AN292	<0.200	SE85496-1	2.60 || [N/T]	LCS	103%
Total Nitrogen (by calc.)	mg/L	0.2	SEI-103	<0.200	SE85496-1	2.60 || [N/T]	[NR]	[NR]

QUALITY CONTROL Trace HM (ICP-MS)-Dissolved	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals-ICPMS)				<5	SE85496-1	18/02/2011 || 18/02/2011	SE85496-2	18/02/2011
Date Analysed (Metals-ICPMS)				<5	SE85496-1	18/02/2011 || 18/02/2011	SE85496-2	18/02/2011
Arsenic	µg/L	1	AN318	<1	SE85496-1	52 || 52 || RPD: 0	SE85496-2	105%
Cadmium	µg/L	0.1	AN318	<0.1	SE85496-1	<0.5 || <0.5	SE85496-2	85%
Chromium	µg/L	1	AN318	<1	SE85496-1	<5 || <5	SE85496-2	93%
Copper	µg/L	1	AN318	<1	SE85496-1	33 || 33 || RPD: 0	SE85496-2	96%
Nickel	µg/L	1	AN318	<1	SE85496-1	<5 || <5	SE85496-2	87%
Lead	µg/L	1	AN318	<1	SE85496-1	9 || 9 || RPD: 0	SE85496-2	90%
Zinc	µg/L	1	AN318	<1	SE85496-1	160 || 160 || RPD: 0	SE85496-2	105%
Molybdenum	µg/L	1	AN318	<1	SE85496-1	<1 || <1	SE85496-2	113%

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Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

LOR's are raised for Nitrate and trace metals due to high dissolved solids in the samples.
Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

29 March 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna de Castro**

Your Reference: ENAUWOLL04009AE - Additional Analysis

Our Reference: SE85496A-R

Samples: 5 Waters
Received: 16/2/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

This report cancels and supersedes report No. SE86496A issued on 21/03/11 by SGS Environmental Services due to the addition of mass balance analysis and correction of anion results for # 7.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Dong Liang
Inorganic/Metal Supervisor

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Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS --------- ----------	SE85496A-R-1 MW09 Water 15/02/2011	SE85496A-R-3 MW11 Water 15/02/2011	SE85496A-R-5 MW14 Water 15/02/2011	SE85496A-R-6 MW15 Water 15/02/2011	SE85496A-R-7 MW05 Water 15/02/2011
Date Extracted		17/03/2011	17/03/2011	17/03/2011	17/03/2011	17/03/2011
Date Analysed		17/03/2011	17/03/2011	17/03/2011	17/03/2011	17/03/2011
Chloride, Cl	mg/L	16,000	2,200	12,000	21,000	18,000
Sulphate, SO4	mg/L	2,200	340	2,600	850	2,200

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS --------- ----------	SE85496A-R-1 MW09 Water 15/02/2011	SE85496A-R-3 MW11 Water 15/02/2011	SE85496A-R-5 MW14 Water 15/02/2011	SE85496A-R-6 MW15 Water 15/02/2011	SE85496A-R-7 MW05 Water 15/02/2011
Date Extracted (Alkalinity)		16/03/2011	16/03/2011	16/03/2011	16/03/2011	16/03/2011
Date Analysed (Alkalinity)		16/03/2011	16/03/2011	16/03/2011	16/03/2011	16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	<2.0	290	1,616	1,005	240
Carbonate Alkalinity as $CaCO_3$	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0

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Metals in water by ICP-OES Our Reference: Your Reference Sample Matrix Date Sampled	UNITS --- ---	SE85496A-R-1 MW09 Water 15/02/2011	SE85496A-R-3 MW11 Water 15/02/2011	SE85496A-R-5 MW14 Water 15/02/2011	SE85496A-R-6 MW15 Water 15/02/2011	SE85496A-R-7 MW05 Water 15/02/2011
Date Extracted (Metals)		17/03/2011	17/03/2011	17/03/2011	17/03/2011	17/03/2011
Date Analysed (Metals)		17/03/2011	17/03/2011	17/03/2011	17/03/2011	17/03/2011
Sodium (Dissolved)	mg/L	6,700	1,200	5,500	10,000	8,800
Potassium (Dissolved)	mg/L	64	67	250	520	380
Calcium (Dissolved)	mg/L	420	84	1,100	460	380
Magnesium (Dissolved)	mg/L	1,500	120	1,100	1,300	1,100
Iron (Dissolved)	mg/L	94	0.03	6.3	60	210

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Cations / Anions Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85496A-R-1 MW09 Water 15/02/2011	SE85496A-R-3 MW11 Water 15/02/2011	SE85496A-R-5 MW14 Water 15/02/2011	SE85496A-R-6 MW15 Water 15/02/2011	SE85496A-R-7 MW05 Water 15/02/2011
Cations calculated	meq/i	441	65.8	392	588	514
Anions calculated	meq/l	498	75.1	425	631	567
% difference	%	6.0	6.6	4.1	3.5	4.9

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Method ID	Methodology Summary
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN135	The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN320	

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				17/03/11	[NT]	[NT]	LCS	17/03/11
Date Analysed				17/03/11	[NT]	[NT]	LCS	17/03/11
Chloride, Cl	mg/L	0.05	AN245	<0.05	[NT]	[NT]	LCS	99%
Sulphate, SO4	mg/L	0.1	AN245	<0.1	[NT]	[NT]	LCS	98%

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Alkalinity)				16/03/2011	[NT]	[NT]	LCS	16/03/2011
Date Analysed (Alkalinity)				16/03/2011	[NT]	[NT]	LCS	16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	2	AN135	<2.0	[NT]	[NT]	LCS	101%
Carbonate Alkalinity as $CaCO_3$	mg/L	2	AN135	<2.0	[NT]	[NT]	LCS	101%

QUALITY CONTROL Metals in water by ICP-OES	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals)				17/03/2011	SE85496A-1	17/03/2011 || 17/03/2011	LCS	17/03/2011
Date Analysed (Metals)				17/03/2011	SE85496A-1	17/03/2011 || 17/03/2011	LCS	17/03/2011
Sodium (Dissolved)	mg/L	0.1	AN320	<0.1	SE85496A-1	6700 || 6700 || RPD: 0	LCS	93%
Potassium (Dissolved)	mg/L	0.2	AN320	<0.2	SE85496A-1	64 || 66 || RPD: 3	LCS	92%
Calcium (Dissolved)	mg/L	0.1	AN320	<0.1	SE85496A-1	420 || 420 || RPD: 0	LCS	99%
Magnesium (Dissolved)	mg/L	0.1	AN320	<0.1	SE85496A-1	1500 || 1500 || RPD: 0	LCS	93%
Iron (Dissolved)	mg/L	0.02	AN320	<0.02	SE85496A-1	94 || 94 || RPD: 0	LCS	99%

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QUALITY CONTROL Cations / Anions	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Cations calculated	meq/i	0		[NT]		441 || [N/T]	[NR]	[NR]
Anions calculated	meq/l	0		[NT]		498 || [N/T]	[NR]	[NR]
% difference	%	0		[NT]		6.0 || [N/T]	[NR]	[NR]

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Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

1 March 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna de Castro**

Your Reference: ENAUWOLL04009AE

Our Reference: SE85547-R

Samples: 10 Waters
Received: 17/2/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

This report cancels and supersedes report No. SE85496 issued on 24/02/11 by SGS Environmental Services due to the addition of report comment.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Dong Liang
Quality Manager

Snezana Kostoka
Chemist

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Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547-R-1 MW18 Water 16/02/2011	SE85547-R-2 TA6M-D3 Water 16/02/2011	SE85547-R-3 MW3 Water 16/02/2011	SE85547-R-4 SW8 Water 16/02/2011	SE85547-R-5 MW04 Water 16/02/2011
Date Extracted		17/02/2011	17/02/2011	17/02/2011	17/02/2011	17/02/2011
Date Analysed		21/02/2011	21/02/2011	21/02/2011	21/02/2011	21/02/2011
Nitrate as N	mg/L	0.039	<0.025	<0.050	<0.025	<0.050

Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547-R-6 MW17 Water 16/02/2011	SE85547-R-7 MW16 Water 16/02/2011	SE85547-R-8 MW01 Water 16/02/2011	SE85547-R-9 MW02 Water 16/02/2011	SE85547-R-10 QC03 Water 16/02/2011
Date Extracted		17/02/2011	17/02/2011	17/02/2011	17/02/2011	17/02/2011
Date Analysed		21/02/2011	21/02/2011	21/02/2011	21/02/2011	21/02/2011
Nitrate as N	mg/L	<0.050	<0.050	<0.050	<0.050	<0.010

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS --- ---	SE85547-R-1 MW18 Water 16/02/2011	SE85547-R-2 TA6M-D3 Water 16/02/2011	SE85547-R-3 MW3 Water 16/02/2011	SE85547-R-4 SW8 Water 16/02/2011	SE85547-R-5 MW04 Water 16/02/2011
Date Extracted (Ammonia)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Date Analysed (Ammonia)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Ammonia as N	mg/L	0.05	17	0.57	0.33	5.2
Date Extracted (NO_2)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Date Analysed (NO_2)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Nitrite as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Date Extracted (TKN)		23/02/2011	23/02/2011	23/02/2011	23/02/2011	23/02/2011
Date Analysed (TKN)		23/02/2011	23/02/2011	23/02/2011	23/02/2011	23/02/2011
Total Kjeldahl Nitrogen	mg/L	0.690	17.0	1.20	6.70	9.00
Total Nitrogen (by calc.)	mg/L	0.730	17.0	1.20	6.70	9.00

Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS --- ---	SE85547-R-6 MW17 Water 16/02/2011	SE85547-R-7 MW16 Water 16/02/2011	SE85547-R-8 MW01 Water 16/02/2011	SE85547-R-9 MW02 Water 16/02/2011	SE85547-R-10 QC03 Water 16/02/2011
Date Extracted (Ammonia)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Date Analysed (Ammonia)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Ammonia as N	mg/L	8.5	1.6	2.2	0.91	2.3
Date Extracted (NO_2)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Date Analysed (NO_2)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Nitrite as N	mg/L	<0.005	<0.005	<0.005	<0.005	0.006
Date Extracted (TKN)		23/02/2011	23/02/2011	23/02/2011	23/02/2011	23/02/2011
Date Analysed (TKN)		23/02/2011	23/02/2011	23/02/2011	23/02/2011	23/02/2011
Total Kjeldahl Nitrogen	mg/L	9.20	17.0	3.40	4.60	3.60
Total Nitrogen (by calc.)	mg/L	9.20	17.0	3.40	4.60	3.60

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Trace HM (ICP-MS)-Dissolved Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547-R-1 MW18 Water 16/02/2011	SE85547-R-2 TA6M-D3 Water 16/02/2011	SE85547-R-3 MW3 Water 16/02/2011	SE85547-R-4 SW8 Water 16/02/2011	SE85547-R-5 MW04 Water 16/02/2011
Date Extracted (Metals-ICPMS)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Date Analysed (Metals-ICPMS)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Arsenic	µg/L	<1	<1	4	7	9
Cadmium	µg/L	<0.5	<0.5	<1	<0.5	<1
Chromium	µg/L	<5	<5	<10	<5	<10
Copper	µg/L	1	<1	6	<1	<1
Nickel	µg/L	<5	<5	52	<5	37
Lead	µg/L	1	<1	11	<1	<1
Zinc	µg/L	67	32	230	43	88
Molybdenum	µg/L	2	<1	<2	9	5

Trace HM (ICP-MS)-Dissolved Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547-R-6 MW17 Water 16/02/2011	SE85547-R-7 MW16 Water 16/02/2011	SE85547-R-8 MW01 Water 16/02/2011	SE85547-R-9 MW02 Water 16/02/2011	SE85547-R-10 QC03 Water 16/02/2011
Date Extracted (Metals-ICPMS)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Date Analysed (Metals-ICPMS)		18/02/2011	18/02/2011	18/02/2011	18/02/2011	18/02/2011
Arsenic	µg/L	<2	<4	7	9	7
Cadmium	µg/L	<1	<2	<0.5	<1	<0.5
Chromium	µg/L	<10	<20	<5	<10	<5
Copper	µg/L	6	<2	<1	<1	<1
Nickel	µg/L	31	<20	5	<10	5
Lead	µg/L	8	<2	<1	<1	<1
Zinc	µg/L	150	40	67	54	52
Molybdenum	µg/L	2	9	1	<2	2

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Method ID	Methodology Summary
SEI-038	Water Soluble Chloride After carrying out a 1:5 soil:water extraction, an aliquot of the extract is reacted with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference NEPM, Schedule B(3), 401 and APHA 4500Cl- Water Soluble Sulphate After carrying out a 1:5 soil:water extraction ,sulphate in the extract is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulphate concentration in the sample. Reference NEPM, Schedule B(3), 401 and APHA 4500-SO42-.
SEI-037	Ammonia - Determined by salicylate colourimetric method using Discrete Analyser.
AN277	Nitrite as N - determined by colourimetric technique using discrete analyser. Based on APHA 21st Edition, 4500-NO2-B.
AN292	Total Kjeldahl Nitrogen (TKN) - Determined by colourimetric technique using discrete analyser following digestion with Sulphuric Acid, K2SO4 and CuSO4. Based on APHA 21st Edition, 4500-Norg D / USEPA 351.2.
SEI-103	Total Nitrogen - The sum of Nitrate, Nitrite and Total Kjeldahl Nitrogen.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				17/02/11	SE85547-1	17/02/2011 || 17/02/2011	LCS	17/02/11
Date Analysed				22/02/11	SE85547-1	21/02/2011 || 21/02/2011	LCS	22/02/11
Nitrate as N	mg/L	0.005	SEI-038	<0.005	SE85547-1	0.039 || 0.049 || RPD: 23	LCS	98%

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N	mg/L	0.01	SEI-037	<0.01	SE85547-1	0.05 || 0.06 || RPD: 18	LCS	109%
Date Extracted (NO_2)				18/02/2011	SE85547-1	18/02/2011 || 18/02/2011	LCS	18/02/2011
Date Analysed (NO_2)				18/02/2011	SE85547-1	18/02/2011 || 18/02/2011	LCS	18/02/2011
Nitrite as N	mg/L	0.005	AN277	<0.005	SE85547-1	0.005 || 0.006 || RPD: 18	LCS	104%
Date Extracted (TKN)				23/02/2011	SE85547-1	23/02/2011 || 23/02/2011	LCS	23/02/2011
Date Analysed (TKN)				23/02/2011	SE85547-1	23/02/2011 || 23/02/2011	LCS	23/02/2011
Total Kjeldahl Nitrogen	mg/L	0.2	AN292	<0.200	SE85547-1	0.690 || 0.750 || RPD: 8	LCS	103%
Total Nitrogen (by calc.)	mg/L	0.2	SEI-103	<0.200	SE85547-1	0.730 || 0.810 || RPD: 10	[NR]	[NR]

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QUALITY CONTROL Trace HM (ICP-MS)-Dissolved	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals-ICPMS)				18/02/2011	SE85547-1	18/02/2011 || 18/02/2011	LCS	18/02/2011
Date Analysed (Metals-ICPMS)				18/02/2011	SE85547-1	18/02/2011 || 18/02/2011	LCS	18/02/2011
Arsenic	µg/L	1	AN318	<1	SE85547-1	<1 || <1	LCS	100%
Cadmium	µg/L	0.1	AN318	<0.1	SE85547-1	<0.5 || <0.5	LCS	82%
Chromium	µg/L	1	AN318	<1	SE85547-1	<5 || <5	LCS	86%
Copper	µg/L	1	AN318	<1	SE85547-1	1 || <1	LCS	83%
Nickel	µg/L	1	AN318	<1	SE85547-1	<5 || <5	LCS	83%
Lead	µg/L	1	AN318	<1	SE85547-1	1 || <1	LCS	90%
Zinc	µg/L	1	AN318	<1	SE85547-1	67 || 41 || RPD: 48	LCS	100%
Molybdenum	µg/L	1	AN318	<1	SE85547-1	2 || 3 || RPD: 40	LCS	81%

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Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

LOR's are raised for Nitrate and trace metals due to high dissolved solids in the samples.
Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

29 March 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna de Castro**

Your Reference: ENAUWOLL04009AE - Aditional Analysis

Our Reference: SE85547A-R

Samples: 8 Waters
Received: 17/2/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

This report cancels and supersedes report No. SE86547A issued on 21/03/11 by SGS Environmental Services due to the addition of mass balance analysis.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Edward Ibrahim
Laboratory Manager

Dong Liang
Inorganic/Metal Supervisor

Snezana Kostoka
Chemist

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Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ----------	SE85547A-R-1 MW18 Water 16/02/2011	SE85547A-R-2 TA6M-D3 Water 16/02/2011	SE85547A-R-3 MW3 Water 16/02/2011	SE85547A-R-5 MW04 Water 16/02/2011	SE85547A-R-6 MW17 Water 16/02/2011
Date Extracted		17/03/2011	17/03/2011	17/03/2011	17/03/2011	17/03/2011
Date Analysed		17/03/2011	17/03/2011	17/03/2011	17/03/2011	17/03/2011
Chloride, Cl	mg/L	1,800	2,000	4,900	4,500	5,400
Sulphate, SO4	mg/L	79	0.6	220	610	4,600

Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ----------	SE85547A-R-7 MW16 Water 16/02/2011	SE85547A-R-8 MW01 Water 16/02/2011	SE85547A-R-9 MW02 Water 16/02/2011
Date Extracted		17/03/2011	17/03/2011	17/03/2011
Date Analysed		17/03/2011	17/03/2011	17/03/2011
Chloride, Cl	mg/L	7,700	1,300	6,100
Sulphate, SO4	mg/L	2,600	80	830

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547A-R-1 MW18 Water 16/02/2011	SE85547A-R-2 TA6M-D3 Water 16/02/2011	SE85547A-R-3 MW3 Water 16/02/2011	SE85547A-R-5 MW04 Water 16/02/2011	SE85547A-R-6 MW17 Water 16/02/2011
Date Extracted (Alkalinity)		16/03/2011	16/03/2011	16/03/2011	16/03/2011	16/03/2011
Date Analysed (Alkalinity)		16/03/2011	16/03/2011	16/03/2011	16/03/2011	16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	480	1,614	<2.0	600	160
Carbonate Alkalinity as $CaCO_3$	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0

Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547A-R-7 MW16 Water 16/02/2011	SE85547A-R-8 MW01 Water 16/02/2011	SE85547A-R-9 MW02 Water 16/02/2011
Date Extracted (Alkalinity)		16/03/2011	16/03/2011	16/03/2011
Date Analysed (Alkalinity)		16/03/2011	16/03/2011	16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	1,714	320	810
Carbonate Alkalinity as $CaCO_3$	mg/L	<2.0	<2.0	<2.0

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Metals in water by ICP-OES Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547A-R-1 MW18 Water 16/02/2011	SE85547A-R-2 TA6M-D3 Water 16/02/2011	SE85547A-R-3 MW3 Water 16/02/2011	SE85547A-R-5 MW04 Water 16/02/2011	SE85547A-R-6 MW17 Water 16/02/2011
Date Extracted (Metals)		17/03/2011	17/03/2011	17/03/2011	17/03/2011	17/03/2011
Date Analysed (Metals)		17/03/2011	17/03/2011	17/03/2011	17/03/2011	17/03/2011
Sodium (Dissolved)	mg/L	1,000	1,600	2,300	2,000	3,300
Potassium (Dissolved)	mg/L	1.1	90	1.9	82	190
Calcium (Dissolved)	mg/L	61	27	20	280	390
Magnesium (Dissolved)	mg/L	150	110	270	290	740
Iron (Dissolved)	mg/L	<0.02	1.3	140	93	170

Metals in water by ICP-OES Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547A-R-7 MW16 Water 16/02/2011	SE85547A-R-8 MW01 Water 16/02/2011	SE85547A-R-9 MW02 Water 16/02/2011
Date Extracted (Metals)		17/03/2011	17/03/2011	17/03/2011
Date Analysed (Metals)		17/03/2011	17/03/2011	17/03/2011
Sodium (Dissolved)	mg/L	4,100	640	3,400
Potassium (Dissolved)	mg/L	230	49	170
Calcium (Dissolved)	mg/L	330	110	210
Magnesium (Dissolved)	mg/L	840	130	320
Iron (Dissolved)	mg/L	0.04	31	6.2

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Cations / Anions Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547A-R-1 MW18 Water 16/02/2011	SE85547A-R-2 TA6M-D3 Water 16/02/2011	SE85547A-R-3 MW3 Water 16/02/2011	SE85547A-R-5 MW04 Water 16/02/2011	SE85547A-R-6 MW17 Water 16/02/2011
Cations calculated	meq/i	60.6	80.6	133	134	238
Anions calculated	meq/l	62.2	88.8	143	152	252
% difference	%	1.2	4.8	3.8	6.2	2.8

Cations / Anions Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85547A-R-7 MW16 Water 16/02/2011	SE85547A-R-8 MW01 Water 16/02/2011	SE85547A-R-9 MW02 Water 16/02/2011
Cations calculated	meq/i	272	47.1	190
Anions calculated	meq/l	306	44.8	206
% difference	%	5.9	2.4	4.1

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Method ID	Methodology Summary
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN135	The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN320	

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				17/03/11	[NT]	[NT]	LCS	17/03/11
Date Analysed				17/03/11	[NT]	[NT]	LCS	17/03/11
Chloride, Cl	mg/L	0.05	AN245	<0.05	[NT]	[NT]	LCS	99%
Sulphate, SO4	mg/L	0.1	AN245	<0.1	[NT]	[NT]	LCS	98%

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Alkalinity)				16/03/2011	[NT]	[NT]	LCS	16/03/2011
Date Analysed (Alkalinity)				16/03/2011	[NT]	[NT]	LCS	16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	2	AN135	<2.0	[NT]	[NT]	LCS	101%
Carbonate Alkalinity as $CaCO_3$	mg/L	2	AN135	<2.0	[NT]	[NT]	LCS	101%

QUALITY CONTROL Metals in water by ICP-OES	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals)				17/03/2011	SE85547A-1	17/03/2011 || 17/03/2011	LCS	17/03/2011
Date Analysed (Metals)				17/03/2011	SE85547A-1	17/03/2011 || 17/03/2011	LCS	17/03/2011
Sodium (Dissolved)	mg/L	0.1	AN320	<0.1	SE85547A-1	1000 || 1000 || RPD: 0	LCS	93%
Potassium (Dissolved)	mg/L	0.2	AN320	<0.2	SE85547A-1	1.1 || 0.98 || RPD: 12	LCS	92%
Calcium (Dissolved)	mg/L	0.1	AN320	<0.1	SE85547A-1	61 || 60 || RPD: 2	LCS	99%
Magnesium (Dissolved)	mg/L	0.1	AN320	<0.1	SE85547A-1	150 || 150 || RPD: 0	LCS	93%
Iron (Dissolved)	mg/L	0.02	AN320	<0.02	SE85547A-1	<0.02 || <0.02	LCS	99%

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QUALITY CONTROL Cations / Anions	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Cations calculated	meq/i	0		[NT]		60.6 || [N/T]	[NR]	[NR]
Anions calculated	meq/l	0		[NT]		62.2 || [N/T]	[NR]	[NR]
% difference	%	0		[NT]		1.2 || [N/T]	[NR]	[NR]

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Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
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Quality Acceptance Criteria

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ANALYTICAL REPORT

4 March 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna de Castro**

Your Reference: ENAUWOLL04009AE

Our Reference: SE85743 Samples: 2 Waters
Received: 25/2/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Dong Liang
Quality Manager

Snezana Kostoka
Chemist

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Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85743-1 MW06 Water 24/02/2011	SE85743-2 MW08 Water 24/02/2011
Date Extracted		25/02/2011	25/02/2011
Date Analysed		3/03/2011	3/03/2011
Nitrate as N	mg/L	<0.25	<0.25

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85743-1 MW06 Water 24/02/2011	SE85743-2 MW08 Water 24/02/2011
Date Extracted (Ammonia)		25/02/2011	25/02/2011
Date Analysed (Ammonia)		25/02/2011 2011	25/02/2011
Ammonia as N	mg/L	5.6	2.0
Date Extracted (NO_2)		25/02/2011	25/02/2011
Date Analysed (NO_2)		25/02/2011 011	25/02/2011
Nitrite as N	mg/L	0.05	<0.005
Date Extracted (TKN)		4/03/2011	4/03/2011
Date Analysed (TKN)		4/03/2011	4/03/2011
Total Kjeldahl Nitrogen	mg/L	7.20	7.60
Total Nitrogen (by calc.)	mg/L	7.25	7.60

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Trace HM (ICP-MS)-Dissolved Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85743-1 MW06 Water 24/02/2011	SE85743-2 MW08 Water 24/02/2011
Date Extracted (Metals-ICPMS)		1/03/2011	1/03/2011
Date Analysed (Metals-ICPMS)		1/03/2011	1/03/2011
Arsenic	µg/L	330	150
Cadmium	µg/L	<2	<2
Chromium	µg/L	<20	330
Copper	µg/L	<2	7
Nickel	µg/L	66	2,400
Lead	µg/L	<2	<2
Zinc	µg/L	49	90
Molybdenum	µg/L	110	12

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Method ID	Methodology Summary
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN291	
AN277	Nitrite as N - determined by colourimetric technique using discrete analyser. Based on APHA 21st Edition, 4500-NO2-B.
AN292	Total Kjeldahl Nitrogen (TKN) - Determined by colourimetric technique using discrete analyser following digestion with Sulphuric Acid, K2SO4 and CuSO4. Based on APHA 21st Edition, 4500-Norg D / USEPA 351.2.
SEI-103	Total Nitrogen - The sum of Nitrate, Nitrite and Total Kjeldahl Nitrogen.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				25/02/11	[NT]	[NT]	LCS	25/02/11
Date Analysed				03/03/11	[NT]	[NT]	LCS	03/03/11
Nitrate as N	mg/L	0.005	AN245	<0.005	[NT]	[NT]	LCS	97%

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N	mg/L	0.01	AN291	<0.01	[NT]	[NT]	LCS	102%
Date Extracted (NO_2)				25/02/2011	[NT]	[NT]	LCS	25/02/2011
Date Analysed (NO_2)				25/02/2011	[NT]	[NT]	LCS	25/02/2011
Nitrite as N	mg/L	0.005	AN277	<0.005	[NT]	[NT]	LCS	102%
Date Extracted (TKN)				04/03/2011	[NT]	[NT]	LCS	04/03/2011
Date Analysed (TKN)				04/03/2011	[NT]	[NT]	LCS	04/03/2011
Total Kjeldahl Nitrogen	mg/L	0.2	AN292	<0.200	[NT]	[NT]	LCS	106%
Total Nitrogen (by calc.)	mg/L	0.2	SEI-103	<0.200	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Trace HM (ICP-MS)-Dissolved	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals-ICPMS)				1/03/2011	[NT]	[NT]	LCS	1/03/2011
Date Analysed (Metals-ICPMS)				1/03/2011	[NT]	[NT]	LCS	1/03/2011
Arsenic	µg/L	1	AN318	<1	[NT]	[NT]	LCS	98%
Cadmium	µg/L	0.1	AN318	<0.1	[NT]	[NT]	LCS	98%
Chromium	µg/L	1	AN318	<1	[NT]	[NT]	LCS	99%
Copper	µg/L	1	AN318	<1	[NT]	[NT]	LCS	99%
Nickel	µg/L	1	AN318	<1	[NT]	[NT]	LCS	99%
Lead	µg/L	1	AN318	<1	[NT]	[NT]	LCS	103%
Zinc	µg/L	1	AN318	<1	[NT]	[NT]	LCS	95%
Molybdenum	µg/L	1	AN318	<1	[NT]	[NT]	LCS	96%

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[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
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[N/A] : Not Applicable

Report Comments

LOR for trace metals has been raised by a dilution of 20 due to sample matrix interferences
DETECTION LIMITS FOR ANIONS RISE 50X DUE TO HIGH EC ..
Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Acceptance Criteria

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ANALYTICAL REPORT

29 March 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna de Castro**

Your Reference: ENAUWOLL04009AE - Additional Analysis

Our Reference: SE85743A-R

Samples: 2 Waters
Received: 25/2/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

This report cancels and supersedes report No. SE85743A issued on 21/03/11 by SGS Environmental Services due to the addition of mass balance analysis.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Dong Liang
Inorganic/Metal Supervisor

Snezana Kostoka
Chemist

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Environmental Services Unit 16/33 Maddox Street Alexandria NSW 2015 Australia
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Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85743A-R-1 MW06 Water 24/02/2011	SE85743A-R-2 MW08 Water 24/02/2011
Date Extracted		17/03/2011	17/03/2011
Date Analysed		17/03/2011	17/03/2011
Chloride, Cl	mg/L	19,000	14,000
Sulphate, SO4	mg/L	2,700	2,400

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85743A-R-1 MW06 Water 24/02/2011	SE85743A-R-2 MW08 Water 24/02/2011
Date Extracted (Alkalinity)		16/03/2011	16/03/2011
Date Analysed (Alkalinity)		16/03/2011	16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	550	54
Carbonate Alkalinity as $CaCO_3$	mg/L	<2.0	<2.0

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Metals in water by ICP-OES Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ----------	SE85743A-R-1 MW06 Water 24/02/2011	SE85743A-R-2 MW08 Water 24/02/2011
Date Extracted (Metals)		17/03/2011	17/03/2011
Date Analysed (Metals)		17/03/2011	17/03/2011
Sodium (Dissolved)	mg/L	10,000	7,200
Potassium (Dissolved)	mg/L	590	330
Calcium (Dissolved)	mg/L	480	330
Magnesium (Dissolved)	mg/L	1,300	910
Iron (Dissolved)	mg/L	16	220

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Cations / Anions Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE85743A-R-1 MW06 Water 24/02/2011	SE85743A-R-2 MW08 Water 24/02/2011
Cations calculated	meq/i	606	427
Anions calculated	meq/l	604	447
% difference	%	0.20	2.3

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Method ID	Methodology Summary
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN135	The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN320	

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				17/03/11	[NT]	[NT]	LCS	17/03/11
Date Analysed				17/03/11	[NT]	[NT]	LCS	17/03/11
Chloride, Cl	mg/L	0.05	AN245	<0.05	[NT]	[NT]	LCS	99%
Sulphate, SO4	mg/L	0.1	AN245	<0.1	[NT]	[NT]	LCS	99%

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Alkalinity)				16/03/2011	[NT]	[NT]	LCS	16/03/2011
Date Analysed (Alkalinity)				16/03/2011	[NT]	[NT]	LCS	16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	2	AN135	<2.0	[NT]	[NT]	LCS	101%
Carbonate Alkalinity as $CaCO_3$	mg/L	2	AN135	<2.0	[NT]	[NT]	LCS	101%

QUALITY CONTROL Metals in water by ICP-OES	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals)				17/03/2011	[NT]	[NT]	LCS	17/03/2011
Date Analysed (Metals)				17/03/2011	[NT]	[NT]	LCS	17/03/2011
Sodium (Dissolved)	mg/L	0.1	AN320	<0.1	[NT]	[NT]	LCS	93%
Potassium (Dissolved)	mg/L	0.2	AN320	<0.2	[NT]	[NT]	LCS	92%
Calcium (Dissolved)	mg/L	0.1	AN320	<0.1	[NT]	[NT]	LCS	99%
Magnesium (Dissolved)	mg/L	0.1	AN320	<0.1	[NT]	[NT]	LCS	93%
Iron (Dissolved)	mg/L	0.02	AN320	<0.02	[NT]	[NT]	LCS	99%

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QUALITY CONTROL Cations / Anions	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Cations calculated	meq/i	0		[NT]	[NT]	[NT]	[NR]	[NR]
Anions calculated	meq/l	0		[NT]	[NT]	[NT]	[NR]	[NR]
% difference	%	0		[NT]	[NT]	[NT]	[NR]	[NR]

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Report Comments

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Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Acceptance Criteria

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ANALYTICAL REPORT

16 March 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna de Castro**

Your Reference: EW04009AE

Our Reference: SE86052 Samples: 1 Water
Received: 9/3/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Dong Liang
Quality Manager

Snezana Kostoka
Chemist

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Anions in water		
Our Reference:	UNITS	SE86052-1
Your Reference	----------	MW10
Sample Matrix	----------	Water
Date Sampled		8/03/2011
Date Extracted		9/03/2011
Date Analysed		9/03/2011
Nitrate as N	mg/L	<0.025

SGS Australia Pty Ltd
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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	 SE86052-1 MW10 Water 8/03/2011
Date Extracted (Ammonia)		9/03/2011
Date Analysed (Ammonia)		9/03/2011
Ammonia as N	mg/L	1.5
Date Extracted (NO_2)		9/03/2011
Date Analysed (NO_2)		9/03/2011
Nitrite as N	mg/L	<0.005
Date Extracted (TKN)		15/03/2011
Date Analysed (TKN)		15/03/2011
Total Kjeldahl Nitrogen	mg/L	3.80
Total Nitrogen (by calc.)	mg/L	3.80

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Trace HM (ICP-MS)-Dissolved Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	 SE86052-1 MW10 Water 8/03/2011
Date Extracted (Metals-ICPMS)		9/03/2011
Date Analysed (Metals-ICPMS)		9/03/2011
Arsenic	µg/L	3
Cadmium	µg/L	<0.1
Chromium	µg/L	<1
Copper	µg/L	<1
Nickel	µg/L	4
Lead	µg/L	<1
Zinc	µg/L	57
Molybdenum	µg/L	<1

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Method ID	Methodology Summary
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN291	
AN277	Nitrite as N - determined by colourimetric technique using discrete analyser. Based on APHA 21st Edition, 4500-NO2-B.
AN292	Total Kjeldahl Nitrogen (TKN) - Determined by colourimetric technique using discrete analyser following digestion with Sulphuric Acid, K2SO4 and CuSO4. Based on APHA 21st Edition, 4500-Norg D / USEPA 351.2.
SEI-103	Total Nitrogen - The sum of Nitrate, Nitrite and Total Kjeldahl Nitrogen.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				09/03/11	SE86052-1	9/03/2011 || 9/03/2011	SE86052-1	09/03/11
Date Analysed				09/03/11	SE86052-1	9/03/2011 || 9/03/2011	SE86052-1	09/03/11
Nitrate as N	mg/L	0.005	AN245	<0.005	SE86052-1	<0.025 || <0.025	SE86052-1	99%

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N	mg/L	0.01	AN291	<0.01	[NT]	[NT]	LCS	105%
Date Extracted (NO_2)				9/03/2011	[NT]	[NT]	LCS	9/03/2011
Date Analysed (NO_2)				9/03/2011	[NT]	[NT]	LCS	9/03/2011
Nitrite as N	mg/L	0.005	AN277	<0.005	[NT]	[NT]	LCS	97%
Date Extracted (TKN)				15/03/2011	[NT]	[NT]	LCS	15/03/2011
Date Analysed (TKN)				15/03/2011	[NT]	[NT]	LCS	15/03/2011
Total Kjeldahl Nitrogen	mg/L	0.2	AN292	<0.200	[NT]	[NT]	LCS	114%
Total Nitrogen (by calc.)	mg/L	0.2	SEI-103	<0.200	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Trace HM (ICP-MS)-Dissolved	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals-ICPMS)				9/03/2011	[NT]	[NT]	LCS	9/03/2011
Date Analysed (Metals-ICPMS)				9/03/2011	[NT]	[NT]	LCS	9/03/2011
Arsenic	µg/L	1	AN318	<1	[NT]	[NT]	LCS	101%
Cadmium	µg/L	0.1	AN318	<0.1	[NT]	[NT]	LCS	100%
Chromium	µg/L	1	AN318	<1	[NT]	[NT]	LCS	101%
Copper	µg/L	1	AN318	<1	[NT]	[NT]	LCS	102%
Nickel	µg/L	1	AN318	<1	[NT]	[NT]	LCS	105%
Lead	µg/L	1	AN318	<1	[NT]	[NT]	LCS	101%
Zinc	µg/L	1	AN318	<1	[NT]	[NT]	LCS	100%
Molybdenum	µg/L	1	AN318	<1	[NT]	[NT]	LCS	98%

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Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

DETECTION LIMITS FOR ANIONS RISE 5X DUE TO HIGH EC.
Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

29 March 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna de Castro**

Your Reference: EW04009AE - Additional Analysis

Our Reference: SE86052A-R

Samples: 1 Water
Received: 9/3/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

This report cancels and supersedes report No. SE86052A issued on 21/03/11 by SGS Environmental Services due to the addition of mass balance analysis.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Dong Liang
Inorganic/Metal Supervisor

Snezana Kostoka
Chemist

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Anions in water Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ----------	SE86052A-R-1 MW10 Water 8/03/2011
Date Extracted		17/03/2011
Date Analysed		17/03/2011
Chloride, Cl	mg/L	1,400
Sulphate, SO4	mg/L	2,100

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS --- ---	 SE86052A-R-1 MW10 Water 8/03/2011
Date Extracted (Alkalinity)		16/03/2011
Date Analysed (Alkalinity)		16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	250
Carbonate Alkalinity as $CaCO_3$	mg/L	<2.0

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Metals in water by ICP-OES Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	 SE86052A-R-1 MW10 Water 8/03/2011
Date Extracted (Metals)		17/03/2011
Date Analysed (Metals)		17/03/2011
Sodium (Dissolved)	mg/L	1,000
Potassium (Dissolved)	mg/L	25
Calcium (Dissolved)	mg/L	440
Magnesium (Dissolved)	mg/L	270
Iron (Dissolved)	mg/L	84

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Cations / Anions Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	 SE86052A-R-1 MW10 Water 8/03/2011
Cations calculated	meq/i	92.9
Anions calculated	meq/l	88.3
% difference	%	2.5

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Method ID	Methodology Summary
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN135	The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN320	

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				17/03/11	[NT]	[NT]	LCS	17/03/11
Date Analysed				17/03/11	[NT]	[NT]	LCS	17/03/11
Chloride, Cl	mg/L	0.05	AN245	<0.05	[NT]	[NT]	LCS	99%
Sulphate, SO4	mg/L	0.1	AN245	<0.1	[NT]	[NT]	LCS	98%

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Alkalinity)				16/03/2011	[NT]	[NT]	LCS	16/03/2011
Date Analysed (Alkalinity)				16/03/2011	[NT]	[NT]	LCS	16/03/2011
Bicarbonate Alkalinity as $CaCO_3$	mg/L	2	AN135	<2.0	[NT]	[NT]	LCS	101%
Carbonate Alkalinity as $CaCO_3$	mg/L	2	AN135	<2.0	[NT]	[NT]	LCS	101%

QUALITY CONTROL Metals in water by ICP-OES	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals)				17/03/2011	[NT]	[NT]	LCS	17/03/2011
Date Analysed (Metals)				17/03/2011	[NT]	[NT]	LCS	17/03/2011
Sodium (Dissolved)	mg/L	0.1	AN320	<0.1	[NT]	[NT]	LCS	93%
Potassium (Dissolved)	mg/L	0.2	AN320	<0.2	[NT]	[NT]	LCS	92%
Calcium (Dissolved)	mg/L	0.1	AN320	<0.1	[NT]	[NT]	LCS	99%
Magnesium (Dissolved)	mg/L	0.1	AN320	<0.1	[NT]	[NT]	LCS	93%
Iron (Dissolved)	mg/L	0.02	AN320	<0.02	[NT]	[NT]	LCS	99%

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QUALITY CONTROL Cations / Anions	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Cations calculated	meq/i	0		[NT]	[NT]	[NT]	[NR]	[NR]
Anions calculated	meq/l	0		[NT]	[NT]	[NT]	[NR]	[NR]
% difference	%	0		[NT]	[NT]	[NT]	[NR]	[NR]

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Result Codes

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[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

4 May 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna De Castro**

Your Reference: ENAUWOLL04009AE

Our Reference: SE87114-R2 Samples: 14 Soils
Received: 19/4/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

This report cancels and supersedes report No. SE87114-R issued on 29/04/11 by SGS Environmental Services due to amendment of report comment for metal.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Huong Crawford
Metals Signatory

Snezana Kostoska
Chemist

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ----------	SE87114-R2-1 CTP87/0.5-0.6 Soil 18/04/2011	SE87114-R2-2 CTP87/1.4-1.6 Soil 18/04/2011	SE87114-R2-3 CTP88/0.6-0.8 Soil 18/04/2011	SE87114-R2-4 CTP88/3.5-3.7 Soil 18/04/2011	SE87114-R2-5 CTP89/0.5-0.6 Soil 18/04/2011
Date Extracted (Ammonia)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (Ammonia)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Ammonia as N by DA*	mg/kg	0.84	0.37	0.40	1.6	0.73
Date Extracted (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Nitrite as N	mg/kg	0.03	0.03	<0.02	0.08	0.03
Date Extracted (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011	29/04/2011
Date Analysed (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011	29/04/2011
Total Kjeldahl Nitrogen	mg/kg	2,800	1,900	1,100	790	4,200
Total Nitrogen (by calc.)*	mg/kg	2,800	1,900	1,100	790	4,200
Date Extracted (Ammonia as N)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (Ammonia as N)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Ammonia as N (in ASLP Leachate)	mg/L	0.14	0.12	0.12	0.06	0.12
Date Extracted (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Nitrite as N -in ASLP Leachate	mg/L	0.006	0.006	<0.005	0.007	0.006
Date Extracted (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011	29/04/2011
Date Analysed (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011	29/04/2011
Total Kjeldahl Nitrogen (ASLP)	mg/L	4.60	1.70	0.340	<0.200	2.60
Total Nitrogen ASLP(by calc.)	mg/L	4.60	1.70	0.340	<0.200	2.60

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE87114-R2-6 CTP89/1.8-2.0 Soil 18/04/2011	SE87114-R2-7 CTP90/0.5-0.6 Soil 18/04/2011	SE87114-R2-8 CTP90/1.8-2.0 Soil 18/04/2011	SE87114-R2-9 CTP91/0.6-0.8 Soil 18/04/2011	SE87114-R2-10 CTP91/1.6-1.8 Soil 18/04/2011
Date Extracted (Ammonia)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (Ammonia)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Ammonia as N by DA*	mg/kg	0.54	0.55	0.48	<0.15	11
Date Extracted (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Nitrite as N	mg/kg	0.03	0.04	0.03	<0.02	0.07
Date Extracted (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011	29/04/2011
Date Analysed (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011	29/04/2011
Total Kjeldahl Nitrogen	mg/kg	2,300	3,300	2,400	550	490
Total Nitrogen (by calc.)*	mg/kg	2,300	3,300	2,400	550	490
Date Extracted (Ammonia as N)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (Ammonia as N)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Ammonia as N (in ASLP Leachate)	mg/L	0.15	0.12	0.11	0.08	0.16
Date Extracted (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011	2/05/2011
Nitrite as N -in ASLP Leachate	mg/L	0.006	0.006	0.006	0.005	0.007
Date Extracted (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011	29/04/2011
Date Analysed (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011	29/04/2011
Total Kjeldahl Nitrogen (ASLP)	mg/L	3.70	3.60	2.60	0.240	0.420
Total Nitrogen ASLP(by calc.)	mg/L	3.70	3.60	2.60	0.240	0.420

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Inorganics Our Reference:	UNITS	SE87114-R2-11	SE87114-R2-12	SE87114-R2-13	SE87114-R2-14
Your Reference	----------	CTP92/0.6-0.8	CTP92/1.0-1.1	QC2	QC3
Sample Matrix	----------	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted (Ammonia)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (Ammonia)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Ammonia as N by DA*	mg/kg	0.54	6.5	0.55	0.15
Date Extracted (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Nitrite as N	mg/kg	0.06	0.05	0.03	0.04
Date Extracted (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011
Date Analysed (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011
Total Kjeldahl Nitrogen	mg/kg	280	300	3,100	300
Total Nitrogen (by calc.)*	mg/kg	280	300	3,100	300
Date Extracted (Ammonia as N)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (Ammonia as N)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Ammonia as N (in ASLP Leachate)	mg/L	0.1	0.25	0.13	0.09
Date Extracted (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Nitrite as N -in ASLP Leachate	mg/L	0.006	0.008	0.007	0.007
Date Extracted (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011
Date Analysed (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011
Total Kjeldahl Nitrogen (ASLP)	mg/L	<0.200	0.300	3.30	0.270
Total Nitrogen ASLP(by calc.)	mg/L	<0.200	0.300	3.30	0.270

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Anions in soil Our Reference:	UNITS	SE87114-R2-1	SE87114-R2-2	SE87114-R2-3	SE87114-R2-4	SE87114-R2-5
Your Reference	----------	CTP87/0.5-0.6	CTP87/1.4-1.6	CTP88/0.6-0.8	CTP88/3.5-3.7	CTP89/0.5-0.6
Sample Matrix	----------	Soil	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted		28/04/2011	28/04/2011	28/04/2011	28/04/2011	28/04/2011
Date Analysed		28/04/2011	28/04/2011	28/04/2011	28/04/2011	28/04/2011
Nitrate as N 1:5 soil:water	mg/kg	0.16	0.24	0.33	<0.025	0.081

Anions in soil Our Reference:	UNITS	SE87114-R2-6	SE87114-R2-7	SE87114-R2-8	SE87114-R2-9	SE87114-R2-10
Your Reference	----------	CTP89/1.8-2.0	CTP90/0.5-0.6	CTP90/1.8-2.0	CTP91/0.6-0.8	CTP91/1.6-1.8
Sample Matrix	----------	Soil	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted		28/04/2011	28/04/2011	28/04/2011	28/04/2011	28/04/2011
Date Analysed		28/04/2011	28/04/2011	28/04/2011	28/04/2011	28/04/2011
Nitrate as N 1:5 soil:water	mg/kg	0.11	0.069	0.13	0.060	0.037

Anions in soil Our Reference:	UNITS	SE87114-R2-11	SE87114-R2-12	SE87114-R2-13	SE87114-R2-14
Your Reference	----------	CTP92/0.6-0.8	CTP92/1.0-1.1	QC2	QC3
Sample Matrix	----------	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted		28/04/2011	28/04/2011	28/04/2011	28/04/2011
Date Analysed		28/04/2011	28/04/2011	28/04/2011	28/04/2011
Nitrate as N 1:5 soil:water	mg/kg	<0.125	<0.125	0.11	0.062

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Metals in Soil by ICP-OES Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE87114-R2-1 CTP87/0.5-0.6 Soil 18/04/2011	SE87114-R2-2 CTP87/1.4-1.6 Soil 18/04/2011	SE87114-R2-3 CTP88/0.6-0.8 Soil 18/04/2011	SE87114-R2-4 CTP88/3.5-3.7 Soil 18/04/2011	SE87114-R2-5 CTP89/0.5-0.6 Soil 18/04/2011
Date Extracted (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011	27/04/2011
Date Analysed (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011	27/04/2011
Arsenic	mg/kg	9	12	6	9	5
Cadmium	mg/kg	0.7	0.5	<0.3	<0.3	0.4
Chromium	mg/kg	1.8	1.8	5.4	4.1	50
Copper	mg/kg	17	21	9.1	5.2	22
Lead	mg/kg	22	23	4	3	15
Molybdenum	mg/kg	1.4	1.2	<1.0	<1.0	1.7
Nickel	mg/kg	5.9	6.1	6.3	6.2	32
Zinc	mg/kg	66	65	13	15	39

Metals in Soil by ICP-OES Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE87114-R2-6 CTP89/1.8-2.0 Soil 18/04/2011	SE87114-R2-7 CTP90/0.5-0.6 Soil 18/04/2011	SE87114-R2-8 CTP90/1.8-2.0 Soil 18/04/2011	SE87114-R2-9 CTP91/0.6-0.8 Soil 18/04/2011	SE87114-R2-10 CTP91/1.6-1.8 Soil 18/04/2011
Date Extracted (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011	27/04/2011
Date Analysed (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011	27/04/2011
Arsenic	mg/kg	<3	15	<3	<3	4
Cadmium	mg/kg	0.5	<0.3	<0.3	<0.3	<0.3
Chromium	mg/kg	1.7	1.8	1.4	4.5	5.3
Copper	mg/kg	21	23	19	5.7	6.8
Lead	mg/kg	15	14	17	3	4
Molybdenum	mg/kg	1.6	1.1	<1.0	<1.0	1.2
Nickel	mg/kg	8.2	8.4	8.1	3.8	4.0
Zinc	mg/kg	45	60	29	11	12

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Metals in Soil by ICP-OES Our Reference:	UNITS	SE87114-R2-11	SE87114-R2-12	SE87114-R2-13	SE87114-R2-14
Your Reference	----------	CTP92/0.6-0.8	CTP92/1.0-1.1	QC2	QC3
Sample Matrix	----------	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
Date Analysed (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
Arsenic	mg/kg	5	<3	<3	<3
Cadmium	mg/kg	<0.3	<0.3	<0.3	<0.3
Chromium	mg/kg	5.3	5.3	1.4	4.4
Copper	mg/kg	6.5	5.8	22	5.7
Lead	mg/kg	4	3	15	3
Molybdenum	mg/kg	<1.0	<1.0	<1.0	<1.0
Nickel	mg/kg	4.4	3.8	8.3	3.9
Zinc	mg/kg	12	11	60	12

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Anions in water Our Reference:	UNITS	SE87114-R2-1	SE87114-R2-2	SE87114-R2-3	SE87114-R2-4	SE87114-R2-5
Your Reference	----------	CTP87/0.5-0.6	CTP87/1.4-1.6	CTP88/0.6-0.8	CTP88/3.5-3.7	CTP89/0.5-0.6
Sample Matrix	----------	Soil	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted		28/04/2011	28/04/2011	28/04/2011	28/04/2011	28/04/2011
Date Analysed		28/04/2011	28/04/2011	28/04/2011	28/04/2011	28/04/2011
Nitrate as N -in ASLP Leachate	mg/L	0.039	0.033	0.031	<0.005	0.036

Anions in water Our Reference:	UNITS	SE87114-R2-6	SE87114-R2-7	SE87114-R2-8	SE87114-R2-9	SE87114-R2-10
Your Reference	----------	CTP89/1.8-2.0	CTP90/0.5-0.6	CTP90/1.8-2.0	CTP91/0.6-0.8	CTP91/1.6-1.8
Sample Matrix	----------	Soil	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted		28/04/2011	28/04/2011	28/04/2011	28/04/2011	28/04/2011
Date Analysed		28/04/2011	28/04/2011	28/04/2011	28/04/2011	28/04/2011
Nitrate as N -in ASLP Leachate	mg/L	0.029	0.022	0.034	<0.005	<0.005

Anions in water Our Reference:	UNITS	SE87114-R2-11	SE87114-R2-12	SE87114-R2-13	SE87114-R2-14
Your Reference	----------	CTP92/0.6-0.8	CTP92/1.0-1.1	QC2	QC3
Sample Matrix	----------	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted		28/04/2011	28/04/2011	28/04/2011	28/04/2011
Date Analysed		28/04/2011	28/04/2011	28/04/2011	28/04/2011
Nitrate as N -in ASLP Leachate	mg/L	<0.005	<0.005	0.017	<0.005

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Metals in TCLP (AS4439) Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE87114-R2-1 CTP87/0.5-0.6 Soil 18/04/2011	SE87114-R2-2 CTP87/1.4-1.6 Soil 18/04/2011	SE87114-R2-3 CTP88/0.6-0.8 Soil 18/04/2011	SE87114-R2-4 CTP88/3.5-3.7 Soil 18/04/2011	SE87114-R2-5 CTP89/0.5-0.6 Soil 18/04/2011
Date Extracted (ASLP Preparation)		20/04/2011	20/04/2011	20/04/2011	20/04/2011	20/04/2011
pH of final Leachate	pH units	7.65	6.80	6.87	6.76	7.02
Date Extracted (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011	27/04/2011
Date Analysed (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011	27/04/2011
Arsenic	µg/L	<1	<1	2	17	<1
Cadmium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	<1	<1	<1	<1	<1
Copper	µg/L	<1	<1	<1	<1	1
Lead	µg/L	<1	<1	<1	<1	<1
Molybdenum	µg/L	<1	<1	<1	3	<1
Nickel	µg/L	<1	<1	<1	<1	<1
Zinc	µg/L	<1	<1	<1	<1	<1

Metals in TCLP (AS4439) Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE87114-R2-6 CTP89/1.8-2.0 Soil 18/04/2011	SE87114-R2-7 CTP90/0.5-0.6 Soil 18/04/2011	SE87114-R2-8 CTP90/1.8-2.0 Soil 18/04/2011	SE87114-R2-9 CTP91/0.6-0.8 Soil 18/04/2011	SE87114-R2-10 CTP91/1.6-1.8 Soil 18/04/2011
Date Extracted (ASLP Preparation)		20/04/2011	20/04/2011	20/04/2011	27/04/2011	27/04/2011
pH of final Leachate	pH units	6.75	6.67	6.71	7.92	8.03
Date Extracted (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011	27/04/2011
Date Analysed (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011	27/04/2011
Arsenic	µg/L	<1	<1	<1	4	13
Cadmium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	<1	<1	<1	<1	<1
Copper	µg/L	<1	1	<1	<1	<1
Lead	µg/L	<1	<1	<1	<1	<1
Molybdenum	µg/L	<1	1	<1	<1	5
Nickel	µg/L	<1	<1	<1	<1	<1
Zinc	µg/L	<1	1	<1	<1	<1

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Metals in TCLP (AS4439) Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE87114-R2-11 CTP92/0.6-0.8 Soil 18/04/2011	SE87114-R2-12 CTP92/1.0-1.1 Soil 18/04/2011	SE87114-R2-13 QC2 Soil 18/04/2011	SE87114-R2-14 QC3 Soil 18/04/2011
Date Extracted (ASLP Preparation)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
pH of final Leachate	pH units	7.78	7.18	8.23	7.69
Date Extracted (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
Date Analysed (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
Arsenic	µg/L	4	2	<1	3
Cadmium	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	<1	<1	<1	<1
Copper	µg/L	<1	<1	<1	<1
Lead	µg/L	<1	<1	<1	<1
Molybdenum	µg/L	15	7	3	1
Nickel	µg/L	<1	1	<1	<1
Zinc	µg/L	<1	1	<1	<1

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Moisture Our Reference:	UNITS	SE87114-R2-1	SE87114-R2-2	SE87114-R2-3	SE87114-R2-4	SE87114-R2-5
Your Reference	----------	CTP87/0.5-0.6	CTP87/1.4-1.6	CTP88/0.6-0.8	CTP88/3.5-3.7	CTP89/0.5-0.6
Sample Matrix	----------	Soil	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Analysed (moisture)		21/04/2011	21/04/2011	21/04/2011	21/04/2011	21/04/2011
Moisture	%	10	12	34	44	7

Moisture Our Reference:	UNITS	SE87114-R2-6	SE87114-R2-7	SE87114-R2-8	SE87114-R2-9	SE87114-R2-10
Your Reference	----------	CTP89/1.8-2.0	CTP90/0.5-0.6	CTP90/1.8-2.0	CTP91/0.6-0.8	CTP91/1.6-1.8
Sample Matrix	----------	Soil	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Analysed (moisture)		21/04/2011	21/04/2011	21/04/2011	21/04/2011	21/04/2011
Moisture	%	8	9	7	37	45

Moisture Our Reference:	UNITS	SE87114-R2-11	SE87114-R2-12	SE87114-R2-13	SE87114-R2-14
Your Reference	----------	CTP92/0.6-0.8	CTP92/1.0-1.1	QC2	QC3
Sample Matrix	----------	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Analysed (moisture)		21/04/2011	21/04/2011	21/04/2011	21/04/2011
Moisture	%	36	42	6	38

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Method ID	Methodology Summary
AN291	
AN277	Nitrite as N - determined by colourimetric technique using discrete analyser. Based on APHA 21st Edition, 4500-NO2-B.
AN292	Total Kjeldahl Nitrogen (TKN) - Determined by colourimetric technique using discrete analyser following digestion with Sulphuric Acid, K2SO4 and CuSO4. Based on APHA 21st Edition, 4500-Norg D / USEPA 351.2.
AN170	In the presence of H2SO4, K2SO4, Se catalyst and heat, amino nitrogen of many organic materials is converted to ammonium sulphate. Free ammonia and ammonium-nitrogen are similarly converted. After the digestion the ammonia is distilled from an alkaline medium and the ammonia content determined titrimetrically or colorimetrically. Reference APHA 4500-Norg B/APHA 4500-NH3 B/C/F. Internal Reference AN170
SEI-103	Total Nitrogen - The sum of Nitrate, Nitrite and Total Kjeldahl Nitrogen.
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN320	
AN006	Toxicity Characteristic Leaching Procedure (TCLP) - Preparation of leachates for assessing the mobility of both organic and inorganic contaminants present in liquid, solid, and multiphase wastes. Based on USEPA 1311. For volatile analytes, Zero-Headspace Extraction Vessel (ZHE) is used. This method also meets the requirements of Australian Standard Leaching Procedure (ASLP) AS 4439.3-1997 Part 3.
AN101	pH - Measured using pH meter and electrode based on APHA 21st Edition, 4500-H+. For water analyses the results reported are indicative only as the sample holding time requirement specified in APHA was not met (APHA requires that the pH of the samples are to be measured within 15 minutes after sampling).
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN002	

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QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N by DA*	mg/kg	0.15	AN291	<0.15	SE87114-1	0.84 || 0.79 || RPD: 6	LCS	100%
Date Extracted (NO_2)				02/05/2011	SE87114-1	2/05/2011 || 2/05/2011	LCS	02/05/2011
Date Analysed (NO_2)				02/05/2011	SE87114-1	2/05/2011 || 2/05/2011	LCS	02/05/2011
Nitrite as N	mg/kg	0.025	AN277	<0.02	SE87114-1	0.03 || 0.03 || RPD: 0	LCS	102%
Date Extracted (TKN)				29/03/2011	SE87114-1	29/04/2011 || 29/04/2011	LCS	29/03/2011
Date Analysed (TKN)				29/03/2011	SE87114-1	29/04/2011 || 29/04/2011	LCS	29/03/2011
Total Kjeldahl Nitrogen	mg/kg	40	AN292	<40	SE87114-1	2800 || 3400 || RPD: 19	LCS	103%
Total Nitrogen (by calc.)*	mg/kg	20	AN170	<20	SE87114-1	2800 || 3400 || RPD: 19	[NR]	[NR]
Ammonia as N (in ASLP Leachate)	mg/L	0.01	AN291	<0.01	SE87114-1	0.14 || 0.14 || RPD: 0	LCS	94%
Date Extracted (NO_2)				02/05/2011	SE87114-1	2/05/2011 || 2/05/2011	LCS	02/05/2011
Date Analysed (NO_2)				02/05/2011	SE87114-1	2/05/2011 || 2/05/2011	LCS	02/05/2011
Nitrite as N -in ASLP Leachate	mg/L	0.005	AN277	<0.005	SE87114-1	0.006 || 0.006 || RPD: 0	LCS	102%
Date Extracted (TKN)				29/03/2011	SE87114-1	29/04/2011 || 29/04/2011	LCS	29/03/2011
Date Analysed (TKN)				29/03/2011	SE87114-1	29/04/2011 || 29/04/2011	LCS	29/03/2011
Total Kjeldahl Nitrogen (ASLP)	mg/L	0.2	AN292	<0.200	SE87114-1	4.60 || 4.40 || RPD: 4	LCS	103%
Total Nitrogen ASLP(by calc.)	mg/L	0.2	SEI-103	<0.200	SE87114-1	4.60 || 4.40 || RPD: 4	[NR]	[NR]

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QUALITY CONTROL Anions in soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				28/04/11	SE87114-1	28/04/2011 || 28/04/2011	LCS	28/04/11
Date Analysed				28/04/11	SE87114-1	28/04/2011 || 28/04/2011	LCS	28/04/11
Nitrate as N 1:5 soil:water	mg/kg	0.025	AN245	<0.025	SE87114-1	0.16 || 0.15 || RPD: 6	LCS	102%

QUALITY CONTROL Metals in Soil by ICP-OES	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals)				27/04/2011	SE87114-8	27/04/2011 || 27/04/2011	SE87114-9	27/04/2011
Date Analysed (Metals)				27/04/2011	SE87114-8	27/04/2011 || 27/04/2011	SE87114-9	27/04/2011
Arsenic	mg/kg	3	AN320	<3	SE87114-8	<3 || 3	SE87114-9	94%
Cadmium	mg/kg	0.3	AN320	<0.3	SE87114-8	<0.3 || <0.3	SE87114-9	94%
Chromium	mg/kg	0.3	AN320	<0.3	SE87114-8	1.4 || 1.9 || RPD: 30	SE87114-9	97%
Copper	mg/kg	0.5	AN320	<0.5	SE87114-8	19 || 23 || RPD: 19	SE87114-9	97%
Lead	mg/kg	1	AN320	<1	SE87114-8	17 || 30 || RPD: 55	SE87114-9	93%
Molybdenum	mg/kg	1	AN320	<1.0	SE87114-8	<1.0 || <1.0	SE87114-9	93%
Nickel	mg/kg	0.5	AN320	<0.5	SE87114-8	8.1 || 8.0 || RPD: 1	SE87114-9	97%
Zinc	mg/kg	0.5	AN320	<0.5	SE87114-8	29 || 43 || RPD: 39	SE87114-9	97%

QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				28/04/11	SE87114-1	28/04/2011 || 28/04/2011	LCS	28/04/11
Date Analysed				28/04/11	SE87114-1	28/04/2011 || 28/04/2011	LCS	28/04/11
Nitrate as N -in ASLP Leachate	mg/L	0.005	AN245	<0.005	SE87114-1	0.039 || 0.037 || RPD: 5	LCS	102%

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QUALITY CONTROL Metals in TCLP (AS4439)	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
pH of final Leachate	pH units	0	AN101	0.00	[NT]	[NT]	[NR]	[NR]
Date Extracted (Metals)				27/04/2011	[NT]	[NT]	LCS	27/04/2011
Date Analysed (Metals)				27/04/2011	[NT]	[NT]	LCS	27/04/2011
Arsenic	µg/L	1	AN318	<1	[NT]	[NT]	LCS	104%
Cadmium	µg/L	0.1	AN318	<0.1	[NT]	[NT]	LCS	106%
Chromium	µg/L	1	AN318	<1	[NT]	[NT]	LCS	105%
Copper	µg/L	1	AN318	<1	[NT]	[NT]	LCS	109%
Lead	µg/L	1	AN318	<1	[NT]	[NT]	LCS	109%
Molybdenum	µg/L	1	AN318	<1	[NT]	[NT]	LCS	96%
Nickel	µg/L	1	AN318	<1	[NT]	[NT]	LCS	109%
Zinc	µg/L	1	AN318	<1	[NT]	[NT]	LCS	106%

QUALITY CONTROL Moisture	UNITS	LOR	METHOD	Blank
Date Analysed (moisture)				[NT]
Moisture	%	1	AN002	<1

QUALITY CONTROL Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N by DA*	mg/kg	SE87114-11	0.54 || 0.52 || RPD: 4	[NR]	[NR]
Date Extracted (NO_2)		SE87114-11	2/05/2011 || 2/05/2011	[NR]	[NR]
Date Analysed (NO_2)		SE87114-11	2/05/2011 || 2/05/2011	[NR]	[NR]
Nitrite as N	mg/kg	SE87114-11	0.06 || 0.06 || RPD: 0	[NR]	[NR]
Ammonia as N (in ASLP Leachate)	mg/L	SE87114-11	0.1 || 0.1 || RPD: 0	[NR]	[NR]
Date Extracted (NO_2)		SE87114-11	2/05/2011 || 2/05/2011	[NR]	[NR]
Date Analysed (NO_2)		SE87114-11	2/05/2011 || 2/05/2011	[NR]	[NR]
Nitrite as N -in ASLP Leachate	mg/L	SE87114-11	0.006 || 0.006 || RPD: 0	[NR]	[NR]

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QUALITY CONTROL Anions in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted		SE87114-10	28/04/2011 || 28/04/2011	SE87114-10	28/04/11
Date Analysed		SE87114-10	28/04/2011 || 28/04/2011	SE87114-10	28/04/11
Nitrate as N 1:5 soil:water	mg/kg	SE87114-10	0.037 || 0.040 || RPD: 8	SE87114-10	101%

QUALITY CONTROL Anions in water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted		SE87114-10	28/04/2011 || 28/04/2011	SE87114-10	28/04/11
Date Analysed		SE87114-10	28/04/2011 || 28/04/2011	SE87114-10	28/04/11
Nitrate as N -in ASLP Leachate	mg/L	SE87114-10	<0.005 || <0.005	SE87114-10	100%

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Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

DETECTION LIMITS FOR ANIONS RISE 5X FOR SAMPLE 11 AND 12 DUE TO HIGH EC.

METALS_ESDAT_S: #8 duplicate failed the acceptance criteria due to sample heterogeneity.
Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)

Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

4 May 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna De Castro**

Your Reference: ENAUWOLL04009AE

Our Reference: SE87114A-R

Samples: 4 Soils
Received: 19/4/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

This report cancels and supersedes report No. SE87114A issued on 29/04/11 by SGS Environmental Services due to amendment of report comment.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Huong Crawford
Metals Signatory

Snezana Kostoska
Chemist

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ----------	SE87114A-R-15 CTP93/0.6-0.7 Soil 18/04/2011	SE87114A-R-16 CTP94/0.4-0.5 Soil 18/04/2011	SE87114A-R-17 CTP94/0.8-1.0 Soil 18/04/2011	SE87114A-R-18 QC1 Soil 18/04/2011
Date Extracted (Ammonia)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (Ammonia)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Ammonia as N by DA*	mg/kg	11	4.4	11	6.7
Date Extracted (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Nitrite as N	mg/kg	0.04	0.04	0.04	0.05
Date Extracted (TKN)		30/04/2011	30/04/2011	30/04/2011	30/04/2011
Date Analysed (TKN)		30/04/2011	30/04/2011	30/04/2011	30/04/2011
Total Kjeldahl Nitrogen	mg/kg	420	5,300	450	600
Total Nitrogen (by calc.)*	mg/kg	420	5,300	450	600
Date Extracted (Ammonia as N)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (Ammonia as N)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Ammonia as N (in ASLP Leachate)	mg/L	0.51	0.21	0.37	0.50
Date Extracted (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Date Analysed (NO_2)		2/05/2011	2/05/2011	2/05/2011	2/05/2011
Nitrite as N -in ASLP Leachate	mg/L	0.02	0.008	0.007	0.02
Date Extracted (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011
Date Analysed (TKN)		29/04/2011	29/04/2011	29/04/2011	29/04/2011
Total Kjeldahl Nitrogen (ASLP)	mg/L	8.70	17.0	0.570	5.30
Total Nitrogen ASLP (by calc.)	mg/L	8.70	17.0	0.570	5.30

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Anions in soil Our Reference:	UNITS	SE87114A-R-15	SE87114A-R-16	SE87114A-R-17	SE87114A-R-18
Your Reference	----------	CTP93/0.6-0.7	CTP94/0.4-0.5	CTP94/0.8-1.0	QC1
Sample Matrix	----------	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted		28/04/2011	28/04/2011	28/04/2011	28/04/2011
Date Analysed		28/04/2011	28/04/2011	28/04/2011	28/04/2011
Nitrate as N 1:5 soil:water	mg/kg	<0.050	0.17	<0.025	<0.050

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Metals in Soil by ICP-OES Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE87114A-R-15 CTP93/0.6-0.7 Soil 18/04/2011	SE87114A-R-16 CTP94/0.4-0.5 Soil 18/04/2011	SE87114A-R-17 CTP94/0.8-1.0 Soil 18/04/2011	SE87114A-R-18 QC1 Soil 18/04/2011
Date Extracted (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
Date Analysed (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
Arsenic	mg/kg	<3	5	<3	<3
Cadmium	mg/kg	<0.3	<0.3	<0.3	<0.3
Chromium	mg/kg	5.0	22	14	5.5
Copper	mg/kg	9.2	46	12	7.8
Lead	mg/kg	4	47	5	3
Molybdenum	mg/kg	2.2	2.3	1.2	1.8
Nickel	mg/kg	0.8	15	2.2	0.94
Zinc	mg/kg	3.4	39	10	4.0

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Anions in water Our Reference:	UNITS	SE87114A-R-15	SE87114A-R-16	SE87114A-R-17	SE87114A-R-18
Your Reference	----------	CTP93/0.6-0.7	CTP94/0.4-0.5	CTP94/0.8-1.0	QC1
Sample Matrix	----------	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Extracted		28/04/2011	28/04/2011	28/04/2011	28/04/2011
Date Analysed		28/04/2011	28/04/2011	28/04/2011	28/04/2011
Nitrate as N -in ASLP Leachate	mg/L	0.006	0.025	<0.005	0.010

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Metals in TCLP (AS4439) Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE87114A-R-15 CTP93/0.6-0.7 Soil 18/04/2011	SE87114A-R-16 CTP94/0.4-0.5 Soil 18/04/2011	SE87114A-R-17 CTP94/0.8-1.0 Soil 18/04/2011	SE87114A-R-18 QC1 Soil 18/04/2011
Date Extracted (ASLP Preparation)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
pH of final Leachate	pH units	7.32	4.98	5.01	7.33
Date Extracted (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
Date Analysed (Metals)		27/04/2011	27/04/2011	27/04/2011	27/04/2011
Arsenic	µg/L	<1	<1	<1	<1
Cadmium	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	<1	<1	<1	<1
Copper	µg/L	1	3	1	<1
Lead	µg/L	<1	2	<1	<1
Molybdenum	µg/L	29	<1	<1	24
Nickel	µg/L	<1	2	<1	<1
Zinc	µg/L	<1	8	4	<1

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Moisture Our Reference:	UNITS	SE87114A-R-15	SE87114A-R-16	SE87114A-R-17	SE87114A-R-18
Your Reference	----------	CTP93/0.6-0.7	CTP94/0.4-0.5	CTP94/0.8-1.0	QC1
Sample Matrix	----------	Soil	Soil	Soil	Soil
Date Sampled		18/04/2011	18/04/2011	18/04/2011	18/04/2011
Date Analysed (moisture)		21/04/2011	21/04/2011	21/04/2011	21/04/2011
Moisture	%	24	41	23	25

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Method ID	Methodology Summary
AN291	
AN277	Nitrite as N - determined by colourimetric technique using discrete analyser. Based on APHA 21st Edition, 4500-NO2-B.
AN292	Total Kjeldahl Nitrogen (TKN) - Determined by colourimetric technique using discrete analyser following digestion with Sulphuric Acid, K2SO4 and CuSO4. Based on APHA 21st Edition, 4500-Norg D / USEPA 351.2.
AN170	In the presence of H2SO4, K2SO4, Se catalyst and heat, amino nitrogen of many organic materials is converted to ammonium sulphate. Free ammonia and ammonium-nitrogen are similarly converted. After the digestion the ammonia is distilled from an alkaline medium and the ammonia content determined titrimetrically or colorimetrically. Reference APHA 4500-Norg B/APHA 4500-NH3 B/C/F. Internal Reference AN170
SEI-103	Total Nitrogen - The sum of Nitrate, Nitrite and Total Kjeldahl Nitrogen.
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN320	
AN006	Toxicity Characteristic Leaching Procedure (TCLP) - Preparation of leachates for assessing the mobility of both organic and inorganic contaminants present in liquid, solid, and multiphase wastes. Based on USEPA 1311. For volatile analytes, Zero-Headspace Extraction Vessel (ZHE) is used. This method also meets the requirements of Australian Standard Leaching Procedure (ASLP) AS 4439.3-1997 Part 3.
AN101	pH - Measured using pH meter and electrode based on APHA 21st Edition, 4500-H+. For water analyses the results reported are indicative only as the sample holding time requirement specified in APHA was not met (APHA requires that the pH of the samples are to be measured within 15 minutes after sampling).
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN002	

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QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N by DA*	mg/kg	0.15	AN291	<0.15	[NT]	[NT]	LCS	100%
Date Extracted (NO_2)				02/05/2011	[NT]	[NT]	LCS	02/05/2011
Date Analysed (NO_2)				02/05/2011	[NT]	[NT]	LCS	02/05/2011
Nitrite as N	mg/kg	0.025	AN277	<0.02	[NT]	[NT]	LCS	102%
Date Extracted (TKN)				30/04/2011	[NT]	[NT]	LCS	30/04/2011
Date Analysed (TKN)				30/04/2011	[NT]	[NT]	LCS	30/04/2011
Total Kjeldahl Nitrogen	mg/kg	40	AN292	<40	[NT]	[NT]	LCS	101%
Total Nitrogen (by calc.)*	mg/kg	20	AN170	<20	[NT]	[NT]	LCS	101%
Ammonia as N (in ASLP Leachate)	mg/L	0.01	AN291	<0.01	[NT]	[NT]	LCS	94%
Date Extracted (NO_2)				02/05/2011	[NT]	[NT]	LCS	02/05/2011
Date Analysed (NO_2)				02/05/2011	[NT]	[NT]	LCS	02/05/2011
Nitrite as N -in ASLP Leachate	mg/L	0.005	AN277	<0.005	[NT]	[NT]	LCS	102%
Date Extracted (TKN)				29/04/2011	[NT]	[NT]	LCS	29/03/2011
Date Analysed (TKN)				29/04/2011	[NT]	[NT]	LCS	29/03/2011
Total Kjeldahl Nitrogen (ASLP)	mg/L	0.2	AN292	<0.200	[NT]	[NT]	LCS	103%
Total Nitrogen ASLP (by calc.)	mg/L	0.2	SEI-103	<0.200	[NT]	[NT]	[NR]	[NR]

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QUALITY CONTROL Anions in soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				28/04/11	[NT]	[NT]	LCS	28/04/11
Date Analysed				28/04/11	[NT]	[NT]	LCS	28/04/11
Nitrate as N 1:5 soil:water	mg/kg	0.025	AN245	<0.025	[NT]	[NT]	LCS	102%

QUALITY CONTROL Metals in Soil by ICP-OES	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals)				27/04/2011	SE87114A-18	27/04/2011 || 27/04/2011	LCS	27/04/2011
Date Analysed (Metals)				27/04/2011	SE87114A-18	27/04/2011 || 27/04/2011	LCS	27/04/2011
Arsenic	mg/kg	3	AN320	<3	SE87114A-18	<3 || <3	LCS	92%
Cadmium	mg/kg	0.3	AN320	<0.3	SE87114A-18	<0.3 || <0.3	LCS	91%
Chromium	mg/kg	0.3	AN320	<0.3	SE87114A-18	5.5 || 5.6 || RPD: 2	LCS	93%
Copper	mg/kg	0.5	AN320	<0.5	SE87114A-18	7.8 || 7.2 || RPD: 8	LCS	94%
Lead	mg/kg	1	AN320	<1	SE87114A-18	3 || 3 || RPD: 0	LCS	90%
Molybdenum	mg/kg	1	AN320	<1.0	SE87114A-18	1.8 || 1.9 || RPD: 5	LCS	91%
Nickel	mg/kg	0.5	AN320	<0.5	SE87114A-18	0.94 || 0.9 || RPD: 4	LCS	93%
Zinc	mg/kg	0.5	AN320	<0.5	SE87114A-18	4.0 || 4.1 || RPD: 2	LCS	91%

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QUALITY CONTROL Anions in water	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				28/04/11	[NT]	[NT]	LCS	28/04/11
Date Analysed				28/04/11	[NT]	[NT]	LCS	28/04/11
Nitrate as N -in ASLP Leachate	mg/L	0.005	AN245	<0.005	[NT]	[NT]	LCS	102%

QUALITY CONTROL Metals in TCLP (AS4439)	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
pH of final Leachate	pH units	0	AN101	[NT]	[NT]	[NT]	[NR]	[NR]
Date Extracted (Metals)				27/04/2011	[NT]	[NT]	LCS	27/04/2011
Date Analysed (Metals)				27/04/2011	[NT]	[NT]	LCS	27/04/2011
Arsenic	µg/L	1	AN318	<1	[NT]	[NT]	LCS	104%
Cadmium	µg/L	0.1	AN318	<0.1	[NT]	[NT]	LCS	106%
Chromium	µg/L	1	AN318	<1	[NT]	[NT]	LCS	105%
Copper	µg/L	1	AN318	<1	[NT]	[NT]	LCS	109%
Lead	µg/L	1	AN318	<1	[NT]	[NT]	LCS	109%
Molybdenum	µg/L	1	AN318	<1	[NT]	[NT]	LCS	96%
Nickel	µg/L	1	AN318	<1	[NT]	[NT]	LCS	109%
Zinc	µg/L	1	AN318	<1	[NT]	[NT]	LCS	106%

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QUALITY CONTROL Moisture	UNITS	LOR	METHOD	Blank
Date Analysed (moisture)				[NT]
Moisture	%	1	AN002	<1

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Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

DETECTION LIMITS FOR ANIONS RISE 2X FOR SAMPLE 15AND 18 DUE TO HIGH EC.
Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

5 September 2011

Coffey Environments Pty Ltd
118 Auburn Street
Wollongong
NSW 2500

Attention: **Corinna De Castro**

Your Reference: ENAUWOLL04009AE

Our Reference: SE89563 Samples: 8 Soils
Received: 24/8/11

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Dong Liang
Inorganic/Metal Supervisor

Huong Crawford
Metals Signatory

Snezana Kostoska
Chemist

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE89563-1 HA1/0.8-1.0 Soil 23/08/2011	SE89563-2 HA2/0.8-0.9 Soil 23/08/2011	SE89563-4 HA3/0.6-0.7 Soil 23/08/2011	SE89563-6 HA4/0.8-1.0 Soil 23/08/2011	SE89563-7 QC1 Soil 23/08/2011
Date Extracted (Ammonia)		29/08/2011	29/08/2011	29/08/2011	29/08/2011	29/08/2011
Date Analysed (Ammonia)		29/08/2011	29/08/2011	29/08/2011	29/08/2011	29/08/2011
Ammonia as N by DA*	mg/kg	6.4	2.3	0.41	5.4	7.2
Date Extracted (NO_2)		29/08/2011	29/08/2011	29/08/2011	29/08/2011	29/08/2011
Date Analysed (NO_2)		29/08/2011	29/08/2011	29/08/2011	29/08/2011	29/08/2011
Nitrite as N	mg/kg	0.03	<0.02	<0.02	<0.02	0.03
Date Extracted (TKN)		26/08/2011	26/08/2011	26/08/2011	26/08/2011	26/08/2011
Date Analysed (TKN)		29/08/2011	29/08/2011	29/08/2011	29/08/2011	29/08/2011
Total Kjeldahl Nitrogen	mg/kg	340	170	120	400	400
Total Nitrogen (by calc.)*	mg/kg	340	170	120	400	400

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Inorganics Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE89563-1 HA1/0.8-1.0 Soil 23/08/2011	SE89563-2 HA2/0.8-0.9 Soil 23/08/2011	SE89563-4 HA3/0.6-0.7 Soil 23/08/2011	SE89563-6 HA4/0.8-1.0 Soil 23/08/2011	SE89563-7 QC1 Soil 23/08/2011
Date Extracted (TOC)		26/08/2011	26/08/2011	26/08/2011	26/08/2011	26/08/2011
Date Analysed (TOC)		26/08/2011	26/08/2011	26/08/2011	26/08/2011	26/08/2011
Total Organic Carbon	%	0.42	0.25	0.19	0.43	0.53

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Anions in soil Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE89563-1 HA1/0.8-1.0 Soil 23/08/2011	SE89563-2 HA2/0.8-0.9 Soil 23/08/2011	SE89563-4 HA3/0.6-0.7 Soil 23/08/2011	SE89563-6 HA4/0.8-1.0 Soil 23/08/2011	SE89563-7 QC1 Soil 23/08/2011
Date Extracted		25/08/2011	25/08/2011	25/08/2011	25/08/2011	25/08/2011
Date Analysed		30/08/2011	30/08/2011	30/08/2011	30/08/2011	30/08/2011
Nitrate as N 1:5 soil:water	mg/kg	0.088	<0.050	0.27	0.062	0.15

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Cation Exchange Capacity*						
Our Reference:	UNITS	SE89563-1	SE89563-2	SE89563-4	SE89563-6	SE89563-7
Your Reference	----------	HA1/0.8-1.0	HA2/0.8-0.9	HA3/0.6-0.7	HA4/0.8-1.0	QC1
Sample Matrix	----------	Soil	Soil	Soil	Soil	Soil
Date Sampled		23/08/2011	23/08/2011	23/08/2011	23/08/2011	23/08/2011
Cation Exchange Capacity*	mg/kg	#	#	#	#	#

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Moisture Our Reference: Your Reference Sample Matrix Date Sampled	UNITS ---------- ----------	SE89563-1 HA1/0.8-1.0 Soil 23/08/2011	SE89563-2 HA2/0.8-0.9 Soil 23/08/2011	SE89563-4 HA3/0.6-0.7 Soil 23/08/2011	SE89563-6 HA4/0.8-1.0 Soil 23/08/2011	SE89563-7 QC1 Soil 23/08/2011
Date Analysed (moisture)		24/08/2011	24/08/2011	24/08/2011	24/08/2011	24/08/2011
Moisture	%	20	21	15	19	20

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Method ID	Methodology Summary
AN291	
AN277	Nitrite as N - determined by colourimetric technique using discrete analyser. Based on APHA 21st Edition, 4500-NO2-B.
AN292	Total Kjeldahl Nitrogen (TKN) - Determined by colourimetric technique using discrete analyser following digestion with Sulphuric Acid, K2SO4 and CuSO4. Based on APHA 21st Edition, 4500-Norg D / USEPA 351.2.
AN170	In the presence of H2SO4, K2SO4, Se catalyst and heat, amino nitrogen of many organic materials is converted to ammonium sulphate. Free ammonia and ammonium-nitrogen are similarly converted. After the digestion the ammonia is distilled from an alkaline medium and the ammonia content determined titrimetrically or colorimetrically. Reference APHA 4500-Norg B/APHA 4500-NH3 B/C/F. Internal Reference AN170
AN188	The organic material in the soil sample is oxidised with chromic acid, the excess dichromate is determined by back titration and the amount of oxidised material is calculated from the quantity of dichromate reduced, in accordance with NEPM guideline method 105.
AN245	A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
Ext-002	Analysis subcontracted to SGS Environmental Services Cairns, NATA Accreditation No. 2562, Site No. 3146.
AN002	

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QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N by DA*	mg/kg	0.15	AN291	<0.15	SE89563-1	6.4 || 6.6 || RPD: 3	LCS	106%
Date Extracted (NO_2)				29/08/2011	SE89563-1	29/08/2011 || 29/08/2011	LCS	29/08/2011
Date Analysed (NO_2)				29/08/2011	SE89563-1	29/08/2011 || 29/08/2011	LCS	29/08/2011
Nitrite as N	mg/kg	0.025	AN277	<0.02	SE89563-1	0.03 || 0.03 || RPD: 0	LCS	99%
Date Extracted (TKN)				26/08/2011	SE89563-1	26/08/2011 || [N/T]	LCS	26/08/2011
Date Analysed (TKN)				29/08/2011	SE89563-1	29/08/2011 || [N/T]	LCS	29/08/2011
Total Kjeldahl Nitrogen	mg/kg	40	AN292	<40	SE89563-1	340 || [N/T]	LCS	107%
Total Nitrogen (by calc.)*	mg/kg	20	AN170	<20	SE89563-1	340 || [N/T]	[NR]	[NR]

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (TOC)				26/08/2011	SE89563-7	26/08/2011 || 26/08/2011	LCS	26/08/2011
Date Analysed (TOC)				26/08/2011	SE89563-7	26/08/2011 || 26/08/2011	LCS	26/08/2011
Total Organic Carbon	%	0.05	AN188	<0.05	SE89563-7	0.53 || 0.53 || RPD: 0	LCS	98%

QUALITY CONTROL Anions in soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				25/08/11	SE89563-1	25/08/2011 || 25/08/2011	LCS	25/08/11
Date Analysed				30/08/11	SE89563-1	30/08/2011 || 30/08/2011	LCS	30/08/11
Nitrate as N 1:5 soil:water	mg/kg	0.025	AN245	<0.025	SE89563-1	0.088 || 0.069 || RPD: 24	LCS	100%

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QUALITY CONTROL Cation Exchange Capacity*	UNITS	LOR	METHOD	Blank	Duplicate Sm# Base + Duplicate + %RPD	Duplicate	Spike Sm# Matrix Spike % Recovery Duplicate + %RPD	
Cation Exchange Capacity*	mg/kg		Ext-002	<2	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Hold sample-**NO test** required	UNITS	LOR	METHOD	Blank	Duplicate Sm# Base + Duplicate + %RPD	Duplicate	Spike Sm# Matrix Spike % Recovery Duplicate + %RPD	
Sample on HOLD		[NT]		[NT]	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Moisture	UNITS	LOR	METHOD	Blank	Duplicate Sm# Base + Duplicate + %RPD	Duplicate	Spike Sm# Matrix Spike % Recovery Duplicate + %RPD	
Date Analysed (moisture)				[NT]	[NT]	[NT]	[NR]	[NR]
Moisture	%	1	AN002	<1	[NT]	[NT]	[NR]	[NR]

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Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

CEC analysed by SGS-Cairns, report No. CE73674, report attached.

DETECTION LIMITS FOR ANION SAMPLE 2 RISE 2X DUE TO SAMPLE MATRIX.
Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)

Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
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Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

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LABORATORY REPORT COVERSHEET

Date: 5 September 2011

To: Coffey Geotechnics Pty Ltd
118 Auburn Street
WOLLONGONG NSW 2500

Attention: Corinna De Castro

Your Reference: SE89563 - ENAUWOLL04009AE
Laboratory Report No: CE73674

Samples Received: 25/08/2011
Samples / Quantity: 5 Soils

The above samples were received intact and analysed according to your written instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

Jon Dicker
Manager
CAIRNS

Shey Goddard
Administration Manager
CAIRNS

SGS Australia Pty Ltd ABN 44 000 964 278 | Environmental Services Unit 2, 58 Comport Street, Portsmith 4870 QLD Australia
t +61 (0)7 4035 5111 f +61 (0)7 4035 5122

CLIENT: Coffey Geotechnics Pty Ltd
PROJECT: SE89563 - ENAUWOLL04009AE **Laboratory Report No:** CE73674

LABORATORY REPORT

Cation Exchange Capacity Suite Our Reference Your Reference Type of Sample Date Sampled	Units	CE73674-1 HA1/0.8-1.0 Soil 23/08/2011	CE73674-2 HA2/0.8-0.9 Soil 23/08/2011	CE73674-3 HA3/0.6-0.7 Soil 23/08/2011
Date Extracted		25/08/2011	25/08/2011	25/08/2011
Date Analysed		2/09/2011	2/09/2011	2/09/2011
Sodium, Na	mg/kg	880	710	180
Sodium (meq%)	meq%	3.8	3.1	0.78
Exchangeable Sodium	%	42	55	52
Potassium, K	mg/kg	260	170	86
Potassium (meq%)	meq%	0.66	0.43	0.22
Exchangeable Potassium	%	7	8	15
Calcium, Ca	mg/kg	300	99	35
Calcium (meq%)	meq%	1.5	0.49	0.17
Exchangeable Calcium	%	16	9	12
Magnesium, Mg	mg/kg	380	200	39
Magnesium (meq%)	meq%	3.1	1.6	0.32
Exchangeable Magnesium	%	34	29	21
CEC	meq%	9.1	5.7	1.5

CLIENT: Coffey Geotechnics Pty Ltd
PROJECT: SE89563 - ENAUWOLL04009AE **Laboratory Report No:** CE73674

LABORATORY REPORT

Cation Exchange Capacity Suite Our Reference Your Reference Type of Sample Date Sampled	Units	CE73674-4 HA4/0.8-1.0 Soil 23/08/2011	CE73674-5 QC1 Soil 23/08/2011
Date Extracted		25/08/2011	25/08/2011
Date Analysed		2/09/2011	2/09/2011
Sodium, Na	mg/kg	740	870
Sodium (meq%)	meq%	3.2	3.8
Exchangeable Sodium	%	37	40
Potassium, K	mg/kg	310	250
Potassium (meq%)	meq%	0.79	0.64
Exchangeable Potassium	%	9	7
Calcium, Ca	mg/kg	210	340
Calcium (meq%)	meq%	1.0	1.7
Exchangeable Calcium	%	12	18
Magnesium, Mg	mg/kg	440	420
Magnesium (meq%)	meq%	3.6	3.4
Exchangeable Magnesium	%	42	36
CEC	meq%	8.7	9.6

CLIENT: Coffey Geotechnics Pty Ltd
PROJECT: SE89563 - ENAUWOLL04009AE **Laboratory Report No:** CE73674

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Date Extracted			
Date Analysed			
Sodium, Na	mg/kg	2	AN122 / AN320 RL15D3
Sodium (meq%)	meq%	0.01	Calculation
Exchangeable Sodium	%	1	Calculation
Potassium, K	mg/kg	2	AN122 / AN320 RL15D3
Potassium (meq%)	meq%	0.01	Calculation
Exchangeable Potassium	%	1	Calculation
Calcium, Ca	mg/kg	2	AN122 / AN320 RL15D3
Calcium (meq%)	meq%	0.01	Calculation
Exchangeable Calcium	%	1	Calculation
Magnesium, Mg	mg/kg	2	AN122 / AN320 RL15D3
Magnesium (meq%)	meq%	0.01	Calculation
Exchangeable Magnesium	%	1	Calculation
CEC	meq%	0.01	AN122 / AN320 RL15D3

CLIENT: Coffey Geotechnics Pty Ltd
PROJECT: SE89563 - ENAUWOLL04009AE **Laboratory Report No:** CE73674

LABORATORY REPORT

QUALITY CONTROL	UNITS	Blank	Duplicate Sm#	Duplicate Sample||Duplicate	Spike Sm#	Spike Recovery
Date Extracted		-	CE73674-1	25/08/2011 || 25/08/2011	Batch Spike	-
Date Analysed		-	CE73674-1	2/09/2011 || 2/09/2011	Batch Spike	-
Sodium, Na	mg/kg	<2	CE73674-1	880 || 870 || RPD: 1	Batch Spike	109%
Sodium (meq%)	meq%	-	CE73674-1	3.8 || 3.8 || RPD: 0	Batch Spike	-
Exchangeable Sodium	%	-	CE73674-1	42 || 42 || RPD: 0	Batch Spike	-
Potassium, K	mg/kg	<2	CE73674-1	260 || 260 || RPD: 0	Batch Spike	94%
Potassium (meq%)	meq%	-	CE73674-1	0.66 || 0.66 || RPD: 0	Batch Spike	-
Exchangeable Potassium	%	-	CE73674-1	7 || 7 || RPD: 0	Batch Spike	-
Calcium, Ca	mg/kg	<2	CE73674-1	300 || 300 || RPD: 0	Batch Spike	89%
Calcium (meq%)	meq%	-	CE73674-1	1.5 || 1.5 || RPD: 0	Batch Spike	-
Exchangeable Calcium	%	-	CE73674-1	16 || 17 || RPD: 6	Batch Spike	-
Magnesium, Mg	mg/kg	<2	CE73674-1	380 || 380 || RPD: 0	Batch Spike	103%
Magnesium (meq%)	meq%	-	CE73674-1	3.1 || 3.1 || RPD: 0	Batch Spike	-
Exchangeable Magnesium	%	-	CE73674-1	34 || 34 || RPD: 0	Batch Spike	-
CEC	meq%	-	CE73674-1	9.1 || 9.1 || RPD: 0	Batch Spike	-

CLIENT: Coffey Geotechnics Pty Ltd
PROJECT: SE89563 - ENAUWOLL04009AE **Laboratory Report No:** CE73674

LABORATORY REPORT

NOTES:
LOR - Limit of Reporting.
The significance of all reported results are defined by their analytical limit of reporting.

Analysis Date: **Between** 25/08/11 **and** 5/09/11

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Appendix G
Data Validation

Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AE Batches: SE85496, SE85547, SE85743, SE86052
Anions & Cations: SE85496A, SE85547A, SE85743A, SE86052A

I. SAMPLE HANDLING

	Yes	No (Comment below)
1. Were the sample **holding times** met?	☒	☐
2. Were the samples in **proper custody** between the field and reaching the laboratory?	☐	☒
3. Were the samples **properly and adequately** preserved? *This includes keeping the samples chilled, where applicable.*	☒	☐
4. Were the samples received by the laboratory in good condition?	☒	☐

COMMENTS:

Batches SE85496, SE85547, SE85743 and SE86052

- The relinquishment, consigning office and/or despatch date details were not completed on the COC however the remaining sections of the COC were completed. This is not considered significant as the sample batch was received by the laboratory within expected timeframes.

Sample Handling was: ☐ Satisfactory ☐ Unsatisfactory ☒ Partially Satisfactory

Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AE Batches: SE85496, SE85547, SE85743, SE86052
Anions & Cations: SE85496A, SE85547A, SE85743A, SE86052A

II PRECISION/ACCURACY ASSESSMENT

	Yes	No (Comment below)
1. Was a NATA registered laboratory used?	☒	☐
2. Did the laboratory perform the requested tests?	☒	☐
3. Were the laboratory methods adopted NATA endorsed?	☒	☐
4. Were the appropriate test procedures followed?	☒	☐
5. Were the reporting limits satisfactory?	☐	☒
6. Was the NATA Seal on the reports?	☒	☐
7. Were the reports signed by an authorised person?	☒	☐

COMMENTS:

- For batches SE85496, SE85547, SE85743 and SE86052, the laboratory reporting limit (LOR) was raised for nitrate from 5µg/L to between 25µg/L and 250µg/L due to matrix interference caused by high dissolved solids (ie. electrical conductivity) in samples. This result is not considered significant as the LOR was well below the adopted assessment criteria.
- For batches SE85496, SE85547, SE85743 and SE86052, the LOR was raised for several heavy metals from 0.5µg/L to between 1µg/L and 20µg/L due to matrix interference caused by high dissolved solids (ie. electrical conductivity) in samples. The assessment of some heavy metals was compromised for groundwater at some locations, as the LOR was above the corresponding assessment criteria. The samples affected by this included MW02, MW04, MW08, MW17 (cadmium), MW06 (cadmium, copper) and MW16 (arsenic, cadmium, copper, nickel).

Precision/Accuracy of the Laboratory Report	☐ Satisfactory	☐ Unsatisfactory
	☒ Partially Satisfactory	

QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AE Batches: SE85496, SE85547, SE85743, SE86052
Anions & Cations: SE85496A, SE85547A, SE85743A, SE86052A

III. FIELD QA/QC

1. Number of Primary Samples Analysed — Soil: 0; Water: 6 (SE85496); 9 (SE85547); 2 (SE85743); 1 (SE86052)

2. Number of Days of Sampling: — Soil: N/A; Water: 4

3. Number and Type of QA/QC Samples Collected:

	SOIL	WATER
Field Duplicates (at least 1 in 10 samples)	NA	2
Trip Blanks (at least 1/day or sampling event)	NA	0
Wash Blanks (at least 1/day/matrix/equipment)	NA	0
Other (Field Blanks, Spiked Trip Blanks, etc.)	NA	0

4. FIELD DUPLICATES

	Yes	No (Comment below)
A. Were an Adequate Number of field duplicates analysed for each chemical (min. 10%)?	☒	☐
B. Were RPDs within Control Limits?*		
a. Organics	N/A ☒	N/A ☐
b. Metals/Inorganics		

* - Result < 10 times LOR then No Limit
- Result between 10 and 20 times LOR then control limit of 30%

COMMENTS:

- Results of quality control samples are presented in Table QAQC1.

5. TRIP BLANKS

	Yes	No (Comment below)
A. Were an Adequate Number of trip blanks collected?	☐	☒
B. Were the Trip Blanks free of contaminants? (If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)	☐	☐

6. WASH BLANKS

	Yes	No (Comment below)
A. Were an adequate number of Wash Blanks collected?	☐	☒
B. Were the Wash Blanks free of contaminants? (If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)	☐	☐

COMMENTS:

- Trip spike and blank samples were not transported with samples as volatile petroleum hydrocarbons were not a chemical of concern.
- Groundwater samples were collected using dedicated sampling equipment therefore a wash blank sample was not required.

Field QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

IV LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Type of QA/QC Samples

	Nitrate	Nitrite	TKN	Ammonia	Metals	Anions	Cations
Laboratory Blanks/Reagent Blanks (at least 1 per batch)	✓	✓	✓	✓	✓	✓	✓
Laboratory Duplicates (at least 1 per batch or 1 per 10 samples whichever is the smaller)	✓	✓	-	✓	✓	✓	✓
Matrix Spikes/Matrix Spike Duplicates (1 for each matrix type)	✓	-	-	-	✓	-	-
Laboratory Control Spike	✓	✓	✓	✓	-	✓	✓
Surrogate (where appropriate)*	-	-	-	-	-	-	-

*Number of surrogates spikes carried out on each sample

	Yes	**No** (Comment below)
2 Were the laboratory blanks/reagents blanks free of contamination?	☒	☐
3. Were the spike recoveries within control limits? a. Organics (60% to 110%) b. Metals/Inorganic (70% to 130%)	N/A ☒	N/A ☐
4. Were the RPDs of the laboratory duplicates within control limits?	☐	☒
5. Were the surrogate recoveries within control limits?	N/A	N/A

COMMENTS:

- A reduced frequency of duplicates, matrix spikes and/or laboratory control spikes was used for batches containing less than 10 samples.

Batch SE85547

- In the batch QA/QC, a RPD of 48%, above the control limit of 30% was reported for zinc between laboratory duplicate pair that corresponded to sample MW18. This result may indicate some variability of zinc concentrations for groundwater in the vicinity of MW18.

5. The laboratory internal QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

V. DATA USABILITY

1.	Data Directly Usable (see comment below)	☒
2.	Data Usable with the following corrections/modifications (see comment below)	☐
3.	Data Not Usable.	☐

COMMENTS:

For batches SE85496, SE85547, SE85743 and SE86052, the laboratory reporting limit (LOR) was raised for several heavy metals from 0.5µg/L to between 1µg/L and 20µg/L due to matrix interference caused by high dissolved solids (ie. electrical conductivity) in samples. The assessment of some heavy metals was compromised for groundwater at some locations, as the LOR was above the corresponding assessment criteria. The samples affected by this included MW02, MW04, MW08, MW17 (cadmium), MW06 (cadmium, copper) and MW16 (arsenic, cadmium, copper, nickel).

A higher RPD was reported between the laboratory duplicate pair corresponding to primary sample MW18 for zinc. Therefore, some variability in those heavy metal concentrations can be expected. The reason for the variability is not clear based on observations made at the time of sampling. This result is not considered significant as zinc concentrations are comparable to those reported at other groundwater monitoring locations targeting a similar water bearing zone. Therefore, the zinc concentrations are considered representative of the concentrations at the locations tested.

QA/QC Report Prepared by Colee Quayle

QA/QC Report Reviewed by: Michael Blackam
(Reviewer)

Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902

QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AE Batches: SE87114 & SE87114A

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

I. SAMPLE HANDLING

	Yes	No (Comment below)
1. Were the sample **holding times** met?	☒	☐
2. Were the samples in **proper custody** between the field and reaching the laboratory?	☒	☐
3. Were the samples **properly and adequately** preserved? *This includes keeping the samples chilled, where applicable.*	☒	☐
4. Were the samples received by the laboratory in good condition?	☒	☐

COMMENTS:

Sample Handling was: ☒ Satisfactory ☐ Partially Satisfactory ☐ Unsatisfactory

II PRECISION/ACCURACY ASSESSMENT

	Yes	No (Comment below)
1. Was a NATA registered laboratory used?	☒	☐
2. Did the laboratory perform the requested tests?	☒	☐
3. Were the laboratory methods adopted NATA endorsed?	☒	☐
4. Were the appropriate test procedures followed?	☒	☐
5. Were the reporting limits satisfactory?	☒	☐
6. Was the NATA Seal on the reports?	☒	☐
7. Were the reports signed by an authorised person?	☒	☐

COMMENTS:

- For batches SE87114 & SE87114A, the LOR was raised for nitrate from 0.025mg/kg to between 0.05mg/kg and 0.125mg/kg due to matrix interference caused by high electrical conductivity in samples CTP92/0.6-0.8m, CTP92/1.0-1.1m, CTP93/0.6-0.7m and QC1. This result is not considered to have a material effect on the conclusions of the report.

Precision/Accuracy of the Laboratory Report	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

III. FIELD QA/QC

1. Number of Primary Samples Analysed — Soil: 12 (SE87114); Water: 0

2. Number of Days of Sampling: — Soil: 1; Water: 0

3. Number and Type of QA/QC Samples Collected:

	SOIL	WATER
Field Duplicates (at least 1 in 10 samples)	2	N/A
Trip Blanks (at least 1/day or sampling event)	0	N/A
Wash Blanks (at least 1/day/matrix/equipment)	0	N/A
Other (Field Blanks, Spiked Trip Blanks, etc.)	0	N/A

4. FIELD DUPLICATES

	Yes	No (Comment below)
A. Were an Adequate Number of field duplicates analysed for each chemical (min. 10%)?	☒	☐
B. Were RPDs within Control Limits?*		
a. Organics	N/A ☐	N/A ☒
b. Metals/Inorganics		

* - Result < 10 times LOR then No Limit
- Result between 10 and 20 times LOR then control limit of 50% (soil) & 30% (water)

COMMENTS:

- A RPD of 59%, above the control limit of 50%, were recorded for TKN and total nitrogen for soil duplicate pair CTP91/0.6-0.8m and QC3. This result is considered to be attributed to the heterogeneous nature of the contaminant distribution throughout the soil/fill matrix.
- RPDs of 49%, above the control limit of 30% were reported for TKN and total nitrogen for leachate duplicate pair CTP93/0.6-0.7m and QC1. It is considered that the variability may be attributed to varying amounts of organic materials in the soil. This result may indicate some variability of TKN and total nitrogen concentrations for leachate derived from clay soils.
- Results of quality control samples are presented in Tables QAQC1 and QAQC2.

5. TRIP BLANKS

	Yes	No (Comment below)
A. Were an Adequate Number of trip blanks collected?	☐	☒
B. Were the Trip Blanks free of contaminants? (If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)	☐	☐

6. WASH BLANKS

	Yes	No (Comment below)
A. Were an adequate number of Wash Blanks collected?	☐	☒
B. Were the Wash Blanks free of contaminants? (If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)	☐	☐

COMMENTS:

- Trip spike and blank samples were not transported with samples as volatile petroleum hydrocarbons were not a chemical of concern.
- Soil samples were either collected directly from the excavator bucket or ground surface using a clean pair of disposable gloves for each sample and therefore a wash blank sample was not considered necessary.

Field QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

IV LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Type of QA/QC Samples

	Nitrate	Nitrite	TKN	Ammonia	Metals
Laboratory Blanks/Reagent Blanks (at least 1 per batch)	✓	✓	✓	✓	✓
Laboratory Duplicates (at least 1 per batch or 1 per 10 samples whichever is the smaller)	✓	✓	✓	✓	✓
Matrix Spikes/Matrix Spike Duplicates (1 for each matrix type)	-	-	-	-	✓
Laboratory Control Spike	✓	✓	✓	✓	✓
Surrogate (where appropriate)*	-	-	-	-	-

*Number of surrogates spikes carried out on each sample

	Yes	**No** (Comment below)
2 Were the laboratory blanks/reagents blanks free of contamination?	☒	☐
3. Were the spike recoveries within control limits?		
a. Organics (60% to 110%)	N/A ☒	N/A ☐
b. Metals/Inorganic (70% to 130%)		
4. Were the RPDs of the laboratory duplicates within control limits?	☐	☒
5. Were the surrogate recoveries within control limits?	N/A	N/A

COMMENTS:

- A reduced frequency of duplicates, matrix spikes and/or laboratory control spikes was used for batch SE87114A, which contained less than 10 samples.

Batch SE87114

- In the batch QA/QC, a RPD of 55%, above the control limit of 50% was reported for lead between laboratory duplicate pair that corresponded to sample CTP90/1.8-2.0m. This result may indicate some variability of lead concentrations for groundwater in the vicinity of CTP90/1.8-2.0m.

5. The laboratory internal QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

V. DATA USABILITY

1. Data Directly Usable (see comment below) ☒
2. Data Usable with the following corrections/modifications (see comment below) ☐
3. Data Not Usable. ☐

COMMENTS:

For batches SE87114 & SE87114A, the LOR was raised for nitrate from 0.025mg/kg to between 0.05mg/kg and 0.125mg/kg due to matrix interference caused by high electrical conductivity in samples CTP92/0.6-0.8m, CTP92/1.0-1.1m, CTP93/0.6-0.7m and QC1. This result is not considered to have a material effect on the conclusions of the report.

A higher RPD was reported between the laboratory duplicate pair corresponding to primary sample CTP90/1.8-2.0m for lead in soil. A higher RPD was also reported for field duplicate pair CTP91/0.6-0.8m and QC3 for TKN and total nitrogen in soil. Therefore, some variability in lead, TKN and total nitrogen concentrations can be expected. In both cases, the variability is considered to be attributed to the heterogeneous nature of the contaminant distribution throughout the soil/fill matrix.

Higher RPDs were reported for field duplicate pair CTP93/0.6-0.7m and QC1 for TKN and total nitrogen in leachate derived from clay soil. It is considered that the variability may be attributed to varying amounts of organic materials in the soil. This result may indicate some variability of TKN and total nitrogen concentrations for leachate derived from clay soils.

QA/QC Report Prepared by Colee Quayle

QA/QC Report Reviewed by: Michael Blackam
(Reviewer)

Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902

QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AE Batch: SE89563, SE89563 CEC

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

I. SAMPLE HANDLING

	Yes	No (Comment below)
1. Were the sample **holding times** met?	☒	☐
2. Were the samples in **proper custody** between the field and reaching the laboratory?	☒	☐
3. Were the samples **properly and adequately** preserved? *This includes keeping the samples chilled, where applicable.*	☒	☐
4. Were the samples received by the laboratory in good condition?	☒	☐

COMMENTS:

Sample Handling was: ☒ Satisfactory ☐ Unsatisfactory ☐ Partially Satisfactory

II PRECISION/ACCURACY ASSESSMENT

	Yes	No (Comment below)
1. Was a NATA registered laboratory used?	☒	☐
2. Did the laboratory perform the requested tests?	☒	☐
3. Were the laboratory methods adopted NATA endorsed?	☒	☐
4. Were the appropriate test procedures followed?	☒	☐
5. Were the reporting limits satisfactory?	☒ See comment	☐
6. Was the NATA Seal on the reports?	☒	☐
7. Were the reports signed by an authorised person?	☒	☐

COMMENTS:

- The laboratory noted that the detection limits for HA2/0.8-0.9m, analysed for nitrate, were elevated by two times (to <0.050mg/kg) due to sample matrix. This result is not considered to have a material effect on the conclusions of the report.

Precision/Accuracy of the Laboratory Report	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

III. FIELD QA/QC

1. Number of Primary Samples Analysed — Soil: 4; Water: 0

2. Number of Days of Sampling: — Soil: 1; Water: 0

3. Number and Type of QA/QC Samples Collected:

	SOIL	WATER
Field Duplicates (at least 1 in 10 samples)	1 intra lab	NA
Trip Spikes	0	NA
Trip Blanks (at least 1/day or sampling event)	0	NA
Wash Blanks (at least 1/day/matrix/equipment)	0	NA
Other (Field Blanks, etc.)	NA	NA

4. FIELD DUPLICATES

	Yes	No (Comment below)
A. Were an Adequate Number of field duplicates analysed for each chemical (min. 10%)?	☒	☐
B. Were RPDs within Control Limits? a. Organics (< 50 % for soil; < 30% for water) b. Metals/Inorganics (< 50 % for soil; < 30% for water)	☒	☐

COMMENTS:

- RPDs calculated for this project have been presented at the end of this report in Table QAQC2.

5. TRIP BLANKS

	Yes	No (Comment below)
A. Were an adequate number of trip blanks collected?	☐	☒
B. Were the trip blanks free of contaminants? (If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)	☐	☒ N/A

6. TRIP SPIKES

	Yes	No (Comment below)
A. Were an adequate number of trip spikes collected?	☐	☒
B. Were the spike recoveries within control limits (60% to 110%)?	☐	☒ N/A

7. WASH BLANKS

	Yes	No (Comment below)
A. Were an adequate number of Wash Blanks collected?	☐	☒
B. Were the Wash Blanks free of contaminants? (If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)	☐	☒ N/A

COMMENTS:

- Trip spike and blank samples were not transported with samples as volatile petroleum hydrocarbons were not a chemical of concern.
- Soil samples were collected directly from the hand auger using a clean pair of disposable gloves for each sample and therefore a wash blank sample was not considered necessary.

Field QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

IV LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Type of QA/QC Samples

	Nutrients	TOC	Cation Exchange Capacity
Laboratory Blanks/Reagent Blanks (at least 1 per batch)	1	1	1
Laboratory Duplicates (at least 1 per batch or 1 per 10 samples whichever is the smaller)	1	1	1
Matrix Spikes/Matrix Spike Duplicates (1 for each soil type)	-	-	1
Laboratory Control Spike	1	1	-
Surrogate (where appropriate)*	-	-	-

*Number of surrogates spikes carried out on each sample

	Yes	**No** (Comment below)
2 Were the laboratory blanks/reagents blanks free of contamination?	☒	☐
3. Were the spike recoveries within laboratory control limits?*		
a. Organics	N/A ☒	N/A ☐
b. Metals/Inorganic		
4. Were the RPDs of the laboratory duplicates within control limits?#	☒	☐
5. Were the surrogate recoveries within control limits?	N/A	N/A

Laboratory control limits:

* - Organics: MS (60 to 130%); LCS (60 to 140%); SS (70 to 130%); SS for BTEX (60 to 140%
- Inorganic: MS (70 to 130%); LCS (80 to 120%)

\# - Result < 5 times LOR then No Limit
- Result > 5 times LOR then control limit of 30%

COMMENTS:

5. The laboratory internal QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

V. DATA USABILITY

1.	Data Directly Usable	☒
2.	Data Usable with the following corrections/modifications (see comment below)	☐
3.	Data Not Usable.	☐

COMMENTS:

The laboratory noted that the detection limits for HA2/0.8-0.9m, analysed for nitrate, were elevated by two times (to <0.050mg/kg) due to sample matrix. This result is not considered to have a material effect on the conclusions of the report.

Trip spike and blank samples were not transported with samples as volatile petroleum hydrocarbons were not a chemical of concern.

Soil samples were collected directly from the hand auger using a clean pair of disposable gloves for each sample and therefore a wash blank sample was not considered necessary.

QA/QC Report Prepared by Alexander Williams

QA/QC Report Reviewed by: Corinna De Castro
(Reviewer)

Table QAQC1: Relative Percentage Difference for Groundwater & Leachate

Batch:	SE85496			SE85547			SE87114			SE87114			SE87114A		
	Primary Sample Conc. (µg/L)	Duplicate Sample Conc. (µg/L)	RPD (%)	Primary Sample Conc. (µg/L)	Duplicate Sample Conc. (µg/L)	RPD (%)	Primary Sample Conc. (µg/L)	Duplicate Sample Conc. (µg/L)	RPD (%)	Primary Sample Conc. (µg/L)	Duplicate Sample Conc. (µg/L)	RPD (%)	Primary Sample Conc. (µg/L)	Duplicate Sample Conc. (µg/L)	RPD (%)
Sample No.	MW05	QC01		MW01	QC03		CTP89	QC2		CTP91	QC3		CTP93	QC1	
Depth (m)	-	-		-	-		1.8-2.0	1.8-2.0		0.6-0.8	0.6-0.8		0.6-0.7	0.6-0.7	
Analyte															
HEAVY METALS (DISSOLVED)															
Arsenic	55	49	12	7	7	0	<1	<1	ND	4	3	29	<1	<1	ND
Cadmium	<0.5	<0.5	ND	<0.5	<0.5	ND	<0.1	<0.1	ND	<0.1	<0.1	ND	<0.1	<0.1	ND
Chromium (III)	<5	<5	ND	<5	<5	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND
Copper	50	38	27	<0.5	<0.5	ND	<1	<1	ND	<1	<1	ND	1	<1	NC
Lead	7	6	15	<0.5	<0.5	ND	<1	<1	ND	<1	<1	ND	<1	<1	ND
Molybdenum	1	<1	NC	1	2	67	<1	3	NC	<1	1	NC	29	24	19
Nickel	5	6	18	5	5	0	<1	<1	ND	<1	<1	ND	<1	<1	ND
Zinc	73	69	6	67	52	25	<1	<1	ND	<1	<1	ND	<1	<1	ND
NUTRIENTS															
Ammonium (NH_4^+) as N	9200	10000	8	2200	2300	4	0.15	0.13	14	0.08	0.09	12	0.51	0.5	2
Nitrate as N	<250	<250	ND	<50	<10	ND	0.029	0.017	52	<0.005	<0.005	ND	0.006	0.01	50
Nitrite as N	<5	<5	ND	<5	6.0	NC	0.006	0.007	15	0.005	0.007	33	0.020	0.020	0
Total Kjeldahl Nitrogen	12000	10500	13	3400	3600	6	3.7	3.3	11	0.24	0.27	12	8.7	5.3	**49**
Total Nitrogen (by calc.)	12000	10500	13	3400	3600	6	3.7	3.3	11	0.24	0.27	12	8.7	5.3	**49**

Notes:

Bold RPD exceeds control limit for soil if:
- Result < 10 times LOR then No Limit
- Result between 10 and 20 times LOR then control limit of 30%

RPD Relative Percentage Difference
ND Not Detected
NC Contaminant is not detected in primary sample but is detected in duplicate sample, or vice versa
LOR Limit of Reporting

Table QAQC2: Relative Percentage Difference for Soil

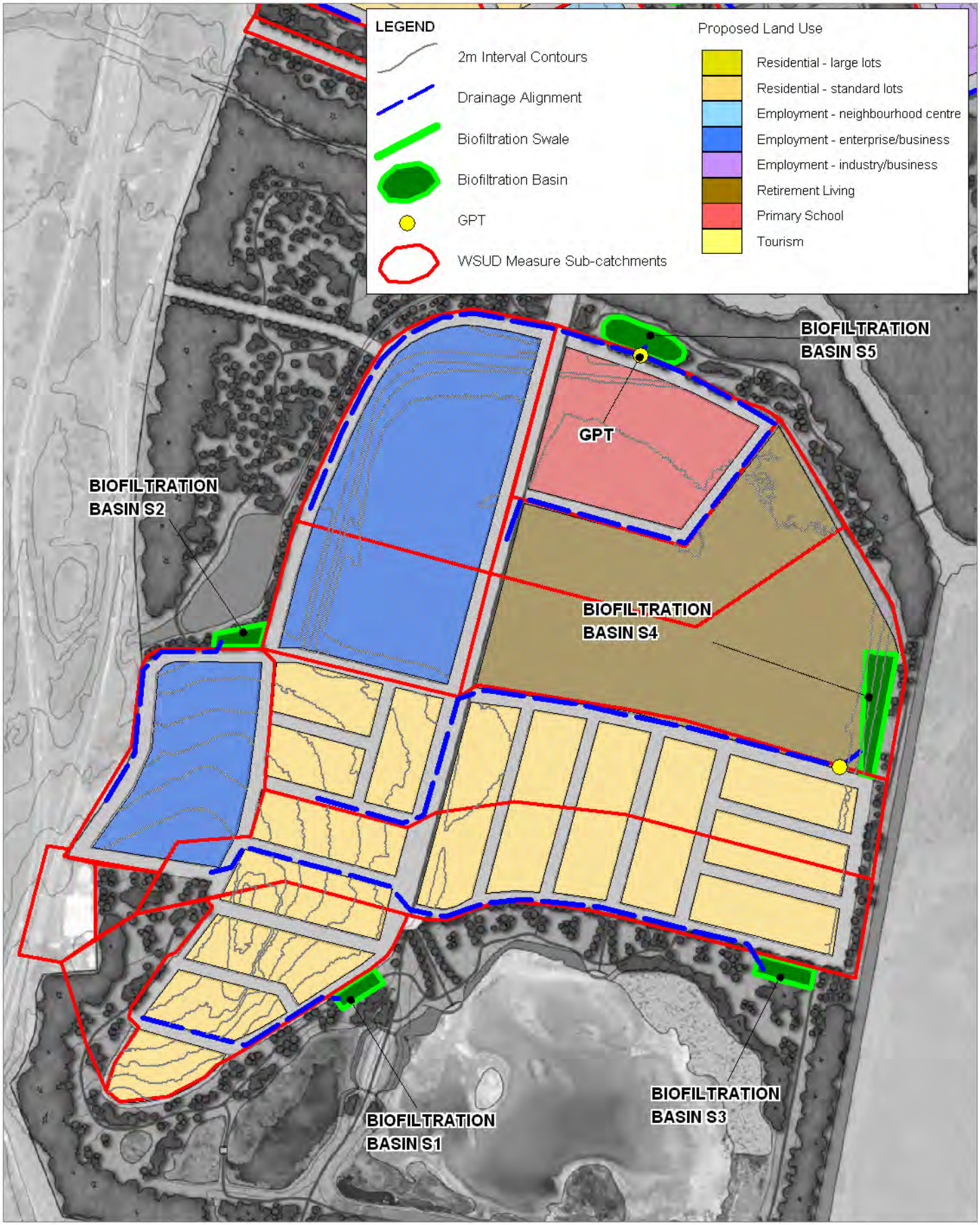
Batch:	SE87114			SE87114			SE87114A			SE89563		
	Primary Sample Conc. (mg/kg)	Duplicate Sample Conc. (mg/kg)	RPD (%)	Primary Sample Conc. (mg/kg)	Duplicate Sample Conc. (mg/kg)	RPD (%)	Primary Sample Conc. (mg/kg)	Duplicate Sample Conc. (mg/kg)	RPD (%)	Primary Sample Conc. (mg/kg)	Duplicate Sample Conc. (mg/kg)	RPD (%)
Sample No.	CTP89	QC2		CTP91	QC3		CTP93	QC1		HA1	QC1	
Depth (m)	1.8-2.0	1.8-2.0		0.6-0.8	0.6-0.8		0.6-0.7	0.6-0.7		0.8-1.0	0.8-1.0	
Analyte												
HEAVY METALS (TOTAL)												
Arsenic	<3	<3	ND	<3	<3	ND	<3	<3	ND	-	-	-
Cadmium	0.5	<0.3	NC	<0.3	<0.3	ND	<0.3	<0.3	ND	-	-	-
Chromium (III)	1.7	1.4	19	4.5	4.4	2	5	5.5	10	-	-	-
Copper	21	22	5	5.7	5.7	0	9.2	7.8	16	-	-	-
Lead	15	15	0	3	3	0	4	3	29	-	-	-
Molybdenum	1.6	<1	NC	<1	<1	ND	2.2	1.8	20	-	-	-
Nickel	8.2	8.3	1	3.8	3.9	3	0.8	0.94	16	-	-	-
Zinc	45	60	29	11	12	9	3.4	4	16	-	-	-
NUTRIENTS												
Ammonium (NH_4^+) as N	0.54	0.55	2	<0.15	0.15	NC	11	6.7	49	6.4	7.2	12
Nitrate as N	0.11	0.11	0	0.060	0.062	3	<0.050	<0.050	ND	0.088	0.15	52
Nitrite as N	0.0	0.0	0	<0.025	0.040	NC	0.0	0.050	22	0.0	0.030	0
Total Kjeldahl Nitrogen	2300	3100	30	550	300	**59**	420	600	35	340	400	16
Total Nitrogen (by calc.)	2300	3100	30	550	300	**59**	420	600	35	340	400	16
CATION EXCHANGE CAPACITY	-	-	-	-	-	-	-	-	-	9.1	9.6	5
TOTAL ORGANIC CARBON	-	-	-	-	-	-	-	-	-	0.42	0.53	23

Notes:

Bold RPD exceeds control limit for soil if:
- Result < 10 times LOR then No Limit
- Result between 10 and 20 times LOR then control limit of 50%

RPD Relative Percentage Difference
ND Not Detected
NC Contaminant is not detected in primary sample but is detected in duplicate sample, or vice versa
LOR Limit of Reporting

Appendix H
Ash Pond 3 – WSUD Strategy



Title:

Southern Precinct - WSUD Strategy

Figure: **5-11**

Rev: **A**

N

0 125 250m

Approx. Scale

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Filepath : K:\N1854 Tallawarra Lands Environmental Assessment\MI\workspaces\DRG_009_100927_South_WSUD.WOR

Appendix I
Preliminary Construction Plans

SURFACE RL = APPROXIMATE SURFACE LEVEL
PIPE IL = APPROX STORMWATER PIPE INVERT LEVEL

LEGEND

2m Interval Contours

Drainage Alignment

Biofiltration Swale

Biofiltration Basin

GPT

WSUD Measure Sub-catchmer

Proposed Land Use

- Residential - large lots
- Residential - standard lots
- Employment - neighbourhood centre
- Employment - enterprise/business
- Employment - industry/business
- Retirement Living
- Primary School
- Tourism

SURFACE RL 7.0
PIPE IL 4.0

SURFACE RL 5.5
PIPE IL 2.5

BIOFILTRATION

SURFACE RL 4.5
PIPE IL 3.0

SURFACE RL 6.0
PIPE IL 5.0

SURFACE RL 7.0
PIPE IL 6.0

GPT

SURFACE RL 5.0
PIPE IL 3.5

BIOFILTRATION
BASIN S2

SURFACE RL 11.0
PIPE IL 9.5

SURFACE RL 9.0
PIPE IL 8.0

SURFACE RL 5.5
PIPE IL 4.5

RATION
S4

SURFACE RL 5.5
PIPE IL 3.2

SURFACE RL 4.5
PIPE IL 2.0

SURFACE RL 15.0
PIPE IL 14.0

SURFACE RL 17.0
PIPE IL 16.0

SURFACE RL 7.0
PIPE IL 5.5

SURFACE RL 5.5
PIPE IL 4.5

SURFACE RL 5.0
PIPE IL 3.5

SURFACE RL 6.0
PIPE IL 5.0

SURFACE RL 15.0
PIPE IL 14.0

SURFACE RL 8.0
PIPE IL 6.5

SURFACE RL 5.5
PIPE IL 2.5

BIOFILTRATION
BASIN S1

BIOFILTRATION
BASIN S3

Title:

Southern Precinct - WSUD Strategy

MARKED-UP BY NORTHROP (06.12.11)

PRELIMINARY SURFACE LEVELS/STORMWATER PIPE INVERT LEVELS

Figure: 5-11

Rev: A

N

0 125 250m

Approx. Scale

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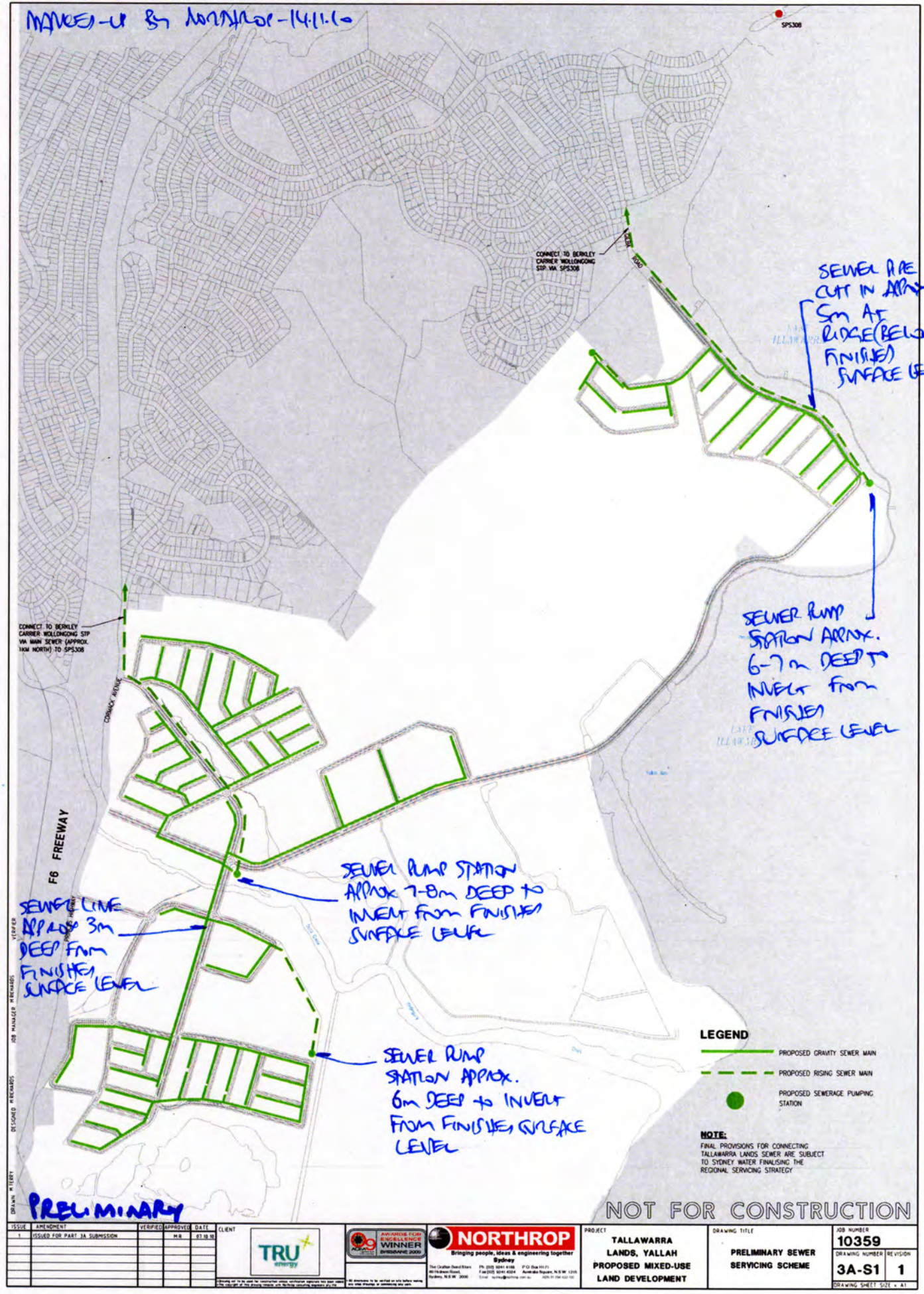

ISSUE	AMENDMENT	VERIFIED	APPROVED	DATE
1	ISSUED FOR PART 3A SUBMISSION		MR	07.10.10

CLIENT: TRU energy

AWARDS FOR EXCELLENCE WINNER BRISBANE 2009

NORTHROP
Bringing people, ideas & engineering together
Sydney
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PROJECT: TALLAWARRA LANDS, YALLAH PROPOSED MIXED-USE LAND DEVELOPMENT

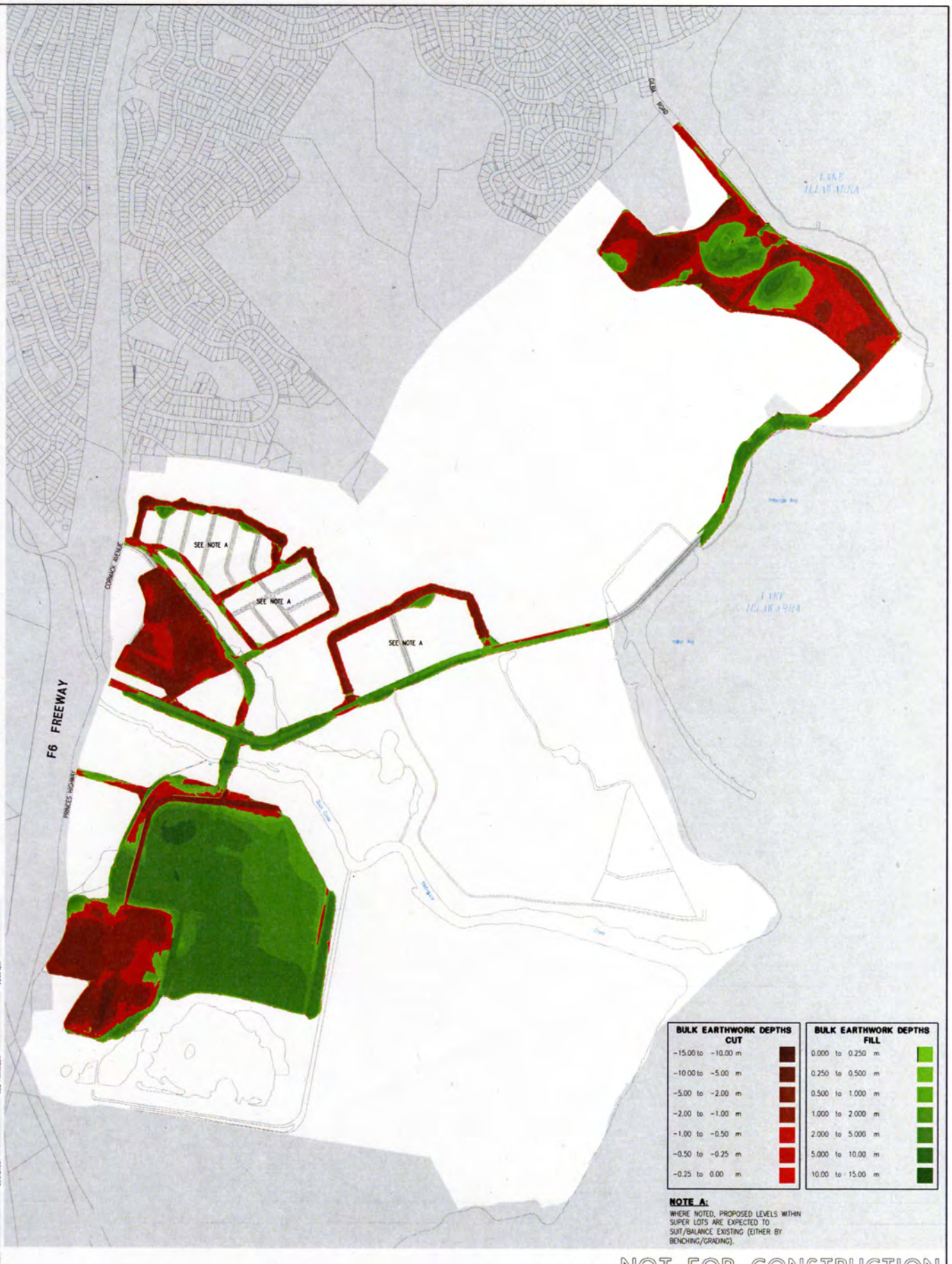
DRAWING TITLE: PRELIMINARY SEWER SERVICING SCHEME

JOB NUMBER: 10359

DRAWING NUMBER: 3A-S1

REVISION: 1

DRAWING SHEET SIZE - A1



NOTE A:
WHERE NOTED, PROPOSED LEVELS WITHIN SUPER LOTS ARE EXPECTED TO SUIT/BALANCE EXISTING (EITHER BY BENCHING/GRADING).

NOT FOR CONSTRUCTION

DRAWN M.TERRY DESIGNED M.RICHARDS JOB MANAGER M.RICHARDS VERIFIER

ISSUE	AMENDMENT	VERIFIED	APPROVED	DATE
1	ISSUED FOR PART 3A SUBMISSION		MR	07.10.10

CLIENT: TRU energy

AWARDS FOR EXCELLENCE WINNER BRISBANE 2009

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ABN 77 054 422 130

PROJECT: TALLAWARRA LANDS, YALLAH PROPOSED MIXED-USE LAND DEVELOPMENT

DRAWING TITLE: PRELIMINARY BULK EARTHWORKS PLAN

JOB NUMBER: 10359
DRAWING NUMBER: 3A-BE1
REVISION: 1
DRAWING SHEET SIZE = A1

Appendix J
Proposed Site Development – Modelled Sequences

Appendix J: Proposed Site Development - Modelled Sequences

Model Stress Period Number	Number of Days in Stress Period	Total Number of Days	Modelled Date			Timeframe and Description of Development Sequences
1	365	365	Jan-98			
2	365	730	Jan-99			
3	365	1095	Jan-00			
4	365	1460	Jan-01			
5	365	1825	Jan-02			
6	365	2190	Jan-03			
7	365	2555	Jan-04			
8	365	2920	Jan-05			
9	365	3285	Jan-06			
10	365	3650	Jan-07			
11	365	4015	Jan-08			
12	365	4380	Jan-09			
13	365	4745	Jan-10			
14	365	5110	Jan-11			
15	365	5475	Jan-12			
16	365	5840	Jan-13			
17	365	6205	Jan-14			
18	365	6570	Jan-15			
19	365	6935	Jan-16			
20	365	7300	Dec-16			
21	30	7330	Jan-17			**Start of development in Ash Pond 3. Assume 5 years from present - January 2017**
22	30	7360	Feb-17			Sewer pump station 1 excavation near Duck Creek. Simulated as a drain for a 1 month period: 1 cell to 0mAHD.
23	30	7390	Mar-17			(Assume drain elevation is the base of sediment in layer 3 - ignore actual base of excavation in rock which is -3mAHD).
24	30	7420	Apr-17			
25	30	7450	May-17			
26	30	7480	Jun-17			
27	30	7510	Jul-17	90% Recharge Ash Pond 3		Ash Pond 3 stormwater drainage lines. Assume all drains installed after 6 months of development.
28	30	7540	Aug-17			
29	30	7570	Sep-17			
30	30	7600	Oct-17			
31	30	7630	Nov-17			
32	30	7660	Dec-17			
33	30	7690	Jan-18	70% Recharge Ash Pond 3		ET reduced to zero over all Ash Pond 3 development area. Assume all cleared after 12 months development.
34	30	7720	Feb-18			Sewer pump station 2 excavation in Ash Pond 3. Simulated as a drain for a 1 month period: 1 cell to -2mAHD.
35	30	7750	Mar-18			
36	30	7780	Apr-18			
37	30	7810	May-18			
38	30	7840	Jun-18			
39	30	7870	Jul-18			
40	30	7900	Aug-18			
41	30	7930	Sep-18			
42	30	7960	Oct-18			
43	30	7990	Nov-18			
44	30	8020	Dec-18			
45	30	8050	Jan-19	50% Recharge Ash Pond 3		
46	30	8080	Feb-19			
47	30	8110	Mar-19			
48	30	8140	Apr-19			
49	30	8170	May-19			
50	30	8200	Jun-19			
51	30	8230	Jul-19			
52	30	8260	Aug-19			
53	30	8290	Sep-19			
54	30	8320	Oct-19			
55	30	8350	Nov-19			
56	30	8380	Dec-19			
57	30	8410	Jan-20	30% Recharge for rest of simulation in Ash Pond 3 development area		
58	30	8440	Feb-20			
59	30	8470	Mar-20			
60	30	8500	Apr-20			
61	30	8530	May-20			
62	30	8560	Jun-20			
63	30	8590	Jul-20		90% Recharge Ash Pond 2	
64	30	8620	Aug-20			
65	30	8650	Sep-20			
66	30	8680	Oct-20			
67	30	8710	Nov-20			
68	30	8740	Dec-20			
69	30	8770	Jan-21		80% Recharge Ash Pond 2	ET reduced to zero over all Ash Pond 2 development area. Assume all cleared after 12 months development.
70	30	8800	Feb-21			
71	30	8830	Mar-21			
72	30	8860	Apr-21			
73	30	8890	May-21			
74	30	8920	Jun-21			
75	30	8950	Jul-21			
76	30	8980	Aug-21			
77	30	9010	Sep-21			
78	30	9040	Oct-21			
79	30	9070	Nov-21			
80	30	9100	Dec-21			
81	30	9130	Dec-21		70% Recharge Ash Pond 2	
82	30	9160	Jan-22			
83	30	9190	Mar-22			
84	30	9220	Mar-22			
85	30	9250	Apr-22			
86	30	9280	May-22			
87	30	9310	Jun-22			
88	30	9340	Jul-22			
89	30	9370	Aug-22			
90	30	9400	Sep-22			
91	30	9430	Oct-22			
92	30	9460	Nov-22			
93	30	9490	Dec-22		60% Recharge Ash Pond 2	
94	30	9520	Jan-23			
95	30	9550	Feb-23			
96	30	9580	Mar-23			
97	30	9610	Apr-23			
98	30	9640	May-23			
99	30	9670	Jun-23			
100	30	9700	Jul-23			
101	30	9730	Aug-23			
102	30	9760	Sep-23			
103	30	9790	Oct-23			
104	30	9820	Nov-23			
105	30	9850	Dec-23		50% Recharge for rest of simulation in Ash Pond 2 development area	
106	30	9880	Jan-24			
107	30	9910	Feb-24			
108	30	9940	Mar-24			
109	30	9970	Apr-24			
110	30	10000	May-24			
111	30	10030	Jun-24			
112	30	10060	Jul-24			
113	30	10090	Aug-24			
114	30	10120	Sep-24			
115	30	10150	Oct-24			
116	30	10180	Nov-24			
117	30	10210	Dec-24			**End of development in Ash Pond 2 area.**
						Post-development: continued model simulation up to maximum period of 5000 years

Appendix K
Contaminant Dilution Calculations

Appendix K
Arsenic Loads - No Development

TIME	Flows (ML/day) DUCK CREEK								Flows (ML/day) LAKE ILLAWARRA										Concentrations (mg/L) - Arsenic						
(days)	IN				OUT	NET	Storage	Mixing	IN						OUT	NET	Storage	Mixing	TIME	Break	Woll	Groundwater	Tidal Inflow	Duck Creek
	River	Runoff	GW	Tide	Evap	OUT		Volume	Surface	GW	Breakwater	Woll Ck	Tide	Duck Ck	Evap	OUT *		Volume	(days)	Water	Ck	Seepage to Duck Creek	From Lake Illawarra	Discharge Water to Lake Illawarra
1	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	1	4.063	0	0.883	0	0.001360555
2	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	2	4.063	0	0.883	1.15539E-06	0.002241133
3	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	3	4.063	0	0.883	2.2816E-06	0.002811093
4	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	4	4.063	0	0.883	3.2927E-06	0.003180026
5	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	5	4.063	0	0.883	4.15754E-06	0.003418853
6	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	6	4.063	0	0.883	4.87421E-06	0.003573469
7	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	7	4.063	0	0.883	5.4551E-06	0.003673577
8	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	8	4.063	0	0.883	5.91834E-06	0.003738401
9	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	9	4.063	0	0.883	6.28326E-06	0.003780381
10	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	10	4.063	0	0.883	6.568E-06	0.003807573
11	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	11	4.063	0	0.883	6.78849E-06	0.003825188
12	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	12	4.063	0	0.883	6.95821E-06	0.003836602
13	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	13	4.063	0	0.883	7.08819E-06	0.003844
14	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	14	4.063	0	0.883	7.18734E-06	0.003848795
15	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	15	4.063	0	0.883	7.26272E-06	0.003851905
16	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	16	4.063	0	0.883	7.31986E-06	0.003853922
17	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	17	4.063	0	0.883	7.36308E-06	0.003855231
18	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	18	4.063	0	0.883	7.3957E-06	0.003856081
19	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	19	4.063	0	0.883	7.42028E-06	0.003856633
20	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	20	4.063	0	0.883	7.43877E-06	0.003856991
21	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	21	4.063	0	0.883	7.45267E-06	0.003857225
22	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	22	4.063	0	0.883	7.46311E-06	0.003857377
23	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	23	4.063	0	0.883	7.47093E-06	0.003857475
24	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	24	4.063	0	0.883	7.4768E-06	0.00385754
25	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	25	4.063	0	0.883	7.48119E-06	0.003857582
26	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	26	4.063	0	0.883	7.48448E-06	0.00385761
27	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	27	4.063	0	0.883	7.48694E-06	0.003857628
28	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	28	4.063	0	0.883	7.48878E-06	0.003857639
29	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	29	4.063	0	0.883	7.49016E-06	0.003857647
30	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	30	4.063	0	0.883	7.49119E-06	0.003857652
31	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	31	4.063	0	0.883	7.49195E-06	0.003857656
32	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	32	4.063	0	0.883	7.49253E-06	0.003857658
33	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	33	4.063	0	0.883	7.49296E-06	0.003857659
34	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	34	4.063	0	0.883	7.49328E-06	0.00385766
35	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	35	4.063	0	0.883	7.49352E-06	0.003857661
36	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	36	4.063	0	0.883	7.49369E-06	0.003857661
37	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	37	4.063	0	0.883	7.49383E-06	0.003857662
38	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	38	4.063	0	0.883	7.49393E-06	0.003857662
39	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	39	4.063	0	0.883	7.494E-06	0.003857662
40	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	40	4.063	0	0.883	7.49406E-06	0.003857662
41	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	41	4.063	0	0.883	7.4941E-06	0.003857662
42	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	42	4.063	0	0.883	7.49413E-06	0.003857662
43	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	43	4.063	0	0.883	7.49415E-06	0.003857662
44	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	44	4.063	0	0.883	7.49417E-06	0.003857662
45	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	45	4.063	0	0.883	7.49418E-06	0.003857662
46	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	46	4.063	0	0.883	7.49419E-06	0.003857662
47	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	47	4.063	0	0.883	7.4942E-06	0.003857662
48	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	48	4.063	0	0.883	7.4942E-06	0.003857662
49	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	49	4.063	0	0.883	7.49421E-06	0.003857662
50	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	50	4.063	0	0.883	7.49421E-06	0.003857662
51	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	51	4.063	0	0.883	7.49421E-06	0.003857662
52	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	52	4.063	0	0.883	7.49421E-06	0.003857662
53	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	53	4.063	0	0.883	7.49422E-06	0.003857662
54	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	54	4.063	0	0.883	7.49422E-06	0.003857662
55	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	55	4.063	0	0.883	7.49422E-06	0.003857662
56	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	56	4.063	0	0.883	7.49422E-06	0.003857662
57	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	57	4.063	0	0.883	7.49422E-06	0.003857662
58	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	58	4.063	0	0.883	7.49422E-06	0.003857662
59	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	59	4.063	0	0.883	7.49422E-06	0.003857662
60	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	60	4.063	0	0.883	7.49422E-06	0.003857662
61	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	61	4.063	0	0.883	7.49422E-06	0.003857662
62	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	62	4.063	0	0.883	7.49422E-06	0.003857662
63	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	63	4.063	0	0.883	7.49422E-06	0.003857662
64	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	64	4.063	0	0.883	7.49422E-06	0.003857662
65	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	65	4.063	0	0.883	7.49422E-06	0.003857662
66	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	66	4.063	0	0.883	7.49422E-06	0.003857662
67	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	67	4.063	0	0.883	7.49422E-06	0.003857662
68	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	68	4.063	0	0.883	7.49422E-06	0.003857662
69	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	69	4.063	0	0.883	7.49422E-06	0.003857662
70	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	70	4.063	0	0.883	7.49422E-06	0.003857662
71	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	71	4.063	0	0.883	7.49422E-06	0.003857662
72	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	72	4.063	0	0.883	7.49422E-06	0.003857662

*** The outflow from Lake Illawarra takes with it some contaminant mass - this has been included in the calculations**

Groundwater Seepage to Duck Creek

88305	Arsenic Load 100 year rate (mg/day) - creek total
100000	Baseflow Groundwater to Duck Creek from Model (L)
0.88305	**Concentrations (mg/L)**

Groundwater Seepage to Lake Illawarra

56881	Arsenic Load 100 year rate (mg/day) - breakwall discharge area
40000	Baseflow Groundwater to Lake Illawarra from Model (L) - TOTAL
14000	Baseflow Groundwater to Lake Illawarra from Model (L) - breakwall discharge
4.063	**Concentrations (mg/L) at breakwall discharge**

0.002	Arsenic Load 100 year rate (mg/day) - Wollingurry Creek
17500	Baseflow Groundwater to Wollingurry Creek from Model (L)
0.0000001	**Concentrations (mg/L) at Wollingurry Creek**

ANZECC Trigger Value
0.0023 mg/L

Appendix K
Arsenic Loads - With Development

TIME	Flows (ML/day) DUCK CREEK								Flows (ML/day) LAKE ILLAWARRA										Concentrations (mg/L) - Arsenic					
(days)	IN				OUT	NET	Storage	Mixing	IN						OUT	NET	Storage	Mixing	TIME	Break	Woll	Groundwater	Tidal Inflow	Duck Creek
	River	Runoff	GW	Tide	Evap	OUT		Volume	Surface	GW	Breakwater	Woll Ck	Tide	Duck Ck	Evap	OUT *		Volume	(days)	Water	Ck	Seepage to Duck Creek	From Lake Illawarra	Discharge Water to Lake Illawarra
1	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	1	4.124	0	0.96773	0	0.001491109
2	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	2	4.124	0	0.96773	1.20584E-06	0.00245618
3	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	3	4.124	0	0.96773	2.39506E-06	0.003080824
4	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	4	4.124	0	0.96773	3.46957E-06	0.003485152
5	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	5	4.124	0	0.96773	4.39234E-06	0.003746889
6	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	6	4.124	0	0.96773	5.15909E-06	0.003916336
7	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	7	4.124	0	0.96773	5.78178E-06	0.004026045
8	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	8	4.124	0	0.96773	6.27908E-06	0.004097085
9	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	9	4.124	0	0.96773	6.67127E-06	0.004143091
10	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	10	4.124	0	0.96773	6.97754E-06	0.004172889
11	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	11	4.124	0	0.96773	7.21488E-06	0.004192192
12	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	12	4.124	0	0.96773	7.39767E-06	0.0042047
13	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	13	4.124	0	0.96773	7.53772E-06	0.004212806
14	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	14	4.124	0	0.96773	7.6446E-06	0.004218061
15	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	15	4.124	0	0.96773	7.72588E-06	0.004221468
16	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	16	4.124	0	0.96773	7.78751E-06	0.004223678
17	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	17	4.124	0	0.96773	7.83413E-06	0.004225112
18	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	18	4.124	0	0.96773	7.86932E-06	0.004226043
19	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	19	4.124	0	0.96773	7.89585E-06	0.004226648
20	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	20	4.124	0	0.96773	7.91581E-06	0.004227041
21	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	21	4.124	0	0.96773	7.93081E-06	0.004227297
22	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	22	4.124	0	0.96773	7.94208E-06	0.004227463
23	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	23	4.124	0	0.96773	7.95053E-06	0.004227571
24	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	24	4.124	0	0.96773	7.95686E-06	0.004227642
25	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	25	4.124	0	0.96773	7.96161E-06	0.004227688
26	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	26	4.124	0	0.96773	7.96516E-06	0.004227718
27	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	27	4.124	0	0.96773	7.96781E-06	0.004227738
28	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	28	4.124	0	0.96773	7.9698E-06	0.004227751
29	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	29	4.124	0	0.96773	7.97129E-06	0.004227759
30	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	30	4.124	0	0.96773	7.9724E-06	0.004227765
31	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	31	4.124	0	0.96773	7.97323E-06	0.004227769
32	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	32	4.124	0	0.96773	7.97385E-06	0.004227771
33	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	33	4.124	0	0.96773	7.97431E-06	0.004227773
34	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	34	4.124	0	0.96773	7.97466E-06	0.004227774
35	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	35	4.124	0	0.96773	7.97491E-06	0.004227774
36	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	36	4.124	0	0.96773	7.97511E-06	0.004227775
37	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	37	4.124	0	0.96773	7.97525E-06	0.004227775
38	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	38	4.124	0	0.96773	7.97536E-06	0.004227775
39	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	39	4.124	0	0.96773	7.97544E-06	0.004227776
40	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	40	4.124	0	0.96773	7.9755E-06	0.004227776
41	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	41	4.124	0	0.96773	7.97554E-06	0.004227776
42	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	42	4.124	0	0.96773	7.97558E-06	0.004227776
43	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	43	4.124	0	0.96773	7.9756E-06	0.004227776
44	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	44	4.124	0	0.96773	7.97562E-06	0.004227776
45	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	45	4.124	0	0.96773	7.97563E-06	0.004227776
46	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	46	4.124	0	0.96773	7.97564E-06	0.004227776
47	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	47	4.124	0	0.96773	7.97565E-06	0.004227776
48	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	48	4.124	0	0.96773	7.97566E-06	0.004227776
49	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	49	4.124	0	0.96773	7.97566E-06	0.004227776
50	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	50	4.124	0	0.96773	7.97566E-06	0.004227776
51	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	51	4.124	0	0.96773	7.97567E-06	0.004227776
52	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	52	4.124	0	0.96773	7.97567E-06	0.004227776
53	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	53	4.124	0	0.96773	7.97567E-06	0.004227776
54	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	54	4.124	0	0.96773	7.97567E-06	0.004227776
55	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	55	4.124	0	0.96773	7.97567E-06	0.004227776
56	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	56	4.124	0	0.96773	7.97567E-06	0.004227776
57	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	57	4.124	0	0.96773	7.97567E-06	0.004227776
58	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	58	4.124	0	0.96773	7.97567E-06	0.004227776
59	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	59	4.124	0	0.96773	7.97567E-06	0.004227776
60	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	60	4.124	0	0.96773	7.97567E-06	0.004227776
61	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	61	4.124	0	0.96773	7.97567E-06	0.004227776
62	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	62	4.124	0	0.96773	7.97567E-06	0.004227776
63	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	63	4.124	0	0.96773	7.97567E-06	0.004227776
64	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	64	4.124	0	0.96773	7.97567E-06	0.004227776
65	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	65	4.124	0	0.96773	7.97567E-06	0.004227776
66	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	66	4.124	0	0.96773	7.97567E-06	0.004227776
67	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	67	4.124	0	0.96773	7.97567E-06	0.004227776
68	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	68	4.124	0	0.96773	7.97567E-06	0.004227776
69	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	69	4.124	0	0.96773	7.97567E-06	0.004227776
70	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	70	4.124	0	0.96773	7.97567E-06	0.004227776
71	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	71	4.124	0	0.96773	7.97567E-06	0.004227776
72	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	72	4.124	0	0.96773	7.97567E-06	0.004227776

*** The outflow from Lake Illawarra takes with it some contaminant mass - this has been included in the calculations**

Groundwater Seepage to Duck Creek

96773	Arsenic Load 100 year rate (mg/day) - creek total
100000	Baseflow Groundwater to Duck Creek from Model (L)
0.96773	**Concentrations (mg/L)**

Groundwater Seepage to Lake Illawarra

57735	Arsenic Load 100 year rate (mg/day) - breakwall discharge area
40000	Baseflow Groundwater to Lake Illawarra from Model (L) - TOTAL
14000	Baseflow Groundwater to Lake Illawarra from Model (L) - breakwall discharge
4.124	**Concentrations (mg/L) at breakwall discharge**
0.002	Arsenic Load 100 year rate (mg/day) - Wollingurry Creek
17500	Baseflow Groundwater to Wollingurry Creek from Model (L)
0.0000001	**Concentrations (mg/L) at Wollingurry Creek**

ANZECC Trigger Value
0.0023 mg/L

Appendix K
Ammonium Loads - No Development

TIME	Flows (ML/day) DUCK CREEK								Flows (ML/day) LAKE ILLAWARRA									
(days)	IN				OUT	NET	Storage	Mixing	IN						OUT	NET	Storage	Mixing
	River	Runoff	GW	Tide	Evap	OUT		Volume	Surface	GW	Breakwater	Woll Ck	Tide	Duck Ck	Evap	OUT *		Volume
1	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
2	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
3	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
4	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
5	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
6	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
7	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
8	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
9	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
10	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
11	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
12	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
13	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
14	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
15	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
16	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
17	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
18	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
19	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
20	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
21	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
22	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
23	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
24	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
25	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
26	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
27	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
28	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
29	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
30	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
31	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
32	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
33	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
34	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
35	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
36	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
37	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
38	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
39	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
40	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
41	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
42	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
43	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
44	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
45	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
46	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
47	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
48	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
49	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
50	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
51	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
52	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
53	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
54	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
55	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
56	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
57	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
58	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
59	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
60	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
61	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
62	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
63	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
64	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
65	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
66	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
67	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
68	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
69	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
70	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
71	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198
72	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198

TIME	Concentrations (mg/L) - Ammonium					
(days)	Break Water	Woll Ck	Groundwater Seepage to Duck Creek	Tidal Inflow From Lake Illawarra	Duck Creek Discharge Water to Lake Illawarra	
1	106.9	1.78	24.824	0	0.038249615	
2	106.9	1.78	24.824	3.15566E-05	0.063005458	
3	106.9	1.78	24.824	6.25279E-05	0.079028766	
4	106.9	1.78	24.824	9.04384E-05	0.089400563	
5	106.9	1.78	24.824	0.000114368	0.096114657	
6	106.9	1.78	24.824	0.00013423	0.100461332	
7	106.9	1.78	24.824	0.000150347	0.103275621	
8	106.9	1.78	24.824	0.000163211	0.105097957	
9	106.9	1.78	24.824	0.000173352	0.106278125	
10	106.9	1.78	24.824	0.000181268	0.107042528	
11	106.9	1.78	24.824	0.000187401	0.107537722	
12	106.9	1.78	24.824	0.000192123	0.107858579	
13	106.9	1.78	24.824	0.00019574	0.108066523	
14	106.9	1.78	24.824	0.0001985	0.108201323	
15	106.9	1.78	24.824	0.000200599	0.108288733	
16	106.9	1.78	24.824	0.00020219	0.108345433	
17	106.9	1.78	24.824	0.000203394	0.108382227	
18	106.9	1.78	24.824	0.000204302	0.108406113	
19	106.9	1.78	24.824	0.000204987	0.108421629	
20	106.9	1.78	24.824	0.000205502	0.108431712	
21	106.9	1.78	24.824	0.000205889	0.10843827	
22	106.9	1.78	24.824	0.00020618	0.108442538	
23	106.9	1.78	24.824	0.000206398	0.108445318	
24	106.9	1.78	24.824	0.000206562	0.108447131	
25	106.9	1.78	24.824	0.000206684	0.108448314	
26	106.9	1.78	24.824	0.000206776	0.108449088	
27	106.9	1.78	24.824	0.000206844	0.108449594	
28	106.9	1.78	24.824	0.000206896	0.108449926	
29	106.9	1.78	24.824	0.000206934	0.108450144	
30	106.9	1.78	24.824	0.000206963	0.108450287	
31	106.9	1.78	24.824	0.000206984	0.108450382	
32	106.9	1.78	24.824	0.000207	0.108450444	
33	106.9	1.78	24.824	0.000207012	0.108450486	
34	106.9	1.78	24.824	0.000207021	0.108450513	
35	106.9	1.78	24.824	0.000207028	0.108450532	
36	106.9	1.78	24.824	0.000207033	0.108450544	
37	106.9	1.78	24.824	0.000207036	0.108450552	
38	106.9	1.78	24.824	0.000207039	0.108450558	
39	106.9	1.78	24.824	0.000207041	0.108450562	
40	106.9	1.78	24.824	0.000207043	0.108450564	
41	106.9	1.78	24.824	0.000207044	0.108450566	
42	106.9	1.78	24.824	0.000207045	0.108450567	
43	106.9	1.78	24.824	0.000207045	0.108450568	
44	106.9	1.78	24.824	0.000207046	0.108450569	
45	106.9	1.78	24.824	0.000207046	0.108450569	
46	106.9	1.78	24.824	0.000207046	0.108450569	
47	106.9	1.78	24.824	0.000207047	0.10845057	
48	106.9	1.78	24.824	0.000207047	0.10845057	
49	106.9	1.78	24.824	0.000207047	0.10845057	
50	106.9	1.78	24.824	0.000207047	0.10845057	
51	106.9	1.78	24.824	0.000207047	0.10845057	
52	106.9	1.78	24.824	0.000207047	0.10845057	
53	106.9	1.78	24.824	0.000207047	0.10845057	
54	106.9	1.78	24.824	0.000207047	0.10845057	
55	106.9	1.78	24.824	0.000207047	0.10845057	
56	106.9	1.78	24.824	0.000207047	0.10845057	
57	106.9	1.78	24.824	0.000207047	0.10845057	
58	106.9	1.78	24.824	0.000207047	0.10845057	
59	106.9	1.78	24.824	0.000207047	0.10845057	
60	106.9	1.78	24.824	0.000207047	0.10845057	
61	106.9	1.78	24.824	0.000207047	0.10845057	
62	106.9	1.78	24.824	0.000207047	0.10845057	
63	106.9	1.78	24.824	0.000207047	0.10845057	
64	106.9	1.78	24.824	0.000207047	0.10845057	
65	106.9	1.78	24.824	0.000207047	0.10845057	
66	106.9	1.78	24.824	0.000207047	0.10845057	
67	106.9	1.78	24.824	0.000207047	0.10845057	
68	106.9	1.78	24.824	0.000207047	0.10845057	
69	106.9	1.78	24.824	0.000207047	0.10845057	
70	106.9	1.78	24.824	0.000207047	0.10845057	
71	106.9	1.78	24.824	0.000207047	0.10845057	
72	106.9	1.78	24.824	0.000207047	0.10845057	

*** The outflow from Lake Illawarra takes with it some contaminant mass - this has been included in the calculations**

Groundwater Seepage to Duck Creek

2482406 Ammonium Load 100 year rate (mg/day) - creek total
100000 Baseflow Groundwater to Duck Creek from Model (L)
24.82406 **Concentrations (mg/L)**

Groundwater Seepage to Lake Illawarra

1496637 Ammonium Load 100 year rate (mg/day) - breakwall discharge area
40000 Baseflow Groundwater to Lake Illawarra from Model (L) - TOTAL
14000 Baseflow Groundwater to Lake Illawarra from Model (L) - breakwall discharge
106.903 **Concentrations (mg/L) at breakwall discharge**

31097 Ammonium Load 100 year rate (mg/day) - Wollingurry Creek
17500 Baseflow Groundwater to Wollingurry Creek from Model (L)
1.777 **Concentrations (mg/L) at Wollingurry Creek**

ANZECC Trigger Value
0.91 (at pH 8.0)

Appendix K
Ammonium Loads - With Development

TIME	Flows (ML/day) DUCK CREEK								Flows (ML/day) LAKE ILLAWARRA										Concentrations (mg/L) - Ammonium					
(days)	IN				OUT	NET	Storage	Mixing	IN						OUT	NET	Storage	Mixing	TIME	Break	Woll	Groundwater	Tidal Inflow	Duck Creek
	River	Runoff	GW	Tide	Evap	OUT		Volume	Surface	GW	Breakwater	Woll Ck	Tide	Duck Ck	Evap	OUT *		Volume	(days)	Water	Ck	Seepage to Duck Creek	From Lake Illawarra	Discharge Water to Lake Illawarra
1	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	1	106.4	1.82	24.824	0	0.038249615
2	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	2	106.4	1.82	24.824	3.14821E-05	0.063005452
3	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	3	106.4	1.82	24.824	6.23979E-05	0.079028751
4	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	4	106.4	1.82	24.824	9.0267E-05	0.089400539
5	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	5	106.4	1.82	24.824	0.000114166	0.096114624
6	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	6	106.4	1.82	24.824	0.000134005	0.100461292
7	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	7	106.4	1.82	24.824	0.000150105	0.103275575
8	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	8	106.4	1.82	24.824	0.000162956	0.105097906
9	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	9	106.4	1.82	24.824	0.000173087	0.10627807
10	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	10	106.4	1.82	24.824	0.000180996	0.10704247
11	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	11	106.4	1.82	24.824	0.000187123	0.107537661
12	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	12	106.4	1.82	24.824	0.000191841	0.107858516
13	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	13	106.4	1.82	24.824	0.000195456	0.108066458
14	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	14	106.4	1.82	24.824	0.000198214	0.108201257
15	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	15	106.4	1.82	24.824	0.000200311	0.108288667
16	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	16	106.4	1.82	24.824	0.000201901	0.108345366
17	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	17	106.4	1.82	24.824	0.000203104	0.108382159
18	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	18	106.4	1.82	24.824	0.000204011	0.108406046
19	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	19	106.4	1.82	24.824	0.000204696	0.10842156
20	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	20	106.4	1.82	24.824	0.00020521	0.108431644
21	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	21	106.4	1.82	24.824	0.000205597	0.108438201
22	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	22	106.4	1.82	24.824	0.000205888	0.108442469
23	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	23	106.4	1.82	24.824	0.000206106	0.108445249
24	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	24	106.4	1.82	24.824	0.000206269	0.108447062
25	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	25	106.4	1.82	24.824	0.000206391	0.108448245
26	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	26	106.4	1.82	24.824	0.000206483	0.108449019
27	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	27	106.4	1.82	24.824	0.000206552	0.108449525
28	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	28	106.4	1.82	24.824	0.000206603	0.108449857
29	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	29	106.4	1.82	24.824	0.000206641	0.108450075
30	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	30	106.4	1.82	24.824	0.00020667	0.108450218
31	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	31	106.4	1.82	24.824	0.000206691	0.108450313
32	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	32	106.4	1.82	24.824	0.000206707	0.108450375
33	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	33	106.4	1.82	24.824	0.000206719	0.108450417
34	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	34	106.4	1.82	24.824	0.000206728	0.108450444
35	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	35	106.4	1.82	24.824	0.000206735	0.108450463
36	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	36	106.4	1.82	24.824	0.00020674	0.108450475
37	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	37	106.4	1.82	24.824	0.000206743	0.108450483
38	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	38	106.4	1.82	24.824	0.000206746	0.108450489
39	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	39	106.4	1.82	24.824	0.000206748	0.108450493
40	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	40	106.4	1.82	24.824	0.00020675	0.108450495
41	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	41	106.4	1.82	24.824	0.000206751	0.108450497
42	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	42	106.4	1.82	24.824	0.000206752	0.108450498
43	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	43	106.4	1.82	24.824	0.000206752	0.108450499
44	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	44	106.4	1.82	24.824	0.000206753	0.1084505
45	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	45	106.4	1.82	24.824	0.000206753	0.1084505
46	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	46	106.4	1.82	24.824	0.000206754	0.1084505
47	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	47	106.4	1.82	24.824	0.000206754	0.108450501
48	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	48	106.4	1.82	24.824	0.000206754	0.108450501
49	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	49	106.4	1.82	24.824	0.000206754	0.108450501
50	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	50	106.4	1.82	24.824	0.000206754	0.108450501
51	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	51	106.4	1.82	24.824	0.000206754	0.108450501
52	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	52	106.4	1.82	24.824	0.000206754	0.108450501
53	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	53	106.4	1.82	24.824	0.000206754	0.108450501
54	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	54	106.4	1.82	24.824	0.000206754	0.108450501
55	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	55	106.4	1.82	24.824	0.000206754	0.108450501
56	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	56	106.4	1.82	24.824	0.000206754	0.108450501
57	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	57	106.4	1.82	24.824	0.000206754	0.108450501
58	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	58	106.4	1.82	24.824	0.000206754	0.108450501
59	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	59	106.4	1.82	24.824	0.000206754	0.108450501
60	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	60	106.4	1.82	24.824	0.000206754	0.108450501
61	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	61	106.4	1.82	24.824	0.000206754	0.108450501
62	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	62	106.4	1.82	24.824	0.000206754	0.108450501
63	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	63	106.4	1.82	24.824	0.000206754	0.108450501
64	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	64	106.4	1.82	24.824	0.000206754	0.108450501
65	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	65	106.4	1.82	24.824	0.000206754	0.108450501
66	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	66	106.4	1.82	24.824	0.000206754	0.108450501
67	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	67	106.4	1.82	24.824	0.000206754	0.108450501
68	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	68	106.4	1.82	24.824	0.000206754	0.108450501
69	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	69	106.4	1.82	24.824	0.000206754	0.108450501
70	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	70	106.4	1.82	24.824	0.000206754	0.108450501
71	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	71	106.4	1.82	24.824	0.000206754	0.108450501
72	17.3	0.2	0.1	5.4	0.1	22.9	42	64.9	70	30	0.014	0.018	9680	22.9	105	9698	66500	76198	72	106.4	1.82	24.824	0.000206754	0.108450501

*** The outflow from Lake Illawarra takes with it some contaminant mass - this has been included in the calculations**

Groundwater Seepage to Duck Creek

2482406 Ammonium Load 100 year rate (mg/day) - creek total

100000 Baseflow Groundwater to Duck Creek from Model (L)

24.82406 **Concentrations (mg/L)**

Groundwater Seepage to Lake Illawarra

1490228 Ammonium Load 100 year rate (mg/day) - breakwall discharge area

40000 Baseflow Groundwater to Lake Illawarra from Model (L) - TOTAL

14000 Baseflow Groundwater to Lake Illawarra from Model (L) - breakwall discharge

106.445 **Concentrations (mg/L) at breakwall discharge**

31810 Ammonium Load 100 year rate (mg/day) - Wollingurry Creek

17500 Baseflow Groundwater to Wollingurry Creek from Model (L)

1.818 **Concentrations (mg/L) at Wollingurry Creek**

ANZECC Trigger Value
0.91 (at pH 8.0)