7 FIELD AND LABORATORY PROGRAMME

7.1 Sampling Plan

The Project Area sampling and analysis plan was designed to target the AECs identified in the CA, as well as to complement the concurrent Geotechnical Assessment.

The assessment was carried out in general accordance with the following guidelines:

- NSW EPA (1995) Sampling Design Guidelines;
- NSW DEC (2007) Guidelines for Assessment and Management of Groundwater Contamination.

For the purposes of this assessment, samples were taken as outlined below:

- Soil samples were taken from 26 test pits at about 100m intervals along the length of the Project Area on 13 December 2011 to 27 April 2012. Environmental samples were collected to assess potential contamination in fill materials, and to assess waste classification. Environmental soil samples were collected from test pits TP501A, TP502A, TP503B, TP504A, TP505B, TP506B, TP507B, TP508B, TP509A, TP510A, TP511B, TP512B, TP513B, TP514B, TP515B, TP516B, TP517A, TP518B, TP519B, TP523B, TP525A, TP528A, TP529A, TP530. TP531,TP532.
- Surface soil samples CS1 to CS16 and fragments of potential asbestos containing materials (PACM) (A1 and A2) were collected in an area of former coal preparation plant buildings to assess potential contamination from hazardous building materials. These were collected on 16 December 2011;
- Surface soil samples CS17 to CS26 were collected at about 250m intervals adjacent to the rail corridor to assess potential contamination on surface soils from the rail corridor. These were collected on 20 December 2011;
- Surface samples SS27 to SS29 were collected on 27 April 2012 adjacent to TP528A to assess the horizontal extent of a hydrocarbon hotspot in that location;
- Surface samples SS30 to SS35 were collected on 27 April 2012 along Woodlands Close to assess contamination in this area;
- Rail ballast samples RB01 to RB20 at approximate 200m to 300m intervals along the length of the rail corridor to assess potential contamination in the rail ballast. These were collected on 12 December 2011 and 27 April 2012;
- Hand auger boreholes (TP520A, TP221A, TP522B and TP522C) were drilled on 12 January 2012 at about 100m intervals between chainage 175.900km and 176.100km. These were initially proposed to be test pits, but due to access constraints relating to SEPP 14 Wetlands, were drilled using hand augers. Soil samples were collected at the surface of each borehole;
- Hand auger boreholes (HA1 to HA3) were drilled on 27 April 2012 adjacent to the Jemena high pressure gas pipeline to assess contamination in this area. Soil samples were collected from each borehole;
- A fragment of PACM (AS1) was collected from a stockpile of fibre-board on 9 February 2012 to assess if the fibre-board contained asbestos. It is noted that this stockpile has since been removed from the site;
- Two fragments of PACM (AS1 and AS2) were collected on 27 April 2012 adjacent to a dilapidated building near the high pressure gas main to assess if they contained asbestos.

- Two samples of soil (SP1-1 and SP2-2) were collected from stockpiles of illegally dumped material to assess potential contamination and waste classification. SP1 was a stockpile of concrete, bricks and soil, and SP2 was a stockpile of soil;
- A hand auger borehole (CHA01) was carried out on 10 February 2012 in a similar location as former DP sample location TP128 (DP, 2011). The hand auger was drilled into what appeared to be a backfilled excavation to a depth of 1.0m, and samples collected at 0.5m intervals;
- Two test pits were excavated in the area of CHA01 and TP128 (DP,2011) on 27 April 2012 to assess for the presence of a backfilled excavation, and if hydrocarbon contamination was present within the backfill materials;
- Surface water samples (CSW1 to CSW20) were collected on 9 February 2012 and 8 March 2012 from surface water ponds within the Project Area and adjacent to the Project Area. Surface water samples were collected along the length of the Project Area;
- Groundwater wells (CMW1 to CMW10) were drilled on 6 to 8 February 2012, with the monitoring well installed to a depth of 4.0m. The groundwater wells were spread along the Project Area to provide groundwater data across the Project Area.
- Groundwater samples were collected from groundwater wells (CMW1 to CMW10), and from two DP wells (101 and 109) on 20 to 21 February 2012.

The sampling locations are shown on Figures 3A to 3D and 4A to 4D.

A total of 122 sampling locations were sampled from soil, surface water or groundwater media across the Project Area. 109 soil samples were collected from 94 locations across the Project Area. Twenty surface water samples and ten groundwater samples were also collected.

The NSW EPA (1995) Sampling Design Guidelines do not recommend a minimum number of sample locations for sites greater than 5ha in area. They recommend that large sites are subdivided into smaller areas for sampling.

If the Project Area was sampled at a rate of 55 samples per 5ha, a total of 429 sample locations would be required. Taking into account the previous site uses, the proposed development and the objectives of the CA, it was considered that a smaller number of samples would provide representative information on contamination across the Project Area.

The sampling carried out was a combination of stratified and judgemental. Twenty-six of the test pits, seven of the hand augers, 19 surface soil samples and the rail ballast samples were collected based on a stratified sampling pattern. Sample locations CHA01, TP533, TP534, CS1 to CS16, A1, A2, AS1 (9/2/12), AS1 (27/4/12), AS2, SP1-1, SP2-2, and SS27 to SS29 were based on judgemental sampling pattern to target the AECs listed above, or potential contamination hotspots.

Based on an average fill depth of about 0.75m across the Project Area (39ha), an approximate fill volume of 300,000m^3 has been estimated. This would equate to about one soil sample per 4,000m^3 across the Project Area.

LEGEND

- APPROXIMATE PROJECT AREA
- CS ● APPROXIMATE SURFACE SAMPLE LOCATION
- TP/CH APPROXIMATE HAND AUGER SAMPLE LOCATION (COFFEY ENVIRONMENTS)
- TP APPROXIMATE TEST PIT SAMPLE LOCATION
- RB APPROXIMATE RAIL BALLAST SAMPLE LOCATION
- APPROXIMATE TEST PIT LOCATION (DOUGLAS PARTNERS)
- APPROXIMATE TEST PIT LOCATION (ERM, 2010)

Soil Sample	Sample Depth (mBGS)
Analyte	mg/kg

SHADED VALUES INDICATE CONCENTRATIONS ABOVE ADOPTED CRITERIA

mg/kg MILLIGRAMS PER KILOGRAM

Image source: Nearmap.com, Hypertiles, 25/06/2011

UHVA ARTC

ARTC
Hexham Relief Roads

Proposed Relief Roads

0 50 100 150 200 250
SCALE 1:5000 (A3) METRES

Aerial image source: Google Earth Pro 2012
Aerial image ©: Sinclair Knight Merz 2012
Image source: UHVA ARTC, Proposed Relief Roads 01/06/2011

drawn	CGT
approved	
date	04.07.2012
scale	AS SHOWN
original size	

client: UPPER HUNTER VALLEY ALLIANCE

project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

title: SOIL SAMPLING LOCATIONS & CONTAMINATION PLAN A

job no: GEOTWARA21045AC-D03

figure no: FIGURE 3A

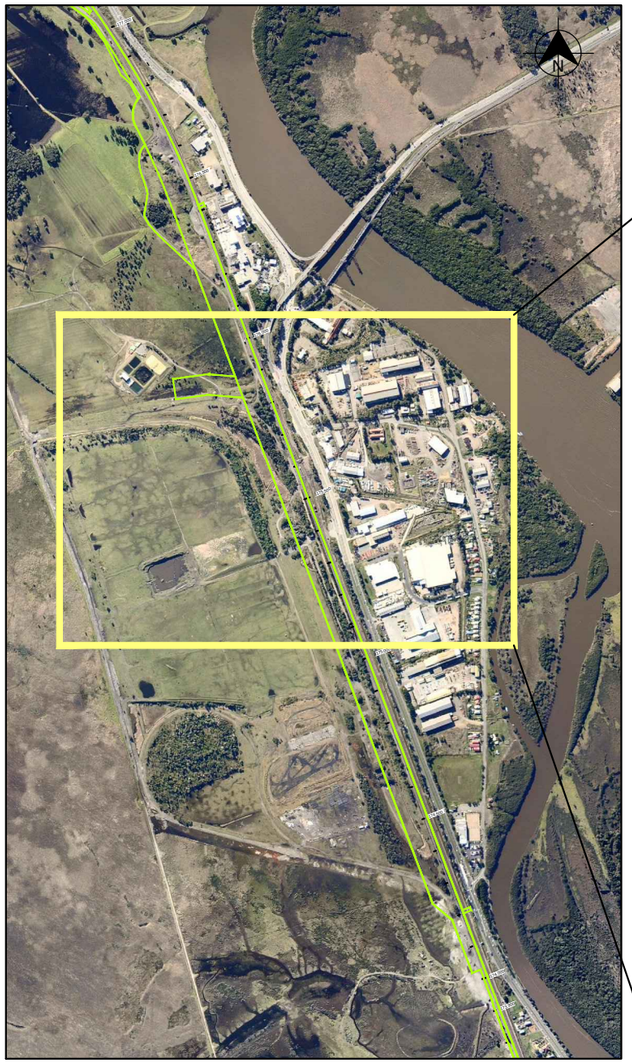

Image source: Nearmap.com, Hypertiles, 25/06/2011

LEGEND

- APPROXIMATE PROJECT AREA
- CS ● APPROXIMATE SURFACE SAMPLE LOCATION
- TP/CH APPROXIMATE HAND AUGER SAMPLE LOCATION (COFFEY ENVIRONMENTS)
- APPROXIMATE ASBESTOS SAMPLE LOCATION
- TP APPROXIMATE TEST PIT SAMPLE LOCATION
- RB APPROXIMATE RAIL BALLAST SAMPLE LOCATION
- APPROXIMATE TEST PIT LOCATION (DOUGLAS PARTNERS)
- APPROXIMATE TEST PIT LOCATION (ERM, 2010)
- SHADED VALUES INDICATE CONCENTRATIONS ABOVE ADOPTED CRITERIA
- mg/kg MILLIGRAMS PER KILOGRAM

UHVA ARTC

ARTC
Hexham Relief Roads

Proposed Relief Roads

0 50 100 150 200 250
SCALE 1:5000 (A3) METRES

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approved	
date	04.07.2012
scale	AS SHOWN
original size	

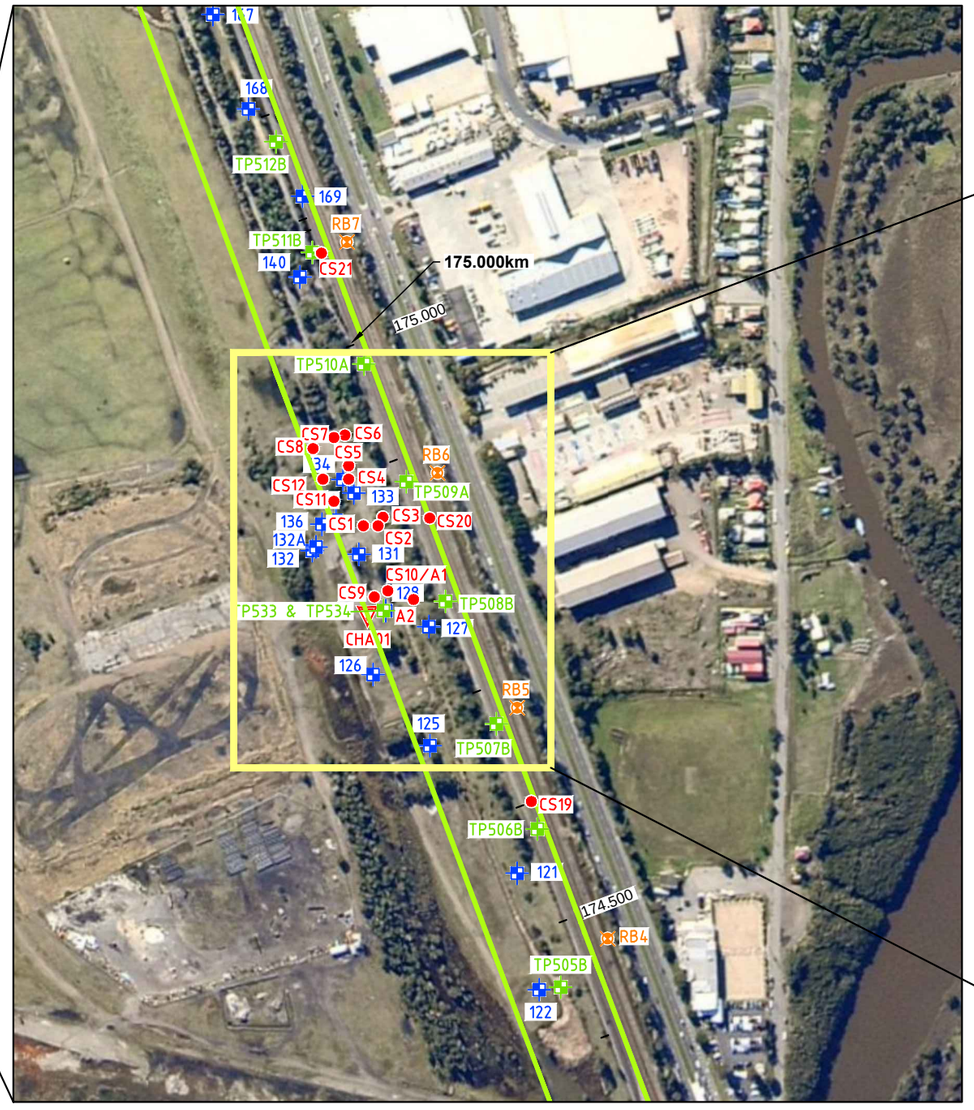
client: UPPER HUNTER VALLEY ALLIANCE

project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

title: SOIL SAMPLING LOCATIONS & CONTAMINATION PLAN B

job no: GEOTWARA21045AC-D03

figure no: FIGURE 3B



SAMPLING DETAIL
Scale 1:2500

Image source: Nearmap.com, Hypertiles, 25/06/2011

LEGEND

- APPROXIMATE PROJECT AREA
- CS ● APPROXIMATE SURFACE SAMPLE LOCATION
- TP/CH APPROXIMATE HAND AUGER SAMPLE LOCATION (COFFEY ENVIRONMENTS)
- TP APPROXIMATE TEST PIT SAMPLE LOCATION
- RB APPROXIMATE RAIL BALLAST SAMPLE LOCATION
- APPROXIMATE TEST PIT LOCATION (DOUGLAS PARTNERS)
- APPROXIMATE TEST PIT LOCATION (ERM, 2010)

UHVA ARTC

ARTC
Hexham Relief Roads

Proposed Relief Roads

0 50 100 150 200 250
SCALE 1:5000 (A3) METRES

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approved	
date	04.07.2012
scale	AS SHOWN
original size	

client: UPPER HUNTER VALLEY ALLIANCE

project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

title: SOIL SAMPLING LOCATIONS & CONTAMINATIONPLAN C

job no: GEOTWARA21045AC-D03

figure no: FIGURE 3C

Image source: Nearmap.com, Hypertiles, 25/06/2011

LEGEND

- APPROXIMATE PROJECT AREA
- CS ● APPROXIMATE SURFACE SAMPLE LOCATION
- TP/CH APPROXIMATE HAND AUGER SAMPLE LOCATION (COFFEY ENVIRONMENTS)
- TP APPROXIMATE TEST PIT SAMPLE LOCATION
- RB APPROXIMATE RAIL BALLAST SAMPLE LOCATION
- APPROXIMATE TEST PIT LOCATION (DOUGLAS PARTNERS)
- APPROXIMATE TEST PIT LOCATION (ERM, 2010)

UHVA ARTC

ARTC
Hexham Relief Roads

Proposed Relief Roads

0 50 100 150 200 250
SCALE 1:5000 (A3) METRES

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approved	
date	04.07.2012
scale	AS SHOWN
original size	

client: UPPER HUNTER VALLEY ALLIANCE

project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

title: SOIL SAMPLING LOCATIONS & CONTAMINATION PLAN D

job no: GEOTWARA21045AC-D03

figure no: FIGURE 3D

CSW1	Copper	Zinc	Faecal coliforms	E.Coli
	24	1600	730	450
	24	1600	730	450

109	Chromium	Zinc	Faecal coliforms	E.Coli
	2	11	-	-
	2	11	-	-

CSW2	Ammonia	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury	Benzo(a) pyrene	Faecal coliforms	E.Coli
	1300	34	2	51	240	200	120	2200	0.9	0.4	130000	130000
	1300	34	2	51	240	200	120	2200	0.9	0.4	130000	130000

CMW10	Copper	Zinc	Faecal coliforms	E.Coli
	2	13	<91	<91

CSW20	Faecal coliforms	E.Coli
	<91	<91

CMW9	Copper	Iron	Zinc	Faecal coliforms	E.Coli
	2	26000	12	<91	<91
	2	26000	12	<91	<91

CSW19	Faecal coliforms	E.Coli
	-	-

CSW9	Ammonia	Cadmium	Copper	Lead	Nickel	Zinc	Faecal coliforms	E.Coli
	2800	0.3	27	26	11	140	270	270
	2800	0.3	27	26	11	140	270	270

CMW8	Iron	Zinc	Faecal coliforms	E.Coli
	18000	15	<91	<91
	18000	15	<91	<91

LEGEND

- APPROXIMATE PROJECT AREA
- CMW — APPROXIMATE GROUNDWATER MONITORING WELL LOCATION (COFFEY ENVIRONMENTS)
- CSW × — APPROXIMATE SURFACE WATER SAMPLE LOCATION (COFFEY ENVIRONMENTS)
- APPROXIMATE BOREHOLE LOCATION (DOUGLAS PARTNERS)
- SW × — APPROXIMATE SURFACE WATER SAMPLE LOCATION (DOUGLAS PARTNERS)
- APPROXIMATE MONITORING WELL LOCATION (ERM)

Sample	Analyte	Faecal coliforms	E.Coli
	µg/L	cfu/100ml	cfu/100ml

- Value — CONTAMINANT EXCEEDS ADOPTED CRITERIA FOR PROTECTION OF HUMAN HEALTH RISK
- Value — CONTAMINANT EXCEEDS ADOPTED CRITERIA FOR PROTECTION OF ECOSYSTEMS
- Value — CONTAMINANT DOES NOT EXCEED ADOPTED CRITERIA
- µg/L — MICROGRAMS PER LITRE
- \- — NOT ANALYSED

Image source: Nearmap.com, Hypertiles, 25/06/2011

UHVA ARTC

ARTC
Hexham Relief Roads

Proposed Relief Roads

SCALE 1:5000 (A3) METRES
0 50 100 150 200 250

Aerial image source: Google Earth Pro 2012
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Image source: UHVA ARTC, Proposed Relief Roads 01/06/2011

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date	04.07.2012
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original size	

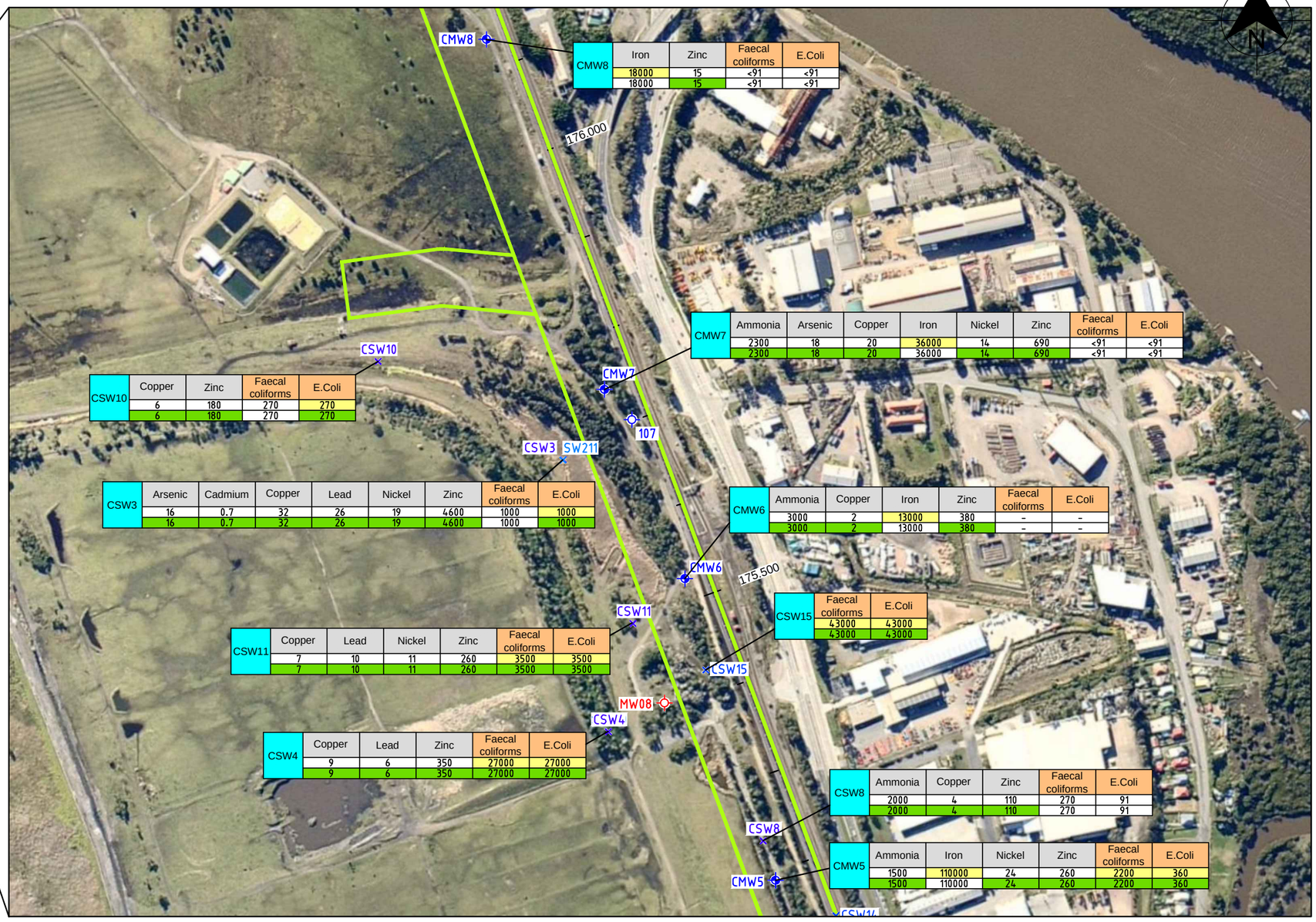
client: UPPER HUNTER VALLEY ALLIANCE

project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

title: GROUNDWATER & SURFACE WATER CONTAMINATION PLAN A

job no: GEOTWARA21045AC-D03

figure no: FIGURE 4A



CMW8	Iron	Zinc	Faecal coliforms	E.Coli
	18000	15	<91	<91
	18000	15	<91	<91

CMW7	Ammonia	Arsenic	Copper	Iron	Nickel	Zinc	Faecal coliforms	E.Coli
	2300	18	20	36000	14	690	<91	<91
	2300	18	20	36000	14	690	<91	<91

CSW10	Copper	Zinc	Faecal coliforms	E.Coli
	6	180	270	270
	6	180	270	270

CSW3	Arsenic	Cadmium	Copper	Lead	Nickel	Zinc	Faecal coliforms	E.Coli
	16	0.7	32	26	19	4600	1000	1000
	16	0.7	32	26	19	4600	1000	1000

CMW6	Ammonia	Copper	Iron	Zinc	Faecal coliforms	E.Coli
	3000	2	13000	380	-	-
	3000	2	13000	380	-	-

CSW15	Faecal coliforms	E.Coli
	43000	43000
	43000	43000

CSW11	Copper	Lead	Nickel	Zinc	Faecal coliforms	E.Coli
	7	10	11	260	3500	3500
	7	10	11	260	3500	3500

CSW4	Copper	Lead	Zinc	Faecal coliforms	E.Coli
	9	6	350	27000	27000
	9	6	350	27000	27000

CSW8	Ammonia	Copper	Zinc	Faecal coliforms	E.Coli
	2000	4	110	270	91
	2000	4	110	270	91

CMW5	Ammonia	Iron	Nickel	Zinc	Faecal coliforms	E.Coli
	1500	110000	24	260	2200	360
	1500	110000	24	260	2200	360

Image source: Nearmap.com, Hypertiles, 25/06/2011

LEGEND

APPROXIMATE PROJECT AREA

CMW — APPROXIMATE GROUNDWATER MONITORING WELL LOCATION (COFFEY ENVIRONMENTS)

CSW — APPROXIMATE SURFACE WATER SAMPLE LOCATION (COFFEY ENVIRONMENTS)

APPROXIMATE BOREHOLE LOCATION (DOUGLAS PARTNERS)

SW — APPROXIMATE SURFACE WATER SAMPLE LOCATION (DOUGLAS PARTNERS)

APPROXIMATE MONITORING WELL LOCATION (ERM)

Sample	Analyte	Faecal coliforms	E.Coli
	µg/L	cfu/100ml	cfu/100ml

µg/L — MICROGRAMS PER LITRE

\- — NOT ANALYSED

Value — CONTAMINANT EXCEEDS ADOPTED CRITERIA FOR PROTECTION OF HUMAN HEALTH RISK

Value — CONTAMINANT EXCEEDS ADOPTED CRITERIA FOR PROTECTION OF ECOSYSTEMS

Value — CONTAMINANT DOES NOT EXCEED ADOPTED CRITERIA

UHVA ARTC

ARTC
Hexham Relief Roads

Proposed Relief Roads

0 50 100 150 200 250
SCALE 1:5000 (A3) METRES

Aerial image source: Google Earth Pro 2012
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Image source: UHVA ARTC, Proposed Relief Roads 01/06/2011

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date	04.07.2012
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original size	

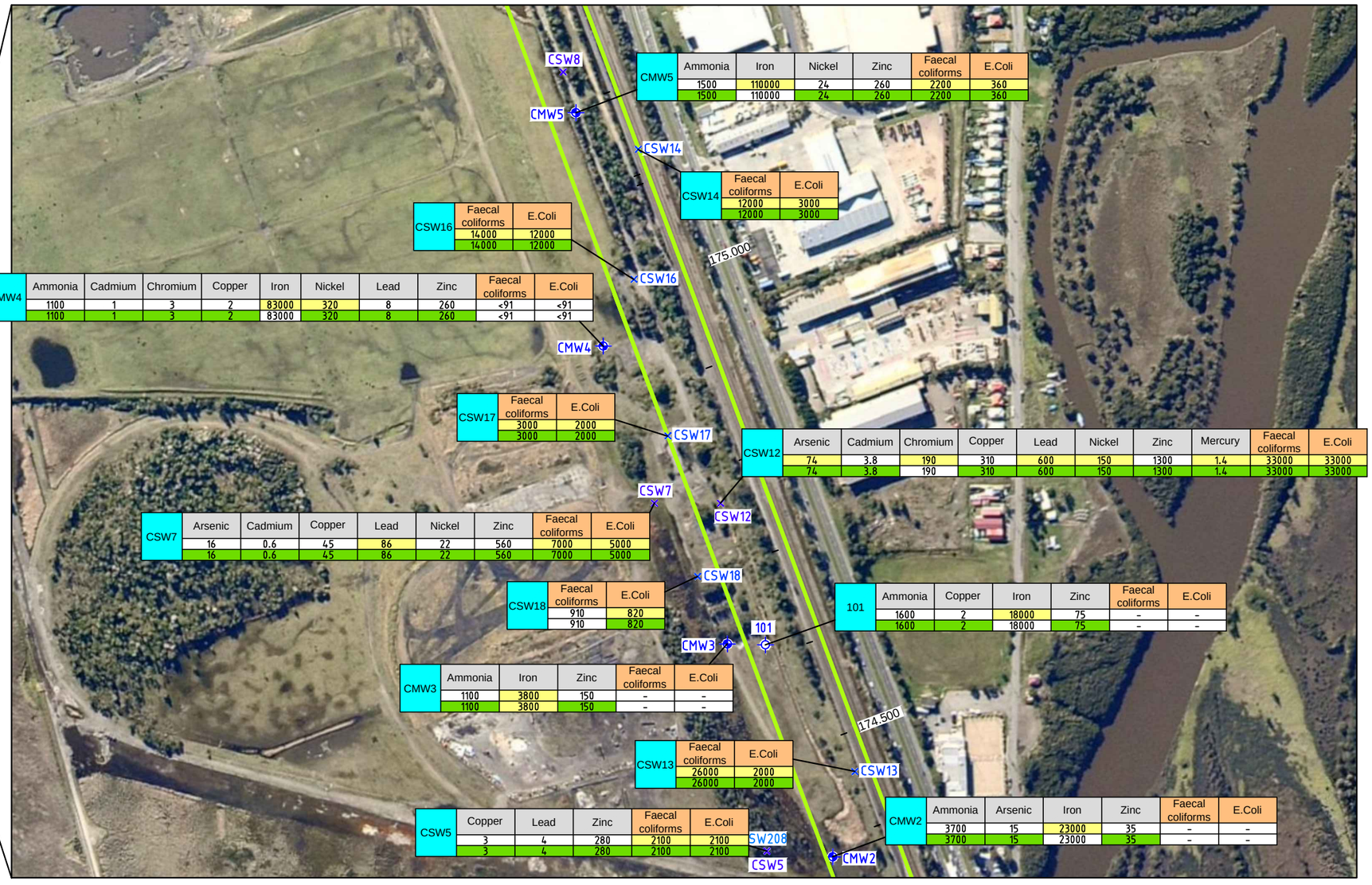
client: UPPER HUNTER VALLEY ALLIANCE

project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

title: GROUNDWATER & SURFACE WATER CONTAMINATION PLAN B

job no: GEOTWARA21045AC-D03

figure no: FIGURE 4B



CMW5	Ammonia	Iron	Nickel	Zinc	Faecal coliforms	E.Coli
	1500	110000	24	260	2200	360
	1500	110000	24	260	2200	360

CSW14	Faecal coliforms	E.Coli
	12000	3000
	12000	3000

CSW16	Faecal coliforms	E.Coli
	14000	12000
	14000	12000

CMW4	Ammonia	Cadmium	Chromium	Copper	Iron	Nickel	Lead	Zinc	Faecal coliforms	E.Coli
	1100	1	3	2	83000	320	8	260	<91	<91
	1100	1	3	2	83000	320	8	260	<91	<91

CSW17	Faecal coliforms	E.Coli
	3000	2000
	3000	2000

CSW12	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury	Faecal coliforms	E.Coli
	74	3.8	190	310	600	150	1300	1.4	33000	33000
	74	3.8	190	310	600	150	1300	1.4	33000	33000

CSW7	Arsenic	Cadmium	Copper	Lead	Nickel	Zinc	Faecal coliforms	E.Coli
	16	0.6	45	86	22	560	7000	5000
	16	0.6	45	86	22	560	7000	5000

CSW18	Faecal coliforms	E.Coli
	910	820
	910	820

101	Ammonia	Copper	Iron	Zinc	Faecal coliforms	E.Coli
	1600	2	18000	75	-	-
	1600	2	18000	75	-	-

CMW3	Ammonia	Iron	Zinc	Faecal coliforms	E.Coli
	1100	3800	150	-	-
	1100	3800	150	-	-

CSW13	Faecal coliforms	E.Coli
	26000	2000
	26000	2000

CSW5	Copper	Lead	Zinc	Faecal coliforms	E.Coli
	3	4	280	2100	2100
	3	4	280	2100	2100

CMW2	Ammonia	Arsenic	Iron	Zinc	Faecal coliforms	E.Coli
	3700	15	23000	35	-	-
	3700	15	23000	35	-	-

Image source: Nearmap.com, Hypertiles, 25/06/2011

LEGEND

- APPROXIMATE PROJECT AREA
- CMW — APPROXIMATE GROUNDWATER MONITORING WELL LOCATION (COFFEY ENVIRONMENTS)
- CSW × — APPROXIMATE SURFACE WATER SAMPLE LOCATION (COFFEY ENVIRONMENTS)
- APPROXIMATE BOREHOLE LOCATION (DOUGLAS PARTNERS)
- SW × — APPROXIMATE SURFACE WATER SAMPLE LOCATION (DOUGLAS PARTNERS)
- APPROXIMATE MONITORING WELL LOCATION (ERM)

Sample	Analyte	Faecal coliforms	E.Coli
	µg/L	cfu/100ml	cfu/100ml

µg/L MICROGRAMS PER LITRE

\- NOT ANALYSED

Value — CONTAMINANT EXCEEDS ADOPTED CRITERIA FOR PROTECTION OF HUMAN HEALTH RISK

Value — CONTAMINANT EXCEEDS ADOPTED CRITERIA FOR PROTECTION OF ECOSYSTEMS

Value — CONTAMINANT DOES NOT EXCEED ADOPTED CRITERIA

ARTC
Hexham Relief Roads

Proposed Relief Roads

0 50 100 150 200 250
SCALE 1:5000 (A3) METRES

Aerial image source: Google Earth Pro 2012
Aerial image ©: Sinclair Knight Merz 2012
Image source: UHVA ARTC, Proposed Relief Roads 01/06/2011

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date	04.07.2012
scale	AS SHOWN
original size	

client: UPPER HUNTER VALLEY ALLIANCE

project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

title: GROUNDWATER & SURFACE WATER CONTAMINATION PLAN C

job no: GEOTWARA21045AC-D03

figure no: FIGURE 4C

Image source: Nearmap.com, Hypertiles, 25/06/2011

LEGEND

APPROXIMATE PROJECT AREA

CMW APPROXIMATE GROUNDWATER MONITORING WELL LOCATION (COFFEY ENVIRONMENTS)

CSW APPROXIMATE SURFACE WATER SAMPLE LOCATION (COFFEY ENVIRONMENTS)

APPROXIMATE BOREHOLE LOCATION (DOUGLAS PARTNERS)

SW APPROXIMATE SURFACE WATER SAMPLE LOCATION (DOUGLAS PARTNERS)

APPROXIMATE MONITORING WELL LOCATION (ERM)

Sample	Analyte	Faecal coliforms	E.Coli
	µg/L	cfu/100ml	cfu/100ml

Value CONTAMINANT EXCEEDS ADOPTED CRITERIA FOR PROTECTION OF HUMAN HEALTH RISK

Value CONTAMINANT EXCEEDS ADOPTED CRITERIA FOR PROTECTION OF ECOSYSTEMS

Value CONTAMINANT DOES NOT EXCEED ADOPTED CRITERIA

µg/L MICROGRAMS PER LITRE

UHVA ARTC

ARTC
Hexham Relief Roads

Proposed Relief Roads

0 50 100 150 200 250
SCALE 1:5000 (A3) METRES

Aerial image source: Google Earth Pro 2012
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Image source: UHVA ARTC, Proposed Relief Roads 01/06/2011

drawn	CGT
approved	
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scale	AS SHOWN
original size	

client: UPPER HUNTER VALLEY ALLIANCE

project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

title: GROUNDWATER & SURFACE WATER CONTAMINATION PLAN D

job no: GEOTWARA21045AC-D03

figure no: FIGURE 4D

7.2 Sampling Methodology

Field work for the CA component was undertaken from 12 December 2011 to 27 April 2012. The sampling methodology used for the assessment is discussed in the sections below.

Test Pits:

Twenty-eight (28) test pits were excavated to depths ranging from approximately 0.7m below ground surface (bgs) to approximately 3.0m bgs using a 14-tonne excavator.

Generally two to three environmental soil samples were collected from the 28 test pits, with samples collected to target the different fill types encountered. The samples were collected directly from the centre of the excavator bucket, so as to minimise the potential for cross-contamination. A clean pair of disposable gloves was used for each discrete sample.

The soil samples were divided into two subsamples. The first subsample was placed into 250mL laboratory supplied glass jars for laboratory analysis. The second subsample was placed into zip-lock plastic bags for headspace screening and asbestos analysis. Each sample was placed directly into an ice-chilled esky and remained chilled during transportation to the laboratory.

Hand Auger Boreholes

Seven boreholes were drilled using a hand auger to depths of between 0.4m to 2.3m bgs. Samples were collected directly from the hand auger using a clean pair of disposable nitrile gloves.

The soil samples were divided into two subsamples. The first subsample was placed into 250mL laboratory supplied glass jars for laboratory analysis. The second subsample was placed into zip-lock plastic bags for headspace screening and asbestos analysis. Each sample was placed directly into an ice-chilled esky and remained chilled during transportation to the laboratory.

Surface Soil Sampling:

Surface soil samples CS1 to CS26 and SS27 to SS35 were collected directly by hand or by using available stainless steel hand tools. Where hand tools were used, these were decontaminated between samples by rinsing with phosphate-free detergent and potable water. A clean pair of disposable gloves was used for each discrete sample.

The soil samples were divided into two subsamples. The first subsample was placed into 250mL laboratory supplied glass jars for laboratory analysis. The second subsample was placed into zip-lock plastic bags for headspace screening and asbestos analysis. Each sample was placed directly into an ice-chilled esky and remained chilled during transportation to the laboratory.

Rail Ballast Sampling:

Rail ballast samples RB01 to RB20 were collected by hand and placed directly into zip-lock plastic bags. The bags were filled as much as practical with the rail ballast. A clean pair of disposable gloves was used for each discrete sample. Each sample was placed directly into an ice-chilled esky and remained chilled during transportation to the laboratory.

Due to the sizes of the rail ballast, samples were not placed into the laboratory-supplied glass jars.

PACM Fragment Sampling:

Two fragments of PACM (labelled as A1 and A2) were collected from small piles of building rubble in one area of former buildings.

One fragment of PACM (AS1) was collected from a stockpile of fibro-board which had been illegally dumped on the Project Area. This stockpile has since been removed from the Project Area.

Two fragments of PACM (labelled as AS1 (27/4/2012) and AS2) were collected adjacent to a dilapidated building near the high pressure gas main.

These samples were collected by hand and placed into zip-lock plastic bags. A clean pair of disposable gloves was used for each discrete sample.

Groundwater Well Installation and Sampling

The groundwater wells were drilled using a truck mounted drill rig equipped with hollow flight augers. The wells were installed to a depth of about 4.0m, which allowed for the screen to be about 2m below and 1m above the observed water inflow during drilling.

The groundwater wells were developed during installation by "surging" using a stainless steel bailer, and then pumping out at least 10L of water using a typhoon pump. The groundwater wells were left to stabilise for at least 12 days prior to sampling.

The wells were gauged using an interface probe, then purged by removing a minimum of two wells volumes or until the well was dry. Field water quality parameters, including electrical conductivity (EC), pH, dissolved oxygen (DO), redox and temperature, were recorded during purging. Once the wells had recharged, a groundwater sample was collected using a low flow pump.

Groundwater samples were placed into appropriately preserved, laboratory supplied bottles, and stored in a chilled esky during fieldwork and transport to the laboratory.

Surface Water Sampling

Surface water samples were collected by dipping the bottles directly into the water. Appropriately preserved, laboratory supplied bottles were used. A clean pair of nitrile gloves was used for collection of each sample. Samples were stored in a chilled esky during fieldwork and transport to the laboratory.

7.3 Laboratory Analysis

7.3.1 Soil Contamination

Selected soil samples were analysed for the respective COCs. The soil samples from the test pits were selected for analysis based on providing representative results for the different fill materials encountered.

The samples were dispatched to the NATA-accredited SGS laboratory in Alexandria, NSW. The samples were dispatched to the laboratory under chain of custody conditions.

The samples were analysed from the following suite of analytes:

- Asbestos – 96 samples;
- Polycyclic Aromatic Hydrocarbons (PAH) – 84 samples;
- Organochlorine Pesticides (OCP) – 53 samples;
- Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) – 47 samples;
- Total Petroleum Hydrocarbons (TPH) – 57 samples;
- Polychlorinated Biphenyls (PCB) – 29 samples; and
- Lead – 16 samples.

7.3.2 Waste Classification

The laboratory programme outlined above in Section 7.3.1 was also used to provide a waste classification for the material assessed. Based on the results of the initial analysis, 13 samples were submitted for leachability testing using the Toxicity Characteristic Leaching Procedure (TCLP) for arsenic, lead, nickel and benzo(a)pyrene.

7.3.3 Groundwater Contamination

Selected groundwater samples were analysed for the respective COCs.

The samples were dispatched to the NATA-accredited SGS laboratory in Alexandria, NSW, and Hunter Water Australia laboratory in Warabrook NSW. The samples were dispatched to the laboratory under chain of custody conditions.

The samples were analysed from the following suite of analytes:

- Total Petroleum Hydrocarbons (TPH) – 12 samples;
- Benzene, toluene, ethylbenzene, xylenes (BTEX) – 12 samples;
- Polycyclic Aromatic Hydrocarbons (PAH) – 12 samples;
- Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) – 12 samples;
- Major cations (Na, K, Ca, Mg, Fe) and major anions (Cl, HCO_3, CO_3, SO_4) – 12 samples;
- Nitrogen – 12 samples;
- Phosphorous – 12 samples;
- Ammonia – 12 samples; and
- Faecal coliforms and E. Coli – 7 samples.

7.3.4 Surface Water Contamination

Surface water samples were analysed for the respective COCs. The samples were dispatched to the NATA-accredited SGS laboratory in Alexandria, NSW, and Hunter Water Australia laboratory in Warabrook NSW. The samples were dispatched to the laboratory under chain of custody conditions.

The samples were analysed from the following suite of analytes:

- Total Petroleum Hydrocarbons (TPH) – 12 samples;
- Benzene, toluene, ethylbenzene, xylenes (BTEX) – 12 samples;
- Polycyclic Aromatic Hydrocarbons (PAH) – 12 samples;
- Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) – 12 samples;
- pH and electrical conductivity – 12 samples;
- Biological oxygen demand (BOD) – 12 samples;
- Nitrogen – 12 samples;
- Phosphorous – 12 samples;
- Ammonia – 12 samples; and
- Faecal coliforms and E. Coli – 20 samples.

8 QUALITY ASSURANCE / QUALITY CONTROL RESULTS AND DATA USABILITY

Sampling activities were undertaken in general accordance with Coffey's Standard Operating Procedures (SOPs), which are based on industry accepted practice. The assessment of field and laboratory quality assurance / quality control (QA / QC) procedures is included in a data validation report, which can be provided upon request.

In order to assess field QA / QC procedures, the following QA/QC samples were collected and dispatched with the primary samples:

- Six soil intra-laboratory duplicate samples QC1 to QC6, QC9 and QC9A;
- Four soil inter-laboratory duplicate samples, QC1A, QC2A, QC3A, and QC6A;
- Two surface water intra-laboratory duplicate samples, SW-QC1 and SW-QC2;
- One groundwater intra-laboratory duplicate sample, QC2;
- One groundwater inter-laboratory duplicate sample, QC3,
- Three equipment rinsates, QC1, QC5 and QC7, and two trip blanks, QC4 and QC7.

Samples were received by SGS within the recommended holding times. Copies of the Chain of Custody documentation are presented in Appendix G.

Tables 5 and 6 presents the relative percentage differences (RPDs) between the primary sample and the duplicate and triplicate samples analysed. Table 6 also presents the results of the equipment rinsate and trip blank samples analysed. A review of the Coffey QA / QC results indicates that QA/QC results were acceptable, with the exception of the following:

Soil

- Duplicate pair TP504A 0.3-0.4m / QC1A with an RPD of 51% for chromium;
- Duplicate pair TP508B 0.3-0.4m / QC2A with an RPD of 74% for TPH C29-C36
- Duplicate pair TP510A 0.1-0.2m / QC3 with RPDs of 144% for arsenic, 77% for TPH C15-C28, 54% for TPH C29-C36, and 79% for total PAHs;
- Duplicate pair TP510A 0.1-0.2m / QC3A with RPDs between 64% and 158% for numerous metals (arsenic, chromium, copper, lead, nickel, and zinc), 52% for TPH C10-C14;
- Duplicate pair TP512B 0.1-0.2m / QC4 with RPDs of 54% for chromium, and 56% for mercury;
- Duplicate pair TP523B 0.3-0.4m / QC5 with an RPD of 151% for arsenic;

Each of the duplicate pairs were collected in fill material, and the majority of the RPD exceedances are considered to be due to the heterogeneous nature of the fill material. For a few duplicate pairs, the RPD exceedances are considered to be due to low concentrations of analytes.

Surface Water and Groundwater

- Duplicate pair CSW1 / SW-QC1 with an RPD of 67% for cadmium.
- Duplicate pair CMW6 / QC2 with an RPD of 67% for cadmium;
- Duplicate pair CMW6 / QC3 with an RPD of 67% for cadmium;
- Duplicate pair CMW6 / QC2 with an RPD of 67% for copper;

- Detection of zinc in equipment rinsates, QC1, QC5 and QC7.

The RPD are considered to be a result of concentrations being close the detection limit, with the concentrations recorded being 0.1 and 0.2µg/L (cadmium), or 1 and 2µg/L (copper).

The laboratory internal QA/QC reports indicated that the appropriate laboratory QA / QC procedures and rates were undertaken for contamination studies, and that:

- Surrogate, matrix spike and laboratory control sample recoveries were within the laboratories acceptable range, with the exception of several matrix spike recoveries which are discussed in the data validation report;
- Method blanks were free of contamination and duplicate RPDs were within the acceptable ranges, with the exception of several RPDs which are discussed in the data validation report.

Based on the data validation assessment it is considered that the field and laboratory methods for soil and water are appropriate and that the data obtained is usable and considered to reasonably represent the concentrations at the sampling points at the time of sampling.

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Table 5 - Summary of Soil Duplicate and Triplicate Results

All results in mg/kg

Sample ID	TP504A	QC1	RPD %	TP504A	QC1A	RPD %	TP508B	QC2	RPD %	TP508B	QC2A	RPD %	TP510A	QC3	RPD %	TP510A	QC3A	RPD %	TP512B	QC4	RPD %	TP523B	QC5	RPD %	CS17	QC6	RPD %	CS17	QC6A	RPD %	HA1	QC9	RPD %	HA1	QC9A	RPD %
Depth (m)	0.3-0.4			0.3-0.4			0.3-0.4			0.3-0.4			0.1-0.2			0.1-0.3			0.1-0.2			0.3-0.4			Surface			Surface			0.0-0.1			0.0-0.1		
Date of Sampling	13/12/2011	13/12/2011		13/12/2011	13/12/2011		14/12/2011	14/12/2011		14/12/2011	14/12/2011		14/12/2011	14/12/2011		14/12/2011	14/12/2011		14/12/2011	14/12/2011		15/12/2011	15/12/2011		20/12/2011	20/12/2011		20/12/2011	20/12/2011		20/12/2011	20/12/2011		20/12/2011	20/12/2011	
Laboratory	SGS	SGS		SGS	MGT		SGS	SGS		SGS	MGT		SGS	SGS		SGS	MGT		SGS	SGS		SGS	SGS		SGS	SGS		SGS	MGT		SGS	SGS		SGS	SGS	
Metals																																				
Arsenic	<3	<3	NC	<3	1.5	NC	<3	<3	NC	<3	2.6	NC	43	7	144%	43	5	158%	6	5	18%	47	340	151%	-	-	-	-	-	-	5	6	18%	5	5	0%
Cadmium	<0.3	<0.3	NC	<0.3	<0.1	NC	<0.3	<0.3	NC	<0.3	0.2	NC	0.7	0.5	33%	0.7	<0.1	NC	<0.3	<0.3	NC	0.6	0.9	NC	-	-	-	-	-	-	0.4	1	22%	0.4	0	0%
Chromium	1.9	1.9	0%	1.9	3.2	51%	2.5	2.7	8%	2.9	4.6	45%	14.0	14.0	0%	14.0	6.8	69%	2.3	4.0	54%	15.0	13.0	14%	-	-	-	-	-	-	8.5	14	49%	8.5	8	6%
Copper	7.3	6.4	13%	5.5	5.4	2%	12.0	17.0	34%	22.0	15.0	38%	38.0	27.0	34%	38.0	18.0	71%	15.0	13.0	14%	87.0	76.0	13%	-	-	-	-	-	-	36	48	29%	36	34	6%
Lead	5	4	22%	3	2.9	3%	11	17	43%	23	16.0	36%	30	25	18%	30	15	67%	18	18	0%	110	98	12%	-	-	-	-	-	-	30	37	21%	30	29	3%
Nickel	5.5	5.4	2%	5.3	4.6	14%	5.1	5.1	0%	5.1	5.2	2%	21.0	16.0	27%	21.0	10.0	71%	5.1	4.0	24%	27.0	25.0	8%	-	-	-	-	-	-	16	21	27%	16	14	13%
Zinc	11	12	9%	13	8.3	44%	27	24	12%	21	25.0	17%	60	52	14%	60	31	64%	30	37	21%	180	210	15%	-	-	-	-	-	-	77	77	0%	77	62	22%
Mercury	<0.05	<0.05	NC	<0.05	<0.05	NC	0.09	<0.05	NC	0.09	0.06	40%	<0.05	<0.05	NC	<0.05	<0.05	NC	0.25	0.14	56%	0.08	0.09	12%	-	-	-	-	-	-	0.17	0	6%	0.17	0	27%
Total Petroleum Hydrocarbons																																				
C6 - C9 Fraction	<20	<20	NC	<20	<10	NC	<20	<20	NC	<20	<10	NC	<20	<20	NC	<20	<10	NC	<20	<20	NC	<20	<20	NC	-	-	-	-	-	-	<20	<20	-	<20	<20	-
C10 - C14 Fraction	<20	<20	NC	<20	<50	NC	<20	<20	NC	<20	<50	NC	37	120	NC	37	63	52%	64	44	NC	120	57	NC	-	-	-	-	-	-	<20	<20	-	<20	<20	-
C15 - C28 Fraction	<50	<50	NC	<50	<100	NC	190	180	5%	170	180	6%	290	650	77%	290	440	41%	340	400	16%	500	340	38%	-	-	-	-	-	-	150	100	40%	150	75	67%
C29 - C36 Fraction	<50	<50	NC	<50	<100	NC	110	94	16%	78	170	74%	150	260	54%	150	190	24%	97	150	43%	230	140	49%	-	-	-	-	-	-	210	180	15%	210	130	47%
Total C10-C36	<20	<20	NC	<20	<50	NC	300	274	9%	248	350	34%	477	1030	73%	477	693	37%	501	594	17%	850	537	45%	-	-	-	-	-	-	<360		-	<360		-
Polynuclear Aromatic Hydroca																																				
Benzo(a)pyrene	<0.1	<0.1	NC	<0.1	<0.5	NC	<0.1	<0.1	NC	<0.1	<0.5	NC	<0.1	<0.1	NC	<0.1	<0.5	NC	0.10	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.5	NC	0.1	<0.1	NC	0.1	<0.1	NC
Total PAHs	<0.8	<0.8	NC	<0.8	<1	NC	1.20	0.90	29%	0.60	<1	NC	1.90	4.40	79%	1.90	<1	NC	3.30	3.90	17%	<0.8	2.50	NC	1.40	1.20	15%	1.40	<1	NC	1.7	<0.8	NC	1.7	<0.8	NC
Organochlorine Pesticides																																				
Aldrin & Dieldrin	-	-	-	-	-	-	<0.1	<0.1	NC	<0.1	<0.05	NC	-	-	-	-	-	-	<0.1	-	NC	<0.1	<0.1	NC	-	-	NC	-	-	-	<0.3	-	-	<0.3	-	-
Chlordane	-	-	-	-	-	-	<0.1	<0.1	NC	<0.1	<0.05	NC	-	-	-	-	-	-	<0.1	-	NC	<0.1	<0.1	NC	-	-	NC	-	-	-	<0.1	-	-	<0.1	-	-
DDT + DDE + DDD	-	-	-	-	-	-	<0.1	<0.1	NC	<0.1	<0.05	NC	-	-	-	-	-	-	<0.1	-	NC	<0.1	<0.1	NC	-	-	NC	-	-	-	<0.6	-	-	<0.6	-	-
Heptachlor	-	-	-	-	-	-	<0.1	<0.1	NC	<0.1	<0.05	NC	-	-	-	-	-	-	<0.1	-	NC	<0.1	<0.1	NC	-	-	NC	-	-	-	<0.1	-	-	<0.1	-	-
Polychlorinated Biphenyls																																				
Total PCB	-	-	-	-	-	-	<1	<1	NC	<1	<0.5	NC	-	-	-	-	-	-	<1	-	NC	<1	<1	NC	-	-	NC	-	-	-	<10	-	NC	<10	-	NC
Asbestos																																				
Asbestos in Soil/ACM	Not Detected	Not Detected	NC	Not Detected	Not Detected	NC	Not Detected	Not Detected	NC	Not Detected	Not Detected	NC	Not Detected	Not Detected	NC	Not Detected	Not Detected	NC	Not Detected	Not Detected	NC	Not Detected	-	NC	Not Detected	-	NC	Not Detected	-	NC	ND	-	NC	ND	-	NC

Notes:

RPD RPD exceeds control limit of 50%

NC RPD not calculated either the primary or duplicate samples (or both) did not produce results

- Not Analysed

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Table 6 - Summary of Surface Water and Groundwater Duplicate Results

			Surface Water						Groundwater										Soil	
Field_ID	**Units**	**LABORATORY DETECTION**	CSW 1	SW-QC1		CSW 12	SW-QC2		CMW6	QC2		CMW6	QC3		QC1	QC5	Trip Blank	Trip Spike	QC7	QC8
Sampled_Date			9/02/2012	9/02/2012	**RPD**	9/02/2012	9/02/2012	**RPD**	20/02/2012	20/02/2012	**RPD**	20/02/2012	20/02/2012	**RPD**	20/02/2012	21/02/2012	21/02/2012	21/02/2012	27/04/2012	27/04/2012
Sample Type			Primary	Duplicate		Primary	Duplicate		Primary	Duplicate		Primary	Triplicate		Rinsate	Rinsate			Rinsate	Trip Blank
Ammonia as N	µg/l	10	<10.0	<10.0	NC	130	140	7	3000	3000	0%	3000	2700	11%	-	-	-	-	-	-
Nitrate (as N)	µg/L	5	<5	<5	NC	300	300	0	<5	<5	NC	<5	<10	NC	<5	<5	-	-	<5	<5
pH (Lab)	pH_Units	0	7.3	7.3	0%	7.8	7.8	0	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	µg/L	5	8	6	29%	31	29	7	7	7	0%	7	-	-	<5	<5	-	-	<5	<5
Kjeldahl Nitrogen Tota	µg/L	50	2500	2400	4%	12000	9200	26	4000	4100	2%	4000	2400	50%	<50	<50	-	-	<50	<50
Phosphorus	µg/L	50	810	770	5%	2900	2400	19	620	670	8%	620	500	21%	<50	<50	-	-	<50	<50
BOD	µg/L	5000	32000	24000	29%	<5000	<5000	NC	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons																				
TPH C6 - C9	µg/L	40	<40	<40	NC	<40	<40	NC	<40	<40	NC	<40	<20	NC	<40	<40	-	-	<40	<40
TPH C10 - C14	µg/L	100	<100	<100	NC	<100	<100	NC	<100	<100	NC	<100	<50	NC	<100	<100	-	-	<100	-
TPH C15 - C28	µg/L	200	<200	<200	NC	<200	<200	NC	<200	<200	NC	<200	<100	NC	<200	<200	-	-	<200	-
TPH C29-C36	µg/L	200	<200	<200	NC	<200	<200	NC	<200	<200	NC	<200	<100	NC	<200	<200	-	-	<200	-
Metals																				
Arsenic	µg/L	1	2	2	0%	74	82	10%	11	11	0%	11	7	44%	<1	<1	-	-	<1	-
Cadmium	µg/L	0.1	0.2	0.1	67%	3.8	4.8	23%	0.2	0.1	67%	0.2	0.1	67%	<0.1	<0.1	-	-	<0.1	-
Chromium (III+VI)	µg/L	1	2	2	0%	190	230	19%	<1	<1	NC	<1	<1.0	NC	<1	<1	-	-	<1	-
Copper	µg/L	1	24	18	29%	310	380	20%	2	1	67%	2	<1.0	NC	<1	<1	-	-	<1	-
Iron	µg/L	5	-	-	-	-	-	-	13000	13000	0%	13000	-	-	<5	<5	-	-	-	-
Lead	µg/L	1	3	3	0%	600	760	24%	<1	<1	NC	<1	<1.0	NC	<1	<1	-	-	<1	-
Nickel	µg/L	1	7	6	15%	150	200	29%	10	10	0%	10	11	10%	<1	<1	-	-	<1	-
Zinc	µg/L	1	1600	1500	6%	1300	1800	32%	380	370	3%	380	330	14%	**3**	**8**	-	-	**10**	-
Mercury	µg/L	0.1	<0.1	<0.1	NC	1.4	1.6	13%	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Polynuclear Aromatic Hydrocarbons																				
Acenaphthene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Acenaphthylene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Anthracene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Benz(a)anthracene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Benzo(a) pyrene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Benzo(b)fluoranthene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Benzo(g,h,i)perylene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Chrysene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Dibenz(a,h)anthracene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Fluoranthene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Fluorene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Naphthalene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
PAHs (Sum of total)	µg/L	1	<1.0	<1.0	NC	<1.0	<1.0	NC	<1.0	<1.0	NC	<1.0	<0.2	NC	<1.0	<1.0	-	-	<1.0	-
Phenanthrene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
Pyrene	µg/L	0.1	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	NC	<0.1	<0.1	-	-	<0.1	-
BTEX																				
Benzene	µg/L	0.5	<0.5	<0.5	NC	<0.5	<0.5	NC	<0.5	<0.5	NC	<0.5	<1.0	NC	<0.5	<0.5	<0.5	95%	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	NC	<0.5	<0.5	NC	<0.5	<0.5	NC	<0.5	<1.0	NC	<0.5	<0.5	<0.5	94%	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5	NC	<0.5	<0.5	NC	<0.5	<0.5	NC	<0.5	<1.0	NC	<0.5	<0.5	<0.5	96%	<0.5	<0.5
Xylene (m & p)	µg/L	1	<1.0	<1.0	NC	<1.0	<1.0	NC	<1.0	<1.0	NC	<1.0	<2.0	NC	<1.0	<1.0	<1.0	97%	<1.0	<1.0
Xylene (o)	µg/L	0.5	<0.5	<0.5	NC	<0.5	<0.5	NC	<0.5	<0.5	NC	<0.5	<1.0	NC	<0.5	<0.5	<0.5	98%	<0.5	<0.5
Xylene Total	µg/L	1.5	<1.5	<1.5	NC	<1.5	<1.5	NC	<1.5	<1.5	NC	<1.5	<3.0	NC	<1.5	<1.5	<1.5	-	<1.5	<1.5

Notes:

RPD RPD exceeds control limit of 50%

NC RPD not calculated either the primary or duplicate samples (or both) did not produce results

- Not Analysed

9 RESULTS OF INVESTIGATION

9.1 Subsurface Conditions

Test pit logs and explanation sheets are presented in Appendix A. The general subsurface conditions comprised:

Unit and Material	**Depth to Base of Unit (m bgs)**
1A to 1F Fill	0.45 to 2.6
2A Topsoil/Alluvial Soil	0.8 to 2.1
3A to 3E Alluvial Soil	1.5* to 3.0*

*Notes: * Depth to base of alluvial soil is the depth of investigation for the majority of test pits.*

Units 2A and 3A to 3E were not present in test pits TP506B, TP507B, TP508B, TP510A and TP511B. In these test pits Unit 1A to 1F (fill) extended to the depth of investigation.

The general material descriptions for each unit are summarised below in Table 7.

TABLE 7: MATERIAL DESCRIPTIONS

Unit	**Material Description**
1A Ballast With Coal Fill	Fill - Ballast with Coal, comprising: • Clayey Sandy Gravel, fine to coarse grained, dark grey, angular, sand fine to coarse grained, low to medium plasticity fines
1B Imported Fill	Fill - Imported Gravel, comprising: • Sandy Gravel, fine to medium grained, pale brown, sand fine to coarse grained, some low plasticity fines • Clayey Sandy Gravel, fine to coarse grained, brown with white, angular, sand fine to coarse grained, low to medium plasticity fines • Sandy Clayey Gravel, fine to coarse grained, grey with brown/orange, medium plasticity fines, sand fine to medium grained • Silty Sandy Gravel, fine to coarse grained, pale brown, sub-rounded and rounded, sand fine to coarse grained, low to medium plasticity fines Fill - Imported Sand, comprising: • Gravelly Sand, fine to coarse grained, pale brown, fine angular gravel, some low plasticity fines Fill - Imported Fill, comprising: • Cobbles and Boulders of sandstone and siltstone in a clayey sandy gravel matrix, with pockets of sandy clay

Unit	Material Description
1C Coal Reject Fill	Fill - Coal Reject, comprising: • Clayey Sandy Gravel, fine to coarse grained, dark grey, angular, sand fine to coarse grained, low to medium plasticity fines • Clayey Sandy Gravel, fine to coarse grained, angular, grey with some iron staining, sand fine to coarse grained, medium plasticity fines, about 10% cobble sized siltstone fragments • Gravel/Sandy Gravel, medium to coarse grained, about 30% cobble sized siltstone fragments, grey with some pale brown to orange, sand fine to coarse grained, some low plasticity fines • Sandy Clayey Gravel, fine to coarse grained, angular, medium plasticity fines, sand fine to coarse grained, about 30% clay. • Sandy Gravel, fine to coarse grained, black, angular, sand fine to coarse grained, some low plasticity fines, about 30% cobble sized sandstone fragments
1D Ash and Ash Mixtures Fill	Fill - Ash, comprising: • Sandy Gravel, fine to medium grained, grey, sand fine to coarse grained, trace low plasticity fines Fill - Topsoil/Ash Mixture, comprising: • Gravelly Clay, medium plasticity, dark grey, gravel fine to medium grained, some fine to coarse grained sand Fill - Coal Reject and Ash Mixture, comprising • Clayey Sandy Gravel, fine to medium grained, grey to dark grey, sand fine to coarse grained
1E Topsoil Fill	Fill Topsoil, comprising: • Clayey Sandy Gravel, fine to coarse grained, dark grey, angular, sand fine to coarse grained, low plasticity fines, grass roots
1F Local Fill	Fill, comprising: • Clayey Sand, fine to medium grained, pale brown with orange and grey clay nodules, medium plasticity, fines, appeared to be sourced on-site
2 Topsoil / Alluvial Soil	2A Topsoil / Alluvial Soil Silty Clay, medium plasticity, dark grey, trace fine to medium grained sand

Unit	Material Description
3 Alluvial/Estuarine Soil	3A Alluvial/Estuarine Soil Clay, high plasticity, grey with some pale brown and orange, trace fine grained sand
	3B Alluvial/Estuarine Soil Clayey Sand, fine to coarse grained, grey, medium plasticity fines, trace fine gravel
	3C Alluvial/Estuarine Soil Clayey Sand and Sandy Clay, fine to medium grained sand, grey and orange, trace fine sub-rounded gravel
	3D Alluvial/Estuarine Soil Sand / Clayey Sand, fine to medium grained, pale grey and pale brown to orange, low to medium plasticity fines
	3E Alluvial/Estuarine Soil Clayey Sand/Sand, fine to medium grained, grey with some orange to pale brown, medium plasticity clay, less than 20% clay in lenses inter-bedded with peat

No staining or odours were observed in the test pits. Coal reject and ash were observed in numerous test pits. Waste materials (other than coal reject and ash) were observed in test pits: TP504A had about 60% slag “skulls” from 0.0m to 0.15m depth, TP519B had several bricks, a glass bottle and a piece of rusted metal at 0.9m to 1.6m depth, and TP517A had a 1m long piece of rail, pieces of wood and a tree root at 0.8m to 1.7m depth.

Groundwater was encountered during test pitting at depths of between 0.25m and 1.90m below ground surface. The groundwater inflows were within fill materials, except for an inflow in TP523B at 1.40m bgs. The inflows may represent localised perched water within fill, rather than the regional groundwater table. Variations in groundwater depth may occur due to factors such as rainfall and climatic conditions.

Groundwater inflows were observed during drilling of the groundwater wells at the following levels:

Monitoring Well	Observed Water Inflow During Drilling (m bgs)
CMW1	1.5
CMW2	1.2
CMW3	0.9
CMW4	1.5
CMW5	1.2
CMW6	0.65
CMW7	1.5
CMW8	1.2
CMW9	1.2
CMW10	1.2

Groundwater was gauged prior to purging and sampling. The results of the gauging are presented in Table 8 below. Figure 5 below shows the groundwater contours.

9.2 PID Results

A Photo-ionisation Detector (PID) was used to screen the environmental samples for volatile organic compounds. The results of the screening are provided in Appendix B. The results ranged from 0.0ppm to 0.9ppm.

9.3 Groundwater Field Quality Control Results

Field water quality parameters were measured during purging of the groundwater wells. The recorded results are shown in Table 9 attached. A summary of the post-purging water quality parameters is provided below:

- pH ranged from 5.43 to 7.29, indicating water is slightly acidic to neutral;
- Electrical Conductivity (EC) ranged from 33µS/cm to 6,759µS/cm indicating water is fresh to moderately saline;
- Dissolved Oxygen ranged from 0.48mg/L to 2.10mgL, indicating a aerobic environment;
- Redox ranged from -148.8mV to 54.5mV, indicating oxidising conditions;
- Temperature ranged from 20.1^{o}C to 24.2^{o}C.

It is noted that the EC results for CW3, CMW9 and CMW10 were anomalous. The water quality meter was calibrated when the results were observed, with no change in the readings. Coffey consider that the EC results recorded for CMW3, CMW9 and CMW10 are probably not representative of groundwater in the Project Area.

A3

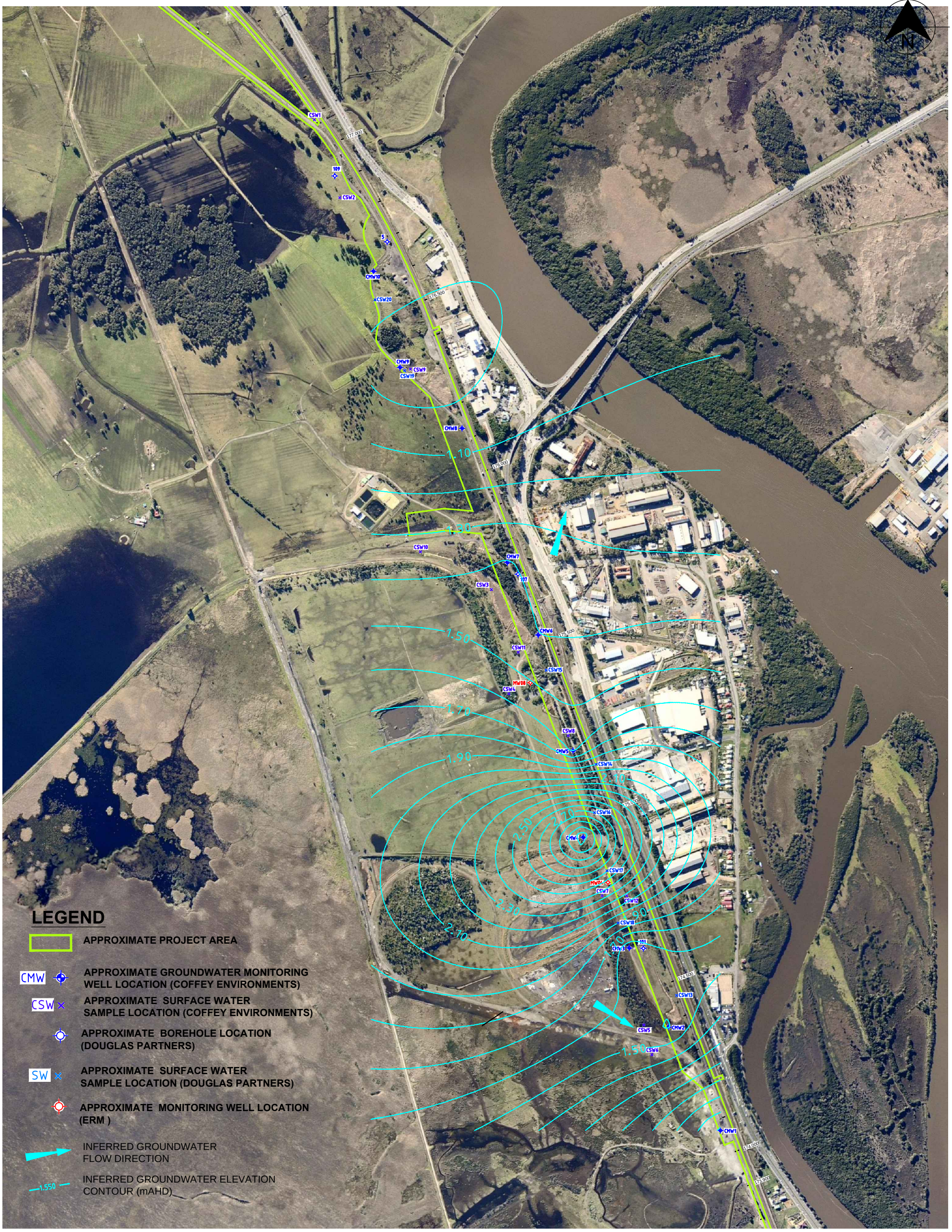

Image source: Nearmap.com, Hypertiles, 25/06/2011

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UHVA ARTC
ARTC Hexham Relief Roads
Proposed Relief Roads

Client: UPPER HUNTER VALLEY ALLIANCE

Project: CONTAMINATION ASSESSMENT HEXHAM RELIEF PROJECT

Drawing Title: **GROUNDWATER CONTOUR PLAN (FEBRUARY 2012)**

Rev	Date	Revision Details	Drn
A	04.07.12	CONTAM ASSESS ISSUE	CGT

0 100 200 300 400 500
SCALE 1:10000 (A3) METRES

Location: HEXHAM, NEW SOUTH WALES

Drawn: CGT
Date: 04.07.2012
Project - Drawing No.: GEOTWARA21045AC-D03
Figure No.: 5
Rev.: A

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Table 8 - Groundwater Gauging Results

Well ID	Date Measured	Time Measured	Event	Top of Well Casing Elevation (mAHD)	Depth to Water (mBTOC)	Depth to PSHs (mBTOC)	PSH Thickness (m)	Corrected Depth to Water (m)	Corrected Water Elevation (mAHD)	Comments
Perched Water Monitoring Wells										
GMW1	2-Feb-12	10:55 AM	Pre - Purge	1.883	1.100	-	-	-	0.783	No odour GC
GMW2	2-Feb-12	10:50 AM	Pre - Purge	2.072	0.462	-	-	-	1.610	No odour, GC
GMW3	2-Feb-12	10:35 AM	Pre - Purge	2.454	0.938	-	-	-	1.516	No odour, no well cap
GMW4	2-Feb-12	10:25 AM	Pre - Purge	3.902	0.704	-	-	-	3.198	No odour, GC
GMW5	2-Feb-12	10:15 AM	Pre - Purge	2.356	0.781	-	-	-	1.575	No odour, GC
GMW6	2-Feb-12	10:08 AM	Pre - Purge	1.970	0.570	-	-	-	1.400	No odour, GC
GMW7	2-Feb-12	10:00 AM	Pre - Purge	2.161	0.751	-	-	-	1.410	No odour, GC
GMW8	2-Feb-12	9:45 AM	Pre - Purge	1.626	0.593	-	-	-	1.033	No odour, GC
GMW9	2-Feb-12	9:35 AM	Pre - Purge	1.347	0.414	-	-	-	0.933	No odour, GC
GMW10	2-Feb-12	9:25 AM	Pre - Purge	1.961	0.895	-	-	-	1.066	No odour, GC
101	2-Feb-12	10:45 AM	Pre - Purge	-	1.550	-	-	-	-	No odour, no well cap
109	2-Feb-12	11:10 AM	Pre - Purge	-	1.678	-	-	-	-	No odour, no well cap

Notes:

mBTOC = metres below top of casing

mAHD = metres above Australian Height Datum

GC = good condition

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Table 9 - Groundwater Water Qaulity Results

Well ID	Date Measured	Time Measured	Event	Dissolved Oxygen (mg/L)	Electrical Conductivity (µS/cm)	Redox Potential (mV)	pH	Total Dissolved Solids* (mg/L)	Temperature (°C)	Purge Volume (L)	Comments
CMW1	20-Feb-12	11:35 AM	Pre-Purge	2.61	1730	-92.4	6.73	1125	22.3	1	Clear, organic odour
		11:39 AM		0.62	1698	-86.6	6.77	1104	22.6	5	Cloudy, grey/brown, organic odour
		11:43 AM		0.61	1406	-67.0	6.68	914	22.6	10	Cloudy, grey/brown, organic odour
		11:50 AM		0.59	1835	-73.2	6.68	1193	22.5	15	Cloudy, grey/brown, organic odour
		11:56 AM		0.55	1876	-76.4	6.68	1219	22.5	20	Cloudy, grey/brown, organic odour
		12:02 PM		0.56	2400	-86.1	6.69	1560	22.5	25	Cloudy, grey/brown, organic odour
		12:07 PM		0.56	2510	-100.2	6.69	1632	22.4	30	Cloudy, grey/brown, organic odour
		12:10 PM	Post-Purge	0.57	2591	-102.7	6.69	1684	22.4	32	Cloudy, grey/brown, organic odour
CMW2	21-Feb-12	12:48 PM	Pre-Purge	0.85	1949	-78	6.39	1267	23.0	1	clear, no odour
		12:53 PM		0.45	1990	-102.5	6.38	1294	22.9	5	Slightly cloudy, grey/brown, no odour
		12:58 PM		0.43	1992	-109.8	6.37	1295	22.9	10	Slightly cloudy, grey/brown, no odour
		1:04 PM		0.47	1989	-112.7	6.37	1293	23.0	15	Slightly cloudy, grey/brown, no odour
		1:09 PM		0.49	1989	-113.9	6.37	1293	23.0	20	Slightly cloudy, grey/brown, no odour
		1:14 PM		0.52	1991	-117.4	6.37	1294	23.0	25	Slightly cloudy, grey/brown, no odour
		1:19 PM	Post-Purge	0.55	1985	-114.9	6.36	1290	22.9	30	Slightly cloudy, grey/brown, no odour
CMW3	21-Feb-12	10:00 AM	Pre-Purge	2.72	535	-58.8	6.40	348	22.1	1.0	Clear, slight organic odour
		10:05 AM		2.46	306	-33.5	6.37	199	22.7	5.0	Slightly cloudy, brown, slight organic odour
		10:10 AM		1.76	320	0.4	6.28	208	23.5	10.0	Slightly cloudy, brown, slight organic odour
		10:15 AM		1.57	84	-20.1	6.25	55	24.0	15.0	Slightly cloudy, brown, slight organic odour
		10:20 AM		1.23	72	-26.2	6.24	47	24.1	20.0	Slightly cloudy, brown, slight organic odour
		10:25 AM		1.15	65	-23.3	6.25	42	24.1	25.0	Slightly cloudy, brown, slight organic odour
		10:30 AM	Post-Purge	1.05	91	-19.9	6.23	59	24.2	30.0	Slightly cloudy, brown, slight organic odour
CMW4	21-Feb-12	1:40 PM	Pre-Purge	1.14	33	45.9	5.67	21	22.5	1.0	clear, no odour
		1:47 PM		1.32	38	64.3	5.34	24	21.5	5.0	Cloudy, grey/brown, no odour
		1:53 PM		1.61	33	54.5	5.43	22	21.1	10.0	Very cloudy, grey/brown
		1:55 PM	Well dry @11L								
CMW5	20-Feb-12	2:30 PM	Pre-Purge	0.61	6808	-81.4	6.2	4425	21.2	1.0	Slightly cloudy, brown, no odour
		2:35 PM		0.61	6589	-77.7	6.18	4283	20.1	5.0	Slightly cloudy, brown, no odour
		2:41 AM		0.52	6657	-85.6	6.16	4327	20	10.0	Slightly cloudy, brown, no odour
		2:47 PM		0.75	6663	-83.0	6.16	4331	20	15.0	Slightly cloudy, brown, no odour
		2:53 AM		0.60	6736	-82.5	6.15	4378	20.0	20.0	Slightly cloudy, brown, no odour
		2:59 PM	Post-Purge	0.64	6759	-76.9	6.14	4393	20.1	25.0	Slightly cloudy, brown, no odour
CMW6	20-Feb-12	1:55 PM	Pre-Purge	0.93	5470	-44.5	6.45	3556	25.6	1.0	Slightly cloudy, pale brown, no odour
		1:58 AM		0.58	5525	-40.1	6.39	3591	24.8	3.0	Slightly cloudy, pale brown, no odour
		2:01 PM		0.50	5652	-40.0	6.35	3674	24.8	5.0	Slightly cloudy, pale brown, no odour
		2:07 PM		0.42	5501	-34.2	6.32	3576	24.6	10.0	Slightly cloudy, pale brown, no odour
		2:12 PM		0.46	5661	-45.6	6.35	3680	24.4	15.0	Slightly cloudy, pale brown, no odour
		2:17 PM		0.45	5750	-68.3	6.36	3738	24.2	20.0	Slightly cloudy, pale brown, no odour
		2:22 PM		0.47	5672	-70.1	6.37	3687	24.3	25.0	Slightly cloudy, pale brown, no odour
		2:27 PM	Post-Purge	0.50	5717	-60.0	6.39	3716	24.1	30.0	Cloudy, pale brown, no odour
CMW7	21-Feb-12	2:23 PM	Pre-Purge	0.80	789	-15.8	6.21	513	23.1	1.0	Clear, slight organic odour
		2:27 PM		0.49	1067	-60.4	6.32	694	23.0	5.0	Slightly cloudy, grey/brown, slight organic odour
		2:33 PM		0.48	1252	-77.8	6.37	814	22.8	10.0	Slightly cloudy, grey/brown, slight organic odour
		2:38 PM		0.45	1269	-83.8	6.37	825	22.8	15	clear, no odour
		2:43 PM		0.46	1291	-87.36	6.38	839	22.7	20	clear, no odour
		2:50 PM	Post-Purge	0.48	1300	-90.2	6.38	845	22.7	25	clear, no odour
CMW8	21-Feb-12	3:03 PM	Pre-Purge	1.19	1908	-75	6.63	1240	22.9	1	clear, no odour
		3:09 PM		0.49	1062	-93.8	6.51	690	23.1	5	Slightly cloudy, grey, no odour
		3:14 PM		0.48	1059	-97.5	6.50	688	23.1	10	Slightly cloudy, grey, no odour
		3:16 PM		0.49	1060	-99.7	6.50	689	23.0	12	Slightly cloudy, grey, no odour
		3:19 PM	Post-Purge	0.50	1065	-98.9	6.50	692	23.0	15	Slightly cloudy, grey, no odour
CMW9	21-Feb-12	3:40 PM	Pre-Purge	1.54	3140	-38.2	6.48	2041	24	1	clear, no odour
		3:45 PM		2.67	46.7	-44.0	6.39	30	22.4	5	Slightly cloudy, brown, no odour
		3:50 PM		1.48	30.1	-28.4	6.35	20	22.4	10	clear, no odour
		5:53 PM		2.23	62.1	-33.5	6.33	40	22.2	13	clear, no odour
		3:55 PM		2.20	55.9	-33.0	6.33	36	22.3	15	clear, no odour
		3:57 PM		2.14	52.0	-33.8	6.33	34	22.2	17	clear, no odour
		4:00 PM	Post-Purge	2.10	55.6	-40.0	6.32	36	22.3	20	clear, no odour
CMW10	20-Feb-12	1:25 PM	Pre-Purge	4.17	524	-31.0	7.33	341	22	1	clear, no odour
		1:27 PM		3.68	607	-10.5	7.19	395	21.9	3	clear, no odour
		1:29 PM		3.45	605	-5.1	7.15	393	22.2	5	clear, no odour
		1:31 PM		2.93	357.3	0.9	7.15	232	22.8	7	clear, no odour
		1:33 PM		2.81	203	16.9	7.03	132	23.2	9	Very cloudy, brown, no odour
		1:35 PM		2.69	230.4	28.9	7.07	150	23.3	11	Very cloudy, brown, no odour
		1:37 PM		2.22	186.2	30.9	6.93	121	23.3	13	Cloudy, brown, no odour
		1:39 PM		2.11	183.7	26.5	6.89	119	23.4	15	Cloudy, brown, no odour
		1:41 PM		2.01	175.4	14.3	6.88	114	23.4	17	Cloudy, brown, no odour
		1:43 PM		1.85	190.4	13.2	6.87	124	23.3	19	Cloudy, brown, no odour
		1:45 PM	Post-Purge	1.89	192.2	10.2	6.86	125	23.3	21	Cloudy, brown, no odour
109	20-Feb-12	11:55 AM	Pre-Purge	2.25	30.5	-187.8	6.63	20	22.7	0.5	Slightly cloudy, slight organic odour
		11:56 AM		1.59	41.2	-184.0	6.68	27	22.3	1	Slightly cloudy, no odour
		11:58 AM		1.80	109.2	-173.5	7.01	71	20.0	2	Slightly cloudy, no odour
		12:00 PM		1.48	103.7	-164.5	6.99	67	19.9	3	Slightly cloudy, no odour
		12:02 PM		1.44	122.1	-153.8	6.96	79	20.0	4	Slightly cloudy, no odour
		12:04 PM		1.33	102.1	-156.8	6.98	66	20.1	5	Slightly cloudy, no odour
		12:06 PM		1.41	661.0	-160.7	7.06	430	20.5	6	Slightly cloudy, no odour
		12:08 PM		1.25	418.0	-168.5	7.10	272	20.5	7	Slightly cloudy, no odour
		12:10 PM		0.93	193.8	-181.3	7.09	126	20.6	8	Slightly cloudy, no odour
		12:14 PM		0.99	285.0	-167.2	7.03	185	20.6	10	Slightly cloudy, no odour
		12:18 PM		0.74	294.5	-157.4	7.05	191	20.3	12	Slightly cloudy, no odour
		12:22 PM		1.21	369.5	-157.8	7.15	240	20.0	14	Slightly cloudy, no odour
		12:23 PM		1.52	261.2	-148.8	7.29	170	20.4	14.5	Slightly cloudy, no odour
		12:23 PM	Well dry @14.5L								
101	21-Feb-12	10:58 AM	Pre-Purge	0.95	3668	-23.8	6.15	2384	23.8	1	Slightly cloudy, brown, slight organic odour
		11:02 AM		0.54	3743	-44.4	6.16	2433	23.6	5	Slightly cloudy, brown, slight organic odour
		11:08 AM		0.52	3628	-64.4	6.15	2358	23.2	10	Slightly cloudy, brown, slight organic odour
		11:15 AM		0.64	3585	-50.8	6.15	2330	23.1	15	Slightly cloudy, brown, slight organic odour
		11:20 AM		0.64	3215	-41.2	6.13	2090	23.1	20	Slightly cloudy, brown, slight organic odour
		11:24 AM	Post-Purge	0.64	3226	-48.9	6.11	2097	23.2	25	Slightly cloudy, brown, slight organic odour

Notes:

ID = identification

mg/L = milligrams per litre

L = litres

µS/cm = microsiemen per centimetre

HCO = hydrocarbon odour

mV = millivolts

°C = degrees Celsius

* Approximate value determined using the following equation: TDS (mg/L) = EC x 0.65

9.4 Laboratory Results

9.4.1 Soil Contamination

The results of the laboratory testing are shown in Table 10. The laboratory reports can be provided upon request.

The results showed concentrations below the adopted criteria for commercial/industrial land use, with the following exceptions:

- TPH C10-C36 above the criteria (1,000mg/kg) in samples TP505B 0.5-0.6m (1,640mg/kg), TP506B 1.1-1.2m (1,880mg/kg), TP509A 0.2-0.3m (1,190mg/kg), TP514B 0.1-0.2m (1,040mg/kg), TP528A 0.2-0.3m (3,200mg/kg), TP529A 0.3-0.4m (1,660mg/kg), HA3 0.0-0.1 (2,363mg/kg), TP531 0.4-0.5m (1,720mg/kg), TP532 0.4-0.5m (4,732mg/kg), SS30 (1,334mg/kg), SS31 (1,040mg/kg), SS35 (1,100mg/kg) and SP2-2 (1,180mg/kg);
- Benzo(a)pyrene above the criteria (5mg/kg) in samples TP532 0.4-0.5m (110mg/kg) SS30 (5.6mg/kg), SS31 (7.1mg/kg), SS32 (21mg/kg), SS33 (9.1mg/kg), SS34 (15mg/kg), and SS35 (28mg/kg);
- Total PAHs above the criteria (100mg/kg) in samples TP532 0.4-0.5m (1,300mg/kg), SS32 (200mg/kg), SS34 (150mg/kg), and SS35 270mg/kg)
- Lead above the criteria (1,500mg/kg) in sample TP516B 0.2-0.3m (1,900mg/kg).

The 95% Upper Confidence Limit (UCL) was calculated for TPH C10-C36 and lead concentrations in fill material. The different types of fill materials were not treated separately, due to the impracticality of defining particular stratigraphic layers or areas of the Project Area that they occurred in.

The 95% UCL was calculated for TPH and lead using ProUCL. The calculation sheets are attached in Appendix C. ProUCL calculates the UCL using a number of different methods, including normal distribution, lognormal distribution, gamma distribution and nonparametric. ProUCL then recommends an appropriate UCL for the data set.

For lead ProUCL recommended the use of nonparametric statistics. This resulted in a 95% UCL of 455.9mg/kg. This shows the arithmetic average concentration of lead across the Project Area was below the adopted criteria.

For TPH C10-C36 ProUCL recommended the use of gamma distribution. This results in a 95% UCL of 982.1mg/kg. This shows the arithmetic average concentration of TPH C10-C36 across the Project Area was below the adopted criteria. Two hot spots (TP528A and TP532) with concentrations greater than 2.5 times the criteria were not included in the calculation.

The 95% UCL was not calculated for contamination in samples SS30 to SS35, as the occurrence of benzo(a)pyrene and PAHs in this area is not considered consistent with rest of the Project Area.

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Table 10 - Summary of Soil Laboratory Results

All results in mg/kg , no units for asbestos

			Rail Ballast Samples																			Fragment Samples				
Sample ID	**INVESTIGATION**	**LABORATORY**	RB-01	RB-02	RB-03	RB-04	RB-05	RB-06	RB-07	RB-08	RB-09	RB-10	RB-11	RB-12	RB-13	RB-14	RB-15	RB16	RB17	RB18	RB19	RB20	A1	A2	AS1	AS1	AS2
Depth (m)		**DETECTION**																					Fragment	Fragment	Fragment	Fragment	Fragment
Date of Sampling	**CRITERIA**	**LIMIT**	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	16/12/2011	16/12/2011	09/02/2012	27/04/2012	27/04/2012
Metals																											
Arsenic	500 [1]	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	100 [1]	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	500 [1]	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	5000 [1]	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	1500 [1]	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	3000 [1]	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	35000 [1]	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	75 [1]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons																											
C6 - C9 Fraction	65 [2]	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C10 - C14 Fraction		20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C15 - C28 Fraction		50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C29 - C36 Fraction		50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total C10-C36	1000 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTEX																											
Benzene	1 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	130 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	50 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene	25 [2]	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polynuclear Aromatic Hydrocarbons																											
Benzo(a)pyrene	5 [1]	0.1	<0.1	<0.1	<0.1	0.20	0.10	0.20	0.10	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Total PAHs	100 [1]	-	<0.8	<0.8	1.20	3.10	2.20	6.20	3.70	0.90	0.90	<1.6	<0.8	1.30	<0.8	1.90	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	-	-	-	-	-
Organochlorine Pesticides																											
Aldrin & Dieldrin	50 [1]	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlordane	250 [1]	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT + DDE + DDD	1000 [1]	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor	50 [1]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polychlorinated Biphenyls																											
Total PCB	50 [1]	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos																											
Asbestos in Soil/ACM	Not Detected [3]	detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Amosite & Chrysotile Asbestos Found	Amosite & Chrysotile Asbestos Found	ND

Notes:

Result Concentrations exceed investigation criteria

\- Not analysed

ND Not detected

[1] NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme (2nd Edition) - Appendix II, Column

[2] Based on NSW EPA (1994) Guidelines for Assessing Service Station Sites

[3] Based on Enhealth (2005) Guidelines for the Management of Asbestos in the Non-occupational Environment

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Table 10 - Summary of Soil Laboratory Results

All results in mg/kg , no units for asbestos

			Hand Auger Samples											Test Pit Samples												
Sample ID	**INVESTIGATION**	**LABORATORY**	CHA 01	CHA 01	CHA 01	TP520A	TP521A	TP522B	TP522C	HA1	HA2	HA3	TP501A	TP501A	TP502A	TP503B	TP504A	TP505B	TP506B	TP506B	TP507B	TP508B	TP509A	TP510A	TP511B	TP512B	TP513B
Depth (m)		**DETECTION**	0.0-0.1	0.4-0.5	0.9-1.0	0.1-0.2	0.15-0.3	0.1-0.2	0.1-0.2	0.0-0.1	0.0-0.1	0.0-0.1	0.1-0.2	0.9-1.0	0.9-1.0	0.3-0.4	0.3-0.4	0.5-0.6	0.3-0.4	1.1-1.2	1.1-1.2	0.3-0.4	0.2-0.3	0.1-0.2	0.5-0.6	0.9-1.0	0.1-0.2
Date of Sampling	**CRITERIA**	**LIMIT**	10/02/2012	10/02/2012	10/02/2012	12/01/2012	12/01/2012	12/01/2012	12/01/2012	27/04/2012	27/04/2012	27/04/2012	13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	14/12/2011	14/12/2011	14/12/2011	14/12/2011	14/12/2011	14/12/2011	14/12/2011
Metals																										
Arsenic	500 [1]	3	-	-	-	5	4	6	5	5	12	37	5	4	12	4	<3	5	<3	7	10	<3	10	43	<3	6	10
Cadmium	100 [1]	0.3	-	-	-	0.5	0.4	0.4	0.5	0.4	<0.3	1.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	0.4	0.7	<0.3	<0.3	<0.3
Chromium	500 [1]	0.3	-	-	-	35	32	32	31	8.5	3.3	45	11.0	4.9	9.7	3.8	1.9	10.0	6.0	2.6	3.1	2.5	9.5	14.0	1.4	2.3	12.0
Copper	5000 [1]	0.5	-	-	-	59	23	36	31	36	19	170	18.0	10.0	21.0	9.0	7.3	24.0	9.8	47.0	16.0	12.0	41.0	38.0	3.0	15.0	13.0
Lead	1500 [1]	1	-	-	-	37	11	28	17	30	25	200	23	17	19	15	5	62	13	36	21	11	47	30	7	18	9
Nickel	3000 [1]	0.5	-	-	-	31	50	30	34	16	5.3	25	6.8	5.7	19.0	3.8	5.5	11.0	5.5	6.8	5.8	5.1	11.0	21.0	1.3	5.1	8.9
Zinc	35000 [1]	0.5	-	-	-	91	56	93	69	77	53	120	53	41	42	34	11	42	48	73	34	27	88	60	32	30	37
Mercury	75 [1]	0.05	-	-	-	0.06	<0.05	<0.05	<0.05	0.17	0.14	0.06	<0.05	<0.05	0.19	0.06	<0.05	0.07	<0.05	0.15	0.13	0.09	0.10	<0.05	<0.05	0.25	<0.05
Total Petroleum Hydrocarbons																										
C6 - C9 Fraction	65 [2]	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction		20	<20	<20	<20	<20	<20	<20	<20	<20	26	23	66	41	100	35	<20	140	<20	310	66	<20	110	37	<20	64	<20
C15 - C28 Fraction		50	520	<50	<50	<50	<50	<50	<50	150	290	840	540	280	540	350	<50	950	72	1200	540	190	760	290	<50	340	79
C29 - C36 Fraction		50	440	<50	<50	<50	<50	50	<50	210	150	1500	200	100	110	120	<50	550	<50	370	190	110	320	150	<50	97	96
Total C10-C36	1000 [2]	-	960	<120	<120	<120	<120	50	<120	<360	466	**2363**	806	421	750	505	<120	**1640**	72	**1880**	796	300	**1190**	477	<120	501	175
BTEX																										
Benzene	1 [2]	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	130 [2]	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	50 [2]	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene	25 [2]	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polynuclear Aromatic Hydrocarbons																										
Benzo(a)pyrene	5 [1]	0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	0.1	0.2	0.2	1.50	0.30	0.10	0.10	<0.1	<0.1	<0.1	0.30	0.20	<0.1	0.20	<0.1	<0.1	0.10	<0.1
Total PAHs	100 [1]	-	1.2	<0.8	<0.8	1.3	<0.8	2.1	<0.8	1.7	3.7	4.3	35.00	10.00	5.00	2.90	<0.8	6.30	<0.8	12.00	5.30	1.20	6.40	1.90	<0.8	3.30	<0.8
Organochlorine Pesticides																										
Aldrin & Dieldrin	50 [1]	0.2	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.1	<0.1	<0.1	-	-	<0.1	-	-	<0.1	<0.1	-	<0.1	<0.1	-
Chlordane	250 [1]	0.2	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.20	<0.1	<0.1	-	-	<0.1	-	-	<0.1	<0.1	-	<0.1	<0.1	-
DDT + DDE + DDD	1000 [1]	0.6	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	-	<0.1	<0.1	<0.1	-	-	<0.1	-	-	<0.1	<0.1	-	<0.1	<0.1	-
Heptachlor	50 [1]	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	-	<0.1	<0.1	-	<0.1	<0.1	-
Polychlorinated Biphenyls																										
Total PCB	50 [1]	1.0	-	-	-	<1	<1	<1	<1	<10	<10	-	-	<1	<1	<1	-	-	<1	-	-	<1	<1	-	<1	<1	-
Asbestos																										
Asbestos in Soil/ACM	Not Detected [3]	detect	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

Result Concentrations exceed investigatior

\- Not analysed

ND Not detected

[1] NSW DEC (2006) Guidelines for the
Auditor Scheme (2nd Edition) - Appe

[2] Based on NSW EPA (1994) Guidelir
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[3] Based on Enhealth (2005) Guidelin
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Table 10 - Summary of Soil Laboratory Results

All results in mg/kg , no units for asbestos

													Test Pit Samples										
Sample ID	**INVESTIGATION**	**LABORATORY**	TP514B	TP515B	TP516B	TP517A	TP518B	TP519B	TP520A	TP521A	TP522B	TP522C	TP523B	TP525A	TP528A	TP529A	TP530	TP531	TP532	TP533	TP533	TP534	TP534
Depth (m)		**DETECTION**	0.1-0.2	0.9-1.0	0.2-0.3	1.5-1.6	1.0-1.1	1.0-1.1	0.1-0.2	0.15-0.3	0.1-0.2	0.1-0.2	0.3-0.4	0.2-0.3	0.2-0.3	0.3-0.4	0.4-0.5	0.4-0.5	0.4-0.5	0.0-0.1	0.5-0.6	0.0-0.1	1.0-1.1
Date of Sampling	**CRITERIA**	**LIMIT**	14/12/2011	14/12/2011	16/12/2011	16/12/2011	16/12/2011	15/12/2011	12/01/2012	12/01/2012	12/01/2012	12/01/2012	15/12/2011	15/12/2011	15/12/2011	15/12/2011	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012
Metals																							
Arsenic	500 [1]	3	6	22	27	8	11	10	5	4	6	5	47	5	470	22	3	71	3	-	-	-	-
Cadmium	100 [1]	0.3	<0.3	0.5	17.0	<0.3	0.6	0.7	1	0	0	1	0.6	<0.3	<0.3	0.4	0.3	<0.3	<0.3	-	-	-	-
Chromium	500 [1]	0.3	2.8	1.8	6.7	6.6	7.5	16.0	35	32	32	31	15.0	9.2	11.0	7.8	9.6	8.1	17.0	-	-	-	-
Copper	5000 [1]	0.5	10.0	12.0	91.0	55.0	380.0	61.0	59	23	36	31	87.0	12.0	35.0	25.0	17.0	25.0	29.0	-	-	-	-
Lead	1500 [1]	1	17	21	**1900**	48	110	460	37	11	28	17	110	13	55	31	45	30	19	-	-	-	-
Nickel	3000 [1]	0.5	4.4	5.7	47.0	9.2	20.0	46.0	31	50	30	34	27.0	4.4	13.0	10.0	7.7	13.0	20.0	-	-	-	-
Zinc	35000 [1]	0.5	33	41	70	32	300	520	91	56	93	69	180	38	41	68	90	37	61	-	-	-	-
Mercury	75 [1]	0.05	0.07	0.12	0.12	<0.05	0.08	0.35	0	<0.05	<0.05	<0.05	0.08	<0.05	0.14	0.12	<0.05	0.07	<0.05	-	-	-	-
Total Petroleum Hydrocarbons																							
C6 - C9 Fraction	65 [2]	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction		20	130	110	36	<20	23	<20	<20	<20	<20	<20	120	<20	550	280	32	130	32	54	50	50	55
C15 - C28 Fraction		50	680	610	270	130	250	200	<50	<50	<50	<50	500	<50	1800	1000	300	1000	2700	500	370	530	600
C29 - C36 Fraction		50	230	210	86	<50	88	140	<50	<50	50	<50	230	<50	850	380	76	590	2000	190	51	230	340
Total C10-C36	1000 [2]	-	**1040**	930	392	130	361	340	<120	<120	50	<120	850	<120	**3200**	**1660**	408	**1720**	**4732**	744	471	810	995
BTEX																							
Benzene	1 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	130 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethyl benzene	50 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylene	25 [2]	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Polynuclear Aromatic Hydrocarbons																							
Benzo(a)pyrene	5 [1]	0.1	0.20	0.20	0.30	0.10	0.50	0.30	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.20	0.20	0.20	0.60	**110**	0.10	<0.1	0.10	<0.1
Total PAHs	100 [1]	-	7.30	5.60	6.20	2.00	8.60	6.50	1.3	<0.8	2.1	<0.8	<0.8	<0.8	8.50	8.40	5.40	11.00	**1300**	4.10	3.20	3.50	2.70
Organochlorine Pesticides																							
Aldrin & Dieldrin	50 [1]	0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	-	-	-	-
Chlordane	250 [1]	0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	-	-	-	-
DDT + DDE + DDD	1000 [1]	0.6	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.6	<0.6	<0.6	<0.6	<0.1	<0.1	<0.1	<0.1	<0.6	<0.6	<0.6	-	-	-	-
Heptachlor	50 [1]	0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Polychlorinated Biphenyls																							
Total PCB	50 [1]	1.0	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	-	-	-
Asbestos																							
Asbestos in Soil/ACM	Not Detected [3]	detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-

Notes:

Result Concentrations exceed investigatior

\- Not analysed

ND Not detected

[1] NSW DEC (2006) Guidelines for the Auditor Scheme (2nd Edition) - Appe

[2] Based on NSW EPA (1994) Guidelir Assessing Service Station Sites

[3] Based on Enhealth (2005) Guidelin Management of Asbestos in the Nor Environment

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Table 10 - Summary of Soil Laboratory Results

All results in mg/kg , no units for asbestos

			Surface Samples																						
Sample ID	**INVESTIGATION**	**LABORATORY**	CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS8	CS9	CS10	CS11	CS12	CS13	CS14	CS15	CS16	CS17	CS18	CS19	CS20	CS21	CS22	CS23	CS24
Depth (m)		**DETECTION**	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Date of Sampling	**CRITERIA**	**LIMIT**	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011
Metals																										
Arsenic	500 [1]	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	100 [1]	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	500 [1]	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	5000 [1]	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	1500 [1]	1	25	33	39	28	49	53	16	29	24	23	27	130	16	20	11	10	-	-	-	-	-	-	-	-
Nickel	3000 [1]	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	35000 [1]	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	75 [1]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons																										
C6 - C9 Fraction	65 [2]	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C10 - C14 Fraction		20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C15 - C28 Fraction		50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C29 - C36 Fraction		50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total C10-C36	1000 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTEX																										
Benzene	1 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	130 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	50 [2]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene	25 [2]	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polynuclear Aromatic Hydrocarbons																										
Benzo(a)pyrene	5 [1]	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	0.10	<0.1	<0.1	<0.1	0.20	<0.1	<0.1
Total PAHs	100 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.40	2.00	1.30	<0.8	<0.8	3.50	<0.8	<0.8
Organochlorine Pesticides																										
Aldrin & Dieldrin	50 [1]	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Chlordane	250 [1]	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
DDT + DDE + DDD	1000 [1]	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Heptachlor	50 [1]	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Polychlorinated Biphenyls																										
Total PCB	50 [1]	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos																										
Asbestos in Soil/ACM	Not Detected [3]	detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

Result Concentrations exceed investigatior

\- Not analysed

ND Not detected

[1] NSW DEC (2006) Guidelines for the
Auditor Scheme (2nd Edition) - Appe

[2] Based on NSW EPA (1994) Guidelir
Assessing Service Station Sites

[3] Based on Enhealth (2005) Guidelin
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Table 10 - Summary of Soil Laboratory Results

All results in mg/kg , no units for asbestos

			Surface Samples											Stockpile Samples	
Sample ID	**INVESTIGATION**	**LABORATORY**	CS25	CS26	SS27	SS28	SS29	SS30	SS31	SS32	SS33	SS34	SS35	SP1-1	SP2-2
Depth (m)		**DETECTION**	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Date of Sampling	**CRITERIA**	**LIMIT**	20/12/2011	20/12/2011	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012
Metals															
Arsenic	500 [1]	3	-	-	N.A.	N.A.	N.A.	5	6	4	3	4	4	<3	<3
Cadmium	100 [1]	0.3	-	-	N.A.	N.A.	N.A.	0	0	0	0	0	0	<0.3	<0.3
Chromium	500 [1]	0.3	-	-	N.A.	N.A.	N.A.	18	10	10	8	8	8	7	3
Copper	5000 [1]	0.5	-	-	N.A.	N.A.	N.A.	22	26	19	17	17	18	5	10
Lead	1500 [1]	1	-	-	N.A.	N.A.	N.A.	33	57	37	40	63	52	4	11
Nickel	3000 [1]	0.5	-	-	N.A.	N.A.	N.A.	8	8	7	8	6	9	4	5
Zinc	35000 [1]	0.5	-	-	N.A.	N.A.	N.A.	100	130	120	65	88	96	30	100
Mercury	75 [1]	0.05	-	-	N.A.	N.A.	N.A.	<0.05	0	<0.05	<0.05	<0.05	<0.05	<0.05	0
Total Petroleum Hydrocarbons															
C6 - C9 Fraction	65 [2]	20	-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction		20	-	-	<20	<20	37	24	<20	<20	<20	<20	<20	<20	110
C15 - C28 Fraction		50	-	-	77	59	350	1100	570	500	310	470	600	<50	840
C29 - C36 Fraction		50	-	-	<50	<50	110	210	470	480	260	360	500	<50	230
Total C10-C36	1000 [2]	-	-	-	<147	<129	497	**1334**	**1040**	980	570	830	**1100**	<120	**1180**
BTEX															
Benzene	1 [2]	0.1	-	-	N.A.	N.A.	N.A.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	130 [2]	0.1	-	-	N.A.	N.A.	N.A.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethyl benzene	50 [2]	0.1	-	-	N.A.	N.A.	N.A.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylene	25 [2]	0.3	-	-	N.A.	N.A.	N.A.	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Polynuclear Aromatic Hydrocarbons															
Benzo(a)pyrene	5 [1]	0.1	<0.1	<0.1	N.A.	N.A.	N.A.	**5.6**	**7.1**	**21**	**9.1**	**15**	**28**	<0.1	0.3
Total PAHs	100 [1]	-	1.30	1.60	N.A.	N.A.	N.A.	59	79	**200**	90	**150**	**270**	<0.8	8.0
Organochlorine Pesticides															
Aldrin & Dieldrin	50 [1]	0.2	-	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	-
Chlordane	250 [1]	0.2	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-
DDT + DDE + DDD	1000 [1]	0.6	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	-	-
Heptachlor	50 [1]	0.1	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
Polychlorinated Biphenyls															
Total PCB	50 [1]	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos															
Asbestos in Soil/ACM	Not Detected [3]	detect	ND	ND	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

Result Concentrations exceed investigatior

\- Not analysed

ND Not detected

[1] NSW DEC (2006) Guidelines for the Auditor Scheme (2nd Edition) - Appe

[2] Based on NSW EPA (1994) Guidelir Assessing Service Station Sites

[3] Based on Enhealth (2005) Guidelin Management of Asbestos in the Nor Environment

9.4.2 Waste Classification

The results of the laboratory testing are shown in Table 11. The laboratory reports can be provided upon request. Some samples were subjected to total characteristic leachability procedure (TCLP) testing to assess their waste classification, these results are also presented in Table 11.

The results showed concentrations below the criteria for general solid waste, with the following exceptions:

- Lead above the criteria in sample TP516B 0.2-0.3m (1,900mg/kg). Lead at this concentration classifies as restricted solid waste;
- Benzo(a)pyrene and total PAHs above the criteria in samples TP532 0.4-0.5m (b(a)p 110mg/kg, PAH 1,300mg/kg), and SS35 (b(a)p 28mg/kg, PAH 270mg/kg). Benzo(a)pyrene and total PAHs at these concentrations classifies as hazardous waste.
- Benzo(a)pyrene, total PAHs and nickel above the criteria in samples SS32 (b(a)p 21mg/kg, PAH 200mg/kg), SS31 (nickel 57mg/kg), and SS34 (b(a)p 15mg/kg, nickel 63mg/kg). Benzo(a)pyrene, total PAHs and nickel at these concentrations classify as restricted solid waste.

Due to the presence of acid sulphate soils, the natural alluvial and estuarine materials do not meet the definition of VENM. Therefore, natural soils classify as general solid waste.

Table 11 - Summary of Waste Classification Results

All results in mg/kg, TCLP results in mg/L, no units for asbestos

					Rail Ballast Samples																		Fragment Samples				
Sample ID	**GENERAL SOLID WASTE GUIDELINES**			**LABORATORY DETECTION LIMIT**	RB-01	RB-02	RB-03	RB-04	RB-05	RB-06	RB-07	RB-08	RB-09	RB-10	RB-11	RB-12	RB-13	RB-14	RB-15	RB16	RB17	RB18	RB19	RB20	A1	A2	AS1	AS1	AS2
Depth (m)					Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast	Rail Ballast						Fragment	Fragment	Fragment	Fragment	Fragment
Date of Sampling					12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	12/11/2011	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	16/12/2011	16/12/2011	09/02/2012	27/04/2012	27/04/2012
	CT	**SCC**	**TCLP**		CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT					
Metals																													
Arsenic	100	500	5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	20	100	1	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	100	1900	5	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	100	1500	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	40	1050	2	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	4	50	0.2	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons																													
C6 - C9 Fraction		650		20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C10 - C14 Fraction				20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C15 - C28 Fraction				50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C29 - C36 Fraction				50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total C10-C36		10000			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTEX																													
Benzene	10	18	1	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	288	518	14	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	600	1080	30	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene	1000	1800	50	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polynuclear Aromatic Hydrocarbons																													
Benzo(a)pyrene	0.8	10	0.04	0.10	<0.1	<0.1	<0.1	0.20	0.10	0.20	0.10	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Total PAHs		200		0.80	<0.8	<0.8	1.20	3.10	2.20	6.20	3.70	0.90	0.90	<1.6	<0.8	1.30	<0.8	1.90	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	-	-	-	-	-
Organochlorine Pesticides																													
Aldrin & Dieldrin				0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlordane				0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT + DDE + DDD				0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor				0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total OCPs		50		0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polychlorinated Biphenyls																													
Total PCB		50		1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos																													
Asbestos	ND	ND		detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Amosite &	Amosite &	ND

Notes:

Result — Concentration exceeds the general solid waste guidelines

Result — Concentration exceeds the restricted solid waste guidelines

\- Not Analysed

ND Not Detected

Based on NSW DECCW (2009) Waste Classification Guidelines, general solid waste

* Douglas Partners test pit results obtained from Douglas Partners (2011) 'Preliminary Contamination Assessment' Report (ref: 39798.04, August 2011)

Table 11 - Summary of Waste Classification Results

All results in mg/kg, TCLP results in mg/L, no units for asbestos

Sample ID	General Solid Waste Guidelines CT	SCC	TCLP	Laboratory Detection Limit	Hand Auger Samples CHA 01	CHA 01	CHA 01	TP520A	TP521A	TP522B	TP522C	HA1	HA2	HA3
Depth (m)					0.0-0.1	0.4-0.5	0.9-1.0	0.1-0.2	0.15-0.3	0.1-0.2	0.1-0.2	0.0-0.1	0.0-0.1	0.0-0.1
Date of Sampling					10/02/2012	10/02/2012	10/02/2012	12/01/2012	12/01/2012	12/01/2012	12/01/2012	27/04/2012	27/04/2012	27/04/2012
Metals														
Arsenic	100	500	5	3	-	-	-	5	4	6	5	5	12	37
Cadmium	20	100	1	0.3	-	-	-	0.5	0.4	0.4	0.5	0.4	<0.3	1.5
Chromium	100	1900	5	0.3	-	-	-	35	32	32	31	8.5	3.3	45
Lead	100	1500	5	1	-	-	-	37	11	28	17	30	25	200
Nickel	40	1050	2	0.5	-	-	-	31	50	30	34	16	5.3	25
Mercury	4	50	0.2	0.05	-	-	-	0.06	<0.05	<0.05	<0.05	0.17	0.14	0.06
Total Petroleum Hydrocarbons														
C6 - C9 Fraction		650		20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction				20	<20	<20	<20	<20	<20	<20	<20	<20	26	23
C15 - C28 Fraction				50	520	<50	<50	<50	<50	<50	<50	150	290	840
C29 - C36 Fraction				50	440	<50	<50	<50	<50	50	<50	210	150	1500
Total C10-C36		10000			960	<120	<120	<120	<120	50	<120	<360	466	2363
BTEX														
Benzene	10	18	1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	288	518	14	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethyl benzene	600	1080	30	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylene	1000	1800	50	1.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Polynuclear Aromatic Hydrocarbons														
Benzo(a)pyrene	0.8	10	0.04	0.10	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	0.1	0.2	0.2
Total PAHs		200		0.80	1.2	<0.8	<0.8	1.3	<0.8	2.1	<0.8	1.7	3.7	4.3
Organochlorine Pesticides														
Aldrin & Dieldrin				0.2	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chlordane				0.2	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDT + DDE + DDD				0.6	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Heptachlor				0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total OCPs		50		0.1	-	-	-	-	-	-	-			
Polychlorinated Biphenyls														
Total PCB		50		1.0	-	-	-	<1	<1	<1	<1	<10	<10	-
Asbestos														
Asbestos	ND	ND		detect	-	-	-	ND	ND	ND	ND	ND	ND	ND

Sample ID	Test Pit Samples TP501A	TP501A	TP501A	TP502A	TP503B	TP504A	TP505B	TP506B	TP506B	TP507B	TP508B	TP509A	TP510A
Depth (m)	0.1-0.2		0.9-1.0	0.9-1.0	0.3-0.4	0.3-0.4	0.5-0.6	0.3-0.4	1.1-1.2	1.1-1.2	0.3-0.4	0.2-0.3	0.1-0.2
Date of Sampling	13/12/2011		13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	13/12/2011	14/12/2011	14/12/2011	14/12/2011
	CT/SCC	TCLP	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT
Metals													
Arsenic	5	-	4	12	4	<3	5	<3	7	10	<3	10	43
Cadmium	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	0.4	0.7
Chromium	11.0	-	4.9	9.7	3.8	1.9	10.0	6.0	2.6	3.1	2.5	9.5	14.0
Lead	23	-	17	19	15	5	62	13	36	21	11	47	30
Nickel	6.8	-	5.7	19.0	3.8	5.5	11.0	5.5	6.8	5.8	5.1	11.0	21.0
Mercury	<0.05	-	<0.05	0.19	0.06	<0.05	0.07	<0.05	0.15	0.13	0.09	0.10	<0.05
Total Petroleum Hydrocarbons													
C6 - C9 Fraction	<20	-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	66	-	41	100	35	<20	140	<20	310	66	<20	110	37
C15 - C28 Fraction	540	-	280	540	350	<50	950	72	1200	540	190	760	290
C29 - C36 Fraction	200	-	100	110	120	<50	550	<50	370	190	110	320	150
Total C10-C36	806	-	421	750	505	<20	1640	72	1880	796	300	1190	477
BTEX													
Benzene	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene	-	-	-	-	-	-	-	-	-	-	-	-	-
Polynuclear Aromatic Hydrocarbons													
Benzo(a)pyrene	1.50	<0.0001	0.30	0.10	0.10	<0.1	<0.1	<0.1	0.30	0.20	<0.1	0.20	<0.1
Total PAHs	35.00	-	10.00	5.00	2.90	<0.8	6.30	<0.8	12.00	5.30	1.20	6.40	1.90
Organochlorine Pesticides													
Aldrin & Dieldrin	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlordane	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT + DDE + DDD	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor	-	-	-	-	-	-	-	-	-	-	-	-	-
Total OCPs	-	-	0.20	<0.1	<0.1	-	-	<0.1	-	-	<0.1	<0.1	-
Polychlorinated Biphenyls													
Total PCB	-	-	<1	<1	<1	-	-	<1	-	-	<1	<1	-
Asbestos													
Asbestos	ND	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Sample ID	TP511B	TP512B	TP513B	TP514B	TP515B	TP516B		TP517A	TP518B		TP519B		TP520A
Depth (m)	0.5-0.6	0.9-1.0	0.1-0.2	0.1-0.2	0.9-1.0	0.2-0.3		1.5-1.6	1.0-1.1		1.0-1.1		0.1-0.2
Date of Sampling	14/12/2011	14/12/2011	14/12/2011	14/12/2011	14/12/2011	16/12/2011		16/12/2011	16/12/2011		15/12/2011		12/01/2012
	CT	CT	CT	CT	CT	CT/SCC	TCLP	CT	CT/SCC	TCLP	CT/SCC	TCLP	CT
Metals													
Arsenic	<3	6	10	6	22	27	-	8	11	-	10	-	5
Cadmium	<0.3	<0.3	<0.3	<0.3	0.5	17.0	-	<0.3	0.6	-	0.7	-	1
Chromium	1.4	2.3	12.0	2.8	1.8	6.7	-	6.6	7.5	-	16.0	-	35
Lead	7	18	9	17	21	1900	<0.02	48	110	0.07	460	0.22	37
Nickel	1.3	5.1	8.9	4.4	5.7	47.0	<0.01	9.2	20.0	-	46.0	0.085	31
Mercury	<0.05	0.25	<0.05	0.07	0.12	0.12	-	<0.05	0.08	-	0.35	-	0.06
Total Petroleum Hydrocarbons													
C6 - C9 Fraction	<20	<20	<20	<20	<20	<20	-	<20	<20	-	<20	-	<20
C10 - C14 Fraction	<20	64	<20	130	110	36	-	<20	23	-	<20	-	<20
C15 - C28 Fraction	<50	340	79	680	610	270	-	130	250	-	200	-	<50
C29 - C36 Fraction	<50	97	96	230	210	86	-	<50	88	-	140	-	<50
Total C10-C36	<20	501	175	1040	930	392	-	130	361	-	340	-	<120
BTEX													
Benzene	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene	-	-	-	-	-	-	-	-	-	-	-	-	-
Polynuclear Aromatic Hydrocarbons													
Benzo(a)pyrene	<0.1	0.10	<0.1	0.20	0.20	0.30	-	0.10	0.50	-	0.30	-	0.1
Total PAHs	<0.8	3.30	<0.8	7.30	5.60	6.20	-	2.00	8.60	-	6.50	-	1.3
Organochlorine Pesticides													
Aldrin & Dieldrin	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlordane	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT + DDE + DDD	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor	-	-	-	-	-	-	-	-	-	-	-	-	-
Total OCPs	<0.1	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.26	<0.26
Polychlorinated Biphenyls													
Total PCB	<1	<1	-	<1	-	<1	-	<1	<1	-	<1	-	<1
Asbestos													
Asbestos	ND	ND	ND	ND	ND	ND	-	ND	ND	-	ND	-	ND

Notes:

Result — Concentration exceeds the general solid waste guidelines

Result — Concentration exceeds the restricted solid waste guidelines

- Not Analysed

ND Not Detected

Based on NSW DECCW (2009) Waste Classification Guidelines, general solid waste

^ Douglas Partners test pit results obtained from Douglas P

coffey environments
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Table 11 - Summary of Waste Classification Results

All results in mg/kg, TCLP results in mg/L, no units for asbestos

					Test Pit Samples															Surface Samples																			
Sample ID	**GENERAL SOLID WASTE GUIDELINES**			**LABORATORY DETECTION LIMIT**	TP521A	TP522B	TP522C	TP523B		TP525A	TP528A			TP529A	TP530	TP531	TP532	TP533	TP533	TP534	TP534	CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS8	CS9	CS10	CS11	CS12	CS13	CS14	CS15	CS16	CS17
Depth (m)					0.15-0.3	0.1-0.2	0.1-0.2	0.3-0.4		0.2-0.3	0.2-0.3			0.3-0.4	0.4-0.5	0.4-0.5	0.4-0.5	0.0-0.1	0.5-0.6	0.0-0.1	1.0-1.1	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Date of Sampling					12/01/2012	12/01/2012	12/01/2012	15/12/2011		15/12/2011	15/12/2011			15/12/2011	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	27/04/2012	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	16/12/2011	20/12/2011
	CT	**SCC**	**TCLP**		CT	CT	CT	CT/SCC	TCLP	CT	SCT/SCC	TCLP	CT									CT	CT	CT	CT	CT	CT	CT										
Metals																																							
Arsenic	100	500	5	3	4	6	5	47	-	5	470	0.44	22	3	71	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	20	100	1	0.3	0	0	1	0.6	-	<0.3	<0.3	-	0.4	0.3	<0.3	<0.3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	100	1900	5	0.3	32	32	31	15.0	-	9.2	11.0	-	7.8	9.6	8.1	17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	100	1500	5	1	11	28	17	110	<0.02	13	55	-	31	45	30	19	-	-	-	-	-	25	33	39	28	49	53	16	29	24	23	27	130	16	20	11	10	-
Nickel	40	1050	2	0.5	50	30	34	27.0	-	4.4	13.0	-	10.0	7.7	13.0	20.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	4	50	0.2	0.05	<0.05	<0.05	<0.05	0.08	-	<0.05	0.14	-	0.12	<0.05	0.07	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons																																							
C6 - C9 Fraction		650		20	<20	<20	<20	<20	-	<20	<20	-	<20	<20	<20	<20	<20	<20	<20	<20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C10 - C14 Fraction				20	<20	<20	<20	120	-	<20	550	-	280	32	130	32	54	50	50	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C15 - C28 Fraction				50	<50	<50	<50	500	-	<50	1800	-	1000	300	1000	2700	500	370	530	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C29 - C36 Fraction				50	<50	50	<50	230	-	<50	850	-	380	76	590	2000	190	51	230	340	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total C10-C36		10000			<120	50	<120	850	-	<20	3200	-	1660	408	1720	4732	744	471	810	995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTEX																																							
Benzene	10	18	1	0.5	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	288	518	14	0.5	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	600	1080	30	0.5	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene	1000	1800	50	1.5	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polynuclear Aromatic Hydrocarbons																																							
Benzo(a)pyrene	0.8	10	0.04	0.10	<0.1	0.2	<0.1	<0.1	-	<0.1	0.20	-	0.20	0.20	0.60	**110**	0.10	<0.1	0.10	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
Total PAHs		200		0.80	<0.8	2.1	<0.8	<0.8	-	<0.8	8.50	-	8.40	5.40	11.00	**1300**	4.10	3.20	3.50	2.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.40
Organochlorine Pesticides																																							
Aldrin & Dieldrin				0.2	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlordane				0.2	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DDT + DDE + DDD				0.6	-	-	-	-	-	-	-	-	-	<0.6	<0.6	<0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor				0.1	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total OCPs		50		0.1	<0.26	<0.26	<0.26	<0.1	-	<0.1	<0.1	-	<0.1									<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
Polychlorinated Biphenyls																																							
Total PCB		50		1.0	<1	<1	<1	<1	-	<1	<1	-	<1	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos																																							
Asbestos	ND	ND		detect	ND	ND	ND	ND	-	ND	ND	-	ND	ND	ND	ND	-	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

Result — Concentration exceeds the general solid waste guidelines

Result — Concentration exceeds the restricted solid waste guidelines

\- Not Analysed

ND Not Detected

Based on NSW DECCW (2009) Waste Classification Guidelines, general solid waste

^ Douglas Partners test pit results obtained from Douglas P

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Table 11 - Summary of Waste Classification Results

All results in mg/kg, TCLP results in mg/L, no units for asbestos

					Surface Samples																								Stockpile Samples	
Sample ID	**GENERAL SOLID WASTE GUIDELINES**				CS18	CS19	CS20	CS21	CS22	CS23	CS24	CS25	CS26	SS27	SS28	SS29	SS30		SS31		SS32		SS33		SS34		SS35	SP1-1	SP2-2
Depth (m)					Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface		Surface		Surface		Surface		Surface		Surface	Surface	Surface
Date of Sampling				LABORATORY DETECTION LIMIT	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	20/12/2011	27/04/2012	27/04/2012	27/04/2012	27/04/2012		27/04/2012		27/04/2012		27/04/2012		27/04/2012		27/04/2012	27/04/2012	27/04/2012
	CT	**SCC**	**TCLP**		CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT/SCC	TCLP	CT/SCC	TCLP	CT/SCC	TCLP	CT	TCLP	CT	TCLP	CT	CT	CT
Metals																														
Arsenic	100	500	5	3	-	-	-	-	-	-	-	-	-	-	-	-	5	-	6	-	4	-	3	-	4	-	4	<3	<3
Cadmium	20	100	1	0.3	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	-	0	-	0	-	0	-	0	<0.3	<0.3
Chromium	100	1900	5	0.3	-	-	-	-	-	-	-	-	-	-	-	-	18	-	10	-	10	-	8	-	8	-	8	7	3
Lead	100	1500	5	1	-	-	-	-	-	-	-	-	-	-	-	-	33	-	57	-	37	-	40	-	63	-	52	4	11
Nickel	40	1050	2	0.5	-	-	-	-	-	-	-	-	-	-	-	-	8	-	8	-	7	-	8	-	6	-	9	4	5
Mercury	4	50	0.2	0.05	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	0	-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	0
Total Petroleum Hydrocarbons																														
C6 - C9 Fraction		650		20	-	-	-	-	-	-	-	-	-	<20	<20	<20	<20	-	<20	-	<20	-	<20	-	<20	-	<20	<20	<20
C10 - C14 Fraction				20	-	-	-	-	-	-	-	-	-	<20	<20	37	24	-	<20	-	<20	-	<20	-	<20	-	<20	<20	110
C15 - C28 Fraction				50	-	-	-	-	-	-	-	-	-	77	59	350	1100	-	570	-	500	-	310	-	470	-	600	<50	840
C29 - C36 Fraction				50	-	-	-	-	-	-	-	-	-	<50	<50	110	210	-	470	-	480	-	260	-	360	-	500	<50	230
Total C10-C36		10000			-	-	-	-	-	-	-	-	-	<147	<129	497	1334	-	1040	-	980	-	570	-	830	-	1100	<120	1180
BTEX																														
Benzene	10	18	1	0.5	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1
Toluene	288	518	14	0.5	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1
Ethyl benzene	600	1080	30	0.5	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1
Xylene	1000	1800	50	1.5	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	<0.3	-	<0.3	-	<0.3	-	<0.3	-	<0.3	<0.3	<0.3
Polynuclear Aromatic Hydrocarbons																														
Benzo(a)pyrene	0.8	10	0.04	0.10	0.10	<0.1	<0.1	<0.1	0.20	<0.1	<0.1	<0.1	<0.1	-	-	-	5.6	<0.0001	7.1	<0.0001	21	<0.0001	9.1	<0.0001	15	<0.0001	**28**	<0.1	0.3
Total PAHs		200		0.80	2.00	1.30	<0.8	<0.8	3.50	<0.8	<0.8	1.30	1.60	-	-	-	59	-	79	-	200	-	90	-	150	-	**270**	<0.8	8.0
Organochlorine Pesticides																														
Aldrin & Dieldrin				0.2	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	<0.3	-	<0.3	-	<0.3	-	<0.3	-	<0.3	-	-
Chlordane				0.2	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	<0.2	-	<0.2	-	<0.2	-	<0.2	-	<0.2	-	-
DDT + DDE + DDD				0.6	-	-	-	-	-	-	-	-	-	-	-	-	<0.6	-	<0.6	-	<0.6	-	<0.6	-	<0.6	-	<0.6	-	-
Heptachlor				0.1	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	<0.1	-	-
Total OCPs		50		0.1	-	-	-	-	-	-	-	-	-																	
Polychlorinated Biphenyls																														
Total PCB		50		1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos																														
Asbestos	ND	ND		detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	ND	ND

Notes:

Result — Concentration exceeds the general solid waste guidelines

Result — Concentration exceeds the restricted solid waste guidelines

\- Not Analysed

ND Not Detected

Based on NSW DECCW (2009) Waste Classification Guidelines, general solid waste

* Douglas Partners test pit results obtained from Douglas P

9.4.3 Surface Water

The results of the laboratory testing are shown in Table 12. The laboratory reports can be provided upon request.

The results showed concentrations below the adopted criteria for protection of ecosystems, with the following exceptions:

- Ammonia in samples CSW2, CSW8 and CSW9 at concentrations ranging from 1,300µg/L to 2,800µg/L;
- Faecal coliforms and E. Coli in samples CSW2, CSW4 to CSW7, and CSW11 to CSW17 with concentrations ranging from 2,100cfu/100ml to 130,000cfu/100ml;
- Arsenic in samples CSW2, CSW3, CSW7, and CSW12 at concentrations ranging from 16µg/L to 74µg/L;
- Cadmium in samples CSW2, CSW3, CSW7, CSW9, and CSW12 at concentrations ranging from 0.3µg/L to 3.8µg/L;
- Copper in each sample tested at concentrations ranging from 3µg/L to 310µg/L;
- Lead in samples CSW2 to CSW7, CSW9, CSW11 and CSW12 with concentrations ranging from 4µg/L to 600µg/L;
- Nickel in samples CSW2, CSW3, CSW7, CSW9, CSW11 and CSW12 at concentrations ranging from 11µg/L to 150µg/L;
- Zinc in each sample at concentrations ranging from 110µgL to 4,600µgL;
- Mercury in samples CSW2 and CSW12 with concentrations ranging from 0.9µg/L to 1.4µg/L.

The results showed concentrations below the adopted criteria for protection of human health, with the following exceptions:

- Faecal coliforms in samples CSW2, CSW4 to CSW7, and CSW11 to CSW17 with concentrations ranging from 2,100cfu/100ml to 130,000cfu/100ml;
- E. Coli in samples CSW1 to CSW7, and CSW9 to CSW17 with concentrations ranging from 270cfu/100ml to 130,000cfu/100ml;
- Benzo(a)pyrene in sample CSW2 at a concentration of 0.4µg/L;
- Arsenic in sample CSW12 at a concentration 74µg/L;
- Chromium in samples CSW2, and CSW12 at concentrations ranging from 51µg/L to 190µg/L;
- Lead in samples CSW2, CSW7, and CSW12 with concentrations ranging from 86µg/L to 600µg/L;
- Nickel in samples CSW2, and CSW12 at concentrations ranging from 120µg/L to 150µg/L;
- Mercury in sample CSW12 with a concentration of 1.4µg/L.

Elevated concentrations were recorded for the following analytes:

- Elevated nitrite, nitrate and total kjedahl nitrogen in each sample with concentrations of total kjedahl nitrogen ranging between 1,800µg/L to 38,000µg/L;;
- Elevated phosphorous in each sample with concentrations ranging between 490µg/L to 15,000µg/L;
- Elevated BOD in samples CSW1 to CSW3, CSW5 to CSW7 and CSW9 to CSW11 with concentrations ranging from 5,000µg/L to 150,000µg/L.

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Table 12 - Summary of Surface Water Laboratory Results

					Surface Water																
Field_ID	**Units**	**LOR**	**ADOPTED CRITERIA**		CSW 1	CSW 2	CSW 3	CSW 4	CSW 5	CSW 6	CSW 7	CSW 8	CSW 9	CSW 10	CSW 11	CSW 12	CSW13	CSW14	CSW15	CSW16	CSW17	CSW18	CSW20
Sampled_Date			**Protection 95%-99% of Species**	**Recreational Use**	9/02/2012	9/02/2012	9/02/2012	9/02/2012	9/02/2012	9/02/2012	9/02/2012	9/02/2012	9/02/2012	9/02/2012	9/02/2012	9/02/2012	8/03/2012	8/03/2012	8/03/2012	8/03/2012	8/03/2012	8/03/2012	8/03/2012
Ammonia as N	µg/L	10	900 [1]		<10	**1300**	850	10	210	30	20	**2000**	**2800**	<10	220	130	-	-	-	-	-	-	-
Nitrate (as N)	µg/L	5	700		<5	300	<10	24	<5	<5	28	<5	<25	<5	<5	300	-	-	-	-	-	-	-
pH (Lab)	pH Units	0			7.3	7	6.4	7.5	6.5	7.3	7.4	6.8	9.4	7	6.6	7.8	-	-	-	-	-	-	-
Nitrite (as N)	µg/L	5	[1]		8	72	<5	5	<5	<5	<5	8	<5	<5	<5	31	-	-	-	-	-	-	-
Kjeldahl Nitrogen Total	µg/L	50			2500	26000	8500	6400	5500	1800	23000	4300	38000	4200	7800	12000	-	-	-	-	-	-	-
Phosphorus	µg/L	50			810	8200	1600	15000	2000	490	10000	1200	5000	2000	1600	2900	-	-	-	-	-	-	-
BOD	µg/L	5000			32000	10000	34000	<5000	23000	5000	6000	<5000	150000	41000	22000	<5000	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons																							
TPH C6 - C9	µg/L	40			<40	<40	<400	<40	<400	<40	<40	<40	<40	<400	<40	<40	-	-	-	-	-	-	-
TPH C10 - C14	µg/L	100			<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	-	-	-	-	-	-	-
TPH C15 - C28	µg/L	200			<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	-	-	-	-	-	-	-
TPH C29-C36	µg/L	200			<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	-	-	-	-	-	-	-
Metals																							
Arsenic	µg/L	1	13 *	50 [3]	2	**34**	**16**	7	2	2	**16**	4	7	3	10	***74***	-	-	-	-	-	-	-
Cadmium	µg/L	0.1	0.2 [1]	5 [3]	0.2	**2**	**0.7**	<0.1	<0.1	<0.1	**0.6**	<0.1	**0.3**	<0.1	0.2	**3.8**	-	-	-	-	-	-	-
Chromium (III+VI)	µg/L	1	1.0 **	50 [3]	2	***51***	4	1	<1	3	16	<1	5	<1	1	***190***	-	-	-	-	-	-	-
Copper	µg/L	1	1.4 [1]	1000 [2]	**24**	**240**	**32**	**9**	**3**	**6**	**45**	**4**	**27**	**6**	**7**	**310**	-	-	-	-	-	-	-
Lead	µg/L	1	3.4 [1]	50 [3]	3	***200***	**26**	**6**	**4**	**7**	***86***	2	**26**	2	**10**	***600***	-	-	-	-	-	-	-
Nickel	µg/L	1	11 [1]	100 [3]	7	***120***	**19**	4	3	5	**22**	3	**11**	4	**11**	***150***	-	-	-	-	-	-	-
Zinc	µg/L	1	8 [1]	5000 [3]	**1600**	**2200**	**4600**	**350**	**280**	**220**	**560**	**110**	**140**	**180**	**260**	**1300**	-	-	-	-	-	-	-
Mercury	µg/L	0.1	0.6 [1]	1 [3]	<0.1	**0.9**	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	***1.4***	-	-	-	-	-	-	-
BTEX																							
Benzene	µg/L	0.5	950 [1]	10 [3]	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	-	-	-	-	-	-	-
Ethylbenzene	µg/L	0.5	80 [L]		<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	-	-	-	-	-	-	-
Toluene	µg/L	0.5	180 [L]		<0.5	<0.5	<5	<0.5	9.7	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	-	-	-	-	-	-	-
Xylene (m & p)	µg/L	1			<1	<1	<10	<1	<10	<1	<1	<1	<1	<10	<1	<1	-	-	-	-	-	-	-
Xylene (o)	µg/L	0.5	350 [1]		<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	-	-	-	-	-	-	-
Xylene Total	µg/L	1.5			<1.5	<1.5	<15	<1.5	<15	<1.5	<1.5	<1.5	<1.5	<15	<1.5	<1.5	-	-	-	-	-	-	-
Polynuclear Aromatic Hydrocarbons																							
Acenaphthene	µg/L	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Acenaphthylene	µg/L	0.1			<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Anthracene	µg/L	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Benz(a)anthracene	µg/L	0.1			<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Benzo(a) pyrene	µg/L	0.1	0.1 [L]	0.01 [3]	*<0.1*	***0.4***	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	-	-	-	-	-	-	-
Benzo(b)fluoranthene	µg/L	0.1			<0.1	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	µg/L	0.1			<0.1	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Benzo(k)fluoranthene	µg/L	0.1			<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Chrysene	µg/L	0.1			<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Dibenz(a,h)anthracene	µg/L	0.1			<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Fluoranthene	µg/L	0.1			<0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Fluorene	µg/L	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	µg/L	0.1			<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Naphthalene	µg/L	0.1	16 [1]		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
PAHs (Sum of total)	µg/L	1			<1	4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-
Phenanthrene	µg/L	0.1			<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Pyrene	µg/L	0.1			<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-
Bacteria																							
Faecal coliforms	cfu/100ml		1000 [2]	1000 [4]	730	***130000***	1000	***27000***	***2100***	***15000***	***7000***	270	270	270	***3500***	***33000***	***26,000***	***12,000***	***43,000***	***14,000***	***3,000***	910	91
E. Coli	cfu/100ml		230 [4]		***450***	***130000***	***1000***	***27000***	***2100***	***15000***	***5000***	91	***270***	***270***	***3500***	***33000***	***2000***	***3000***	***43000***	***12000***	***2000***	820	91

Notes:

Result Concentration exceeds protection of species criteria

Result Concentration exceeds recreational use criteria

Value LOR exceeds adopted criteria

\- Not Analysed

* Arsenic (V) (conservative)

** Chromium (VI)

^ p-xylene (conservative)

L 95% Low Reliabilty Trigger Values (99% protection level applied where recommended)

[1] ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality - Table 3.4.1 Freshwater 95%

[2] NSW DEC (2004) Use of Effluent by Irrigation - Appendix 1, Table A1, Municipal with controlled access

[3] ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality - Table 5.2.3 Water quality guidelines for recreational use

[4] ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality - Chapter 5.2.3.1 Water quality guidelines for microbiological characteristics for recreational use, secondary contact

9.4.4 Groundwater

The results of the laboratory testing are shown in Table 13. The laboratory reports can be provided upon request.

The results showed concentrations below the adopted criteria for protection of ecosystems, with the following exceptions:

- Arsenic in samples CMW2 and CMW7 at concentrations of 15µg/L and 18µg/L respectively;
- Ammonia in samples 101 and CMW1 to CMW7 with concentrations ranging from 1,100µg/L to 3,700µg/L;
- Faecal coliforms in sample CMW5 at a concentration of 2,200 cfu/100ml.

The results showed concentrations below the adopted criteria for protection of human health, with the following exceptions:

- Iron in samples 101, CMW1 to CMW9 at concentrations of 2,300µg/L and 110,000µg/L respectively;
- Nickel in sample CMW4 with a concentration of 320µg/L;
- Faecal coliforms in sample CMW5 at a concentration of 2,200 cfu/100ml;
- E. Coli in sample CMW5 at a concentration of 360 cfu/100ml.

Elevated concentrations were recorded for the following analytes:

- Elevated nitrite, nitrate and total kjedahl nitrogen in each sample with concentrations of total kjedahl nitrogen ranging between 320µg/L to 4,200µg/L;
- Elevated phosphorous in samples 101, 109, CMW1, CMW2, and CMW5 to CMW7 with concentrations ranging between 390µg/L to 6,400µg/L.

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Table 13 - Summary of Groundwater Results

					Groundwater													
	Sample ID				101	109	CMW1	CMW2	CMW3	CMW4	CMW5		CMW6	CMW7	CMW8	CMW9	CMW10	CMW10
	Date				21/02/2012	20/02/2012	21/02/2012	21/02/2012	21/02/2012	21/02/2012	20/02/2012	8/03/2012	20/02/2012	21/02/2012	21/02/2012	21/02/2012	20/02/2012	8/03/2012
Analyte	**Units**	**LOR**	**ADOPTED CRITERIA**															-
			Protection 95%-99% of Species	**Recreational Use**														
Total Kjeldahi Nitrogen	µg/L	50			2000	2100	2300	4200	1800	1700	3000	-	4000	2500	870	1300	320	-
Total Nitrogen	µg/L	50			2000	2100	2300	4200	1800	1800	3000	-	4000	2500	880	1300	360	-
Total Phosphorus	µg/L	50			420	6400	600	900	180	70	600	-	620	390	90	<50	90	-
Anions																		
Ammonia (NH_3) as N	µg/L	10	900 [1]		1600	690	1700	3700	1100	1100	1500	-	3000	2300	740	890	100	-
Nitrite (NO_2) as N	µg/L	5			*<50*	*<5*	*<5*	*<5*	*<5*	*<5*	<5	-	7	*<5*	*<5*	22	*<5*	-
Nitrate (NO_3) as N	µg/L	5	700 [1]		<5	<5	<5	<5	<5	38	<5	-	<5	<5	11	<5	33	-
Metals																		
Arsenic	µg/L	1	13 *	50 [3]	3	2	10	15	<1	4	12	-	11	18	9	2	<1	-
Cadmium	µg/L	0.1	0.2 [1]	5 [3]	<0.1	<0.1	<0.1	<0.1	<0.1	1	<0.1	-	0.2	<0.1	<0.1	<0.1	<0.1	-
Chromium	µg/L	1	1 **	50 [3]	<1	2	<1	<1	<1	3	<1	-	<1	<1	<1	<1	<1	-
Copper	µg/L	1	1.4 [1]	1000 [3]	2	1	1	1	1	2	1	-	2	20	1	2	2	-
Iron	µg/L	5		300 [3]	***18000***	250	***2300***	***23000***	***3800***	***83000***	***110000***	-	***13000***	***36000***	***18000***	***26000***	<5	-
Nickel	µg/L	1	11 [1]	100 [3]	6	1	4	4	8	***320***	24	-	10	14	3	8	2	-
Lead	µg/L	1	3.4 [1]	50 [3]	<1	<1	<1	<1	<1	6	<1	-	<1	1	<1	<1	<1	-
Zinc	µg/L	1	8 [1]	5000 [3]	75	11	19	35	150	730	260	-	380	690	15	12	13	-
Mercury	µg/L	0.1	0.6 [1]	1 [3]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-
Total Petroleum Hydrocarbons																		
C6 - C9 Fraction	µg/L	40			<40	<40	<40	<40	<40	<40	<40	-	<40	<40	<40	<40	<40	-
C10 - C14 Fraction	µg/L	100			<100	<100	<100	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	-
C15 - C28 Fraction	µg/L	200			<200	<200	<200	<200	<200	<200	<200	-	<200	<200	<200	<200	<200	-
C29 - C36 Fraction	µg/L	200			<200	<200	<200	<200	<200	<200	<200	-	<200	<200	<200	<200	<200	-
Total C10-C36	µg/L				<500	<500	<500	<500	<500	<500	<500	-	<500	<500	<500	<500	<500	-
BTEX																		
Benzene	µg/L	0.5	950 [1]	10 [3]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-
Toluene	µg/L	0.5	180 L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-
Ethylbenzene	µg/L	0.5	80 [1]		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-
Xylene Total	µg/L	1.5	200 ^		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	-	<1.5	<1.5	<1.5	<1.5	<1.5	-
Polynuclear Aromatic Hydrocarbons																		
Total PAHs	µg/L	1			<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	-
Benzo(a)pyrene	µg/L	0.1	0.1 L	0.01 [3]	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	-	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	-
Faecal Coliforms	cfu/100ml		1000 [2]	1000 [4]	-	-	180	-	-	<91	-	***2200***	-	<91	<91	<91	-	<91
E. Coli	cfu/100ml			230 [4]	-	-	<91	-	-	<91	-	***360***	-	<91	<91	<91	-	<91

Notes:

Result Concentration exceeds protection of species criteria

Result Concentration exceeds recreational use criteria

Value LOR exceeds adopted criteria

\- Not Analysed

* Arsenic (V) (conservative)

** Chromium (VI)

^ p-xylene (conservative)

L 95% Low Reliabilty Trigger Values (99% protection level applied where recommended)

[1] ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality - Table 3.4.1 Freshwater 95%

[2] NSW DEC (2004) Use of Effluent by Irrigation - Appendix 1, Table A1, Municipal with controlled access

[3] ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality - Table 5.2.3 Water quality guidelines for recreational use

[4] ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality - Chapter 5.2.3.1 Water quality guidelines for microbiological characteristics for recreational use, secondary contact

10 DISCUSSION

Ten AECs were identified for the Project Area, rail ballast, fill materials of unknown origin and quality, former building footprints, former abandoned fuel tanks, historical rail use, adjacent industrial land use, groundwater, effluent irrigation, and northern end of Woodlands Close.

Soil samples were collected in AEC 1 to AEC 5 and AEC 9. Surface water and/or groundwater samples have been collected to target AEC 6 to AEC 8.

A summary of the findings within each AEC are provided below. Figures 3A to 3D and 4A to 4D also provide information on the approximate location of the contamination. Note, information on waste classification is provided in Section 11.2.

AEC 1 Rail Ballast	Concentrations of PAHs below adopted criteria, and no asbestos detected.
AEC 2 Fill materials of unknown quality and origin	TPH C10-C36 was identified at greater than 2.5 times the adopted criteria in samples TP528A 0.2-0.3m (3,200mg/kg), and TP532 0.4-0.5m (4,732mg/kg). The arithmetic average concentration of TPH C10-C36 was below adopted criteria for the Project Area, with the exception of sample locations TP528A, and TP532. The arithmetic average concentration of lead was below adopted criteria. Concentrations of other contaminants below adopted criteria.
AEC 2A. Northern end of Woodlands Close. Imported fill material for access road construction	Concentrations of TPH C10-C36, benzo(a)pyrene and total PAHs in SS30 to SS35. These samples are located on the surface adjacent to the paved area of Woodlands Close. The source may be associated with fill material imported to construct the access road. The concentrations of PAHs in this area are inconsistent with the rest of the Project Area suggesting an secondary (off-site) fill source.
AEC 3 Former building footprints, including the Hexham Coal Preparation Plant	Concentrations below adopted criteria, and no asbestos detected in surface samples collected. A fragment of PACM (AS1, 27/4/12) collected adjacent to a dilapidated building near the high pressure gas main contained asbestos. This building is not located on the Project Area.

AEC 4 Former abandoned fuel tanks	Elevated concentrations of TPH C10-C36 were identified in CHA01 0.0-0.1m and TP533 and TP534 from 0.0m to 1.1m bgs, with concentrations ranging from 471mg/kg to 995mg/kg. The concentrations were below the adopted criteria. Trenches excavated across the area rapidly filled up with water, which was inflowing from within fill material at about 0.2m. This made observations difficult, and no observations were made below 1.1m. There were some slight indications of a backfilled excavation, with a variation in fill material in parts of the trenches. No existing fuel tanks were encountered, and no hydrocarbon odours were noted. A number of samples have been collected in this area, and each showed concentrations below the criteria. Based on this, remediation of this area is not required. However, it is noted that if excavations are carried out in this area to depths greater than 1.1m during construction, there is a possibility that contaminated soil could be encountered. Other contaminants below adopted criteria.
AEC 5 Historical rail use	Concentrations below adopted criteria, and no asbestos detected.
AEC 6 Adjacent industrial land use	Concentrations of arsenic were identified above criteria in samples CMW2 and CMW7. Ammonia was identified above the criteria in the majority of samples tested. Elevated concentrations were recorded for nitrogen and phosphorous in the majority of samples. These concentrations may be related to AEC 8 (effluent irrigation). It is considered unlikely that adjacent industrial uses are the source for the contaminants identified.
AEC 7 Groundwater and Surface Water	<u>Surface Water</u> Concentrations of metals and faecal coliforms were identified above the adopted criteria in the majority of surface water samples. Concentrations of ammonia exceeded adopted criteria in samples CSW2, CSW8 and CSW9. Elevated concentrations of nitrogen, phosphorous and BOD were identified in the majority of surface water samples. <u>Groundwater</u> Concentrations of arsenic were identified above criteria in samples CMW2 and CMW7. Ammonia was identified above the criteria in the majority of samples tested. Elevated concentrations were recorded for nitrogen, and phosphorous in the majority of samples. Faecal coliforms were identified above criteria in sample CMW5.

AEC 8 Effluent irrigation	Surface Water Concentrations of metals and faecal coliforms were identified above the adopted criteria in the majority of surface water samples. Concentrations of ammonia exceeded adopted criteria in samples CSW2, CSW8 and CSW9. Elevated concentrations of nitrogen, phosphorous and BOD were identified in the majority of surface water samples. Groundwater Faecal coliforms were above criteria in sample CMW5. Faecal coliforms were also detected in sample CMW1 at 180cfu/100ml, below adopted criteria. In other samples faecal coliforms were recorded at <91cfu/100ml. Based on this the coliforms detected in surface water generally do not appear to be infiltrating into groundwater, except in the location of CMW5. The concentrations of arsenic, ammonia, nitrogen, phosphorous and iron may be associated with irrigation of effluent.
AEC 9 Illegal dumping of waste	One stockpile of fibre-board was sampled and tested for asbestos. The sample showed the presence of asbestos. This stockpile has since been removed from the site. Two samples were collected from two other stockpiles. One of these showed no contamination. The other showed TPH C10-C36 slightly above the adopted criteria. Both of these stockpiles appear to be located outside of the Project Area. No other stockpiles of waste were observed on 27 April 2012. It is possible stockpiles of waste may be illegally dumped from time to time as the public can access the site.

11 CONCLUSION

Ten AECs were identified for the Project Area: rail ballast, fill materials of unknown origin and quality, fill used for access roads, former building footprints, former abandoned fuel tanks, historical rail use, adjacent industrial land use, groundwater, effluent irrigation, illegal dumping of waste, and the northern end of Woodlands Close.

11.1 Soil Contamination

Based on the results of the site history assessment and the soil sampling and analysis, the potential for widespread soil contamination within the fill and natural materials in the Project Area is considered low.

Contamination in the form of TPH C10-C36 was identified at greater than 2.5 times the adopted criteria in TP528A 0.2-0.3m and TP532 0.4-0.5m. Benzo(a)pyrene and total PAHs were also identified in TP532 0.4-0.5m as greater than 2.5 times the adopted criteria. This was within ballast and coal reject fill material, within the ARTC compound area.

Contamination in the form of TPH C10-C36, benzo(a)pyrene, and total PAHs were identified in samples SS30 to SS35. This was in material that was likely imported for construction of Woodlands Close.

A former abandoned fuel tank area, AEC 4, was identified during the site history assessment. Observations in this area indicated there may be a backfilled excavation. No evidence of existing fuel tanks was observed to a depth of 1.1m bgs. Testing of hydrocarbons in this area identified elevated TPH C10-C36 concentrations from 0.0m to 1.1m bgs (471mg/kg to 995mg/kg).

One part of the Project Area, associated with the Tarro-Interchange, has not been assessed at this stage. Additional sampling is currently being undertaken for this area.

11.2 Preliminary Waste Classification

Based on an average fill depth of about 0.75m across the entire Project Area (39ha), an approximate fill volume of about 300,000m^3 has been estimated. This would equate to about one soil sample per 4,000m^3 across the Project Area.

The results of the laboratory analysis showed that the fill material classifies as general solid waste, with the exception of:

- Localised area around TP516B 0.2-0.3m (lead at 1,900mg/kg) which classifies as restricted solid waste. The potential volume of this material is 2,500m^3;
- Localised area around TP532 0.4-0.5m (benzo(a)pyrene 110mg/kg, PAHs 1,300mg/kg) which classifies as hazardous waste. The potential volume of this is estimated to be about 1,500m^3;
- Woodlands Close, where benzo(a)pyrene and total PAH concentrations classify soils around SS31, SS32 and SS34 as restricted solid waste, and around SS35 as hazardous waste. The potential volume of restricted solid waste is estimated to be about 3,500m^3, and hazardous waste is estimated to be about 900m$^{3.}$ These volumes are based on a fill depth of about 0.2m.
- A stockpile of fibre-board in the location of sample AS1 classified as asbestos waste. This stockpile has been removed from the site.

On the 27 April 2012, no obvious stockpiles of illegally dumped waste were observed on the Project Area. Two samples were collected from stockpiles located outside of the Project Area.

It is possible stockpiles of waste may be illegally dumped from time to time as the public can access the site. If this occurs, stockpiles of illegally dumped waste (AEC 9) will require waste classification prior to removal from site.

Natural material does not meet the definition of VENM due to the potential presence of acid sulfate soils. Therefore, natural soils also classify as general solid waste. Should acid sulfate soils be disposed to landfill, then it will require lime to be added prior to disposal.

Depending on the volumes of material to be excavated, and the proposed re-use, it may be appropriate to apply for site specific exemptions for re-use of natural or fill materials on other properties. This would be assessed once the volumes and types of material to be excavated are known.

11.2.1 Waste Assessment, Handling, Transport and Disposal

Waste materials from the Project are required to be assessed for appropriate disposal, prior to being removed from the Project Area. Waste is required to be assessed in accordance with the following legislation and/or guidelines:

- Protection of the Environment Operations Act 1997 – defines 'waste' for regulatory purposes and establishes management and licensing requirements.
- Protection of the Environment Operations (Waste) Regulation 2005 – Section 51 provides general resource recovery exemptions allowing waste to be re-used on other sites, instead of being disposed to landfill). The Regulation also sets provisions for way waste is managed in terms of storage and transportation, and reporting and record keeping requirements for waste facilities.
- DECCW (2009) Waste Classification Guidelines.
- General Resource Recovery Exemptions published in the NSW Government Gazette. A list of current general exemptions is provided on the NSW OEH website (http://www.environment.nsw.gov.au/waste/generalRRE.htm).

Different waste types will require different procedures for handling and transport to appropriately licensed facilities. General procedures that will apply to all waste types are:

- Waste to be classified before loaded for transport to disposal location;
- If waste quantities are large, the disposal facility should be contacted prior to loading to check when they can accept waste;
- Waste to be covered during transport to prevent loss of waste between Project Area and disposal location;
- Dockets, or other documentation, are to be maintained to demonstrate appropriate disposal of waste;
- Waste must be notified to OEH and tracked in accordance with the Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (Waste) regulation 2005.

Asbestos waste has hazardous characteristics, and will require additional management during handling and transport. It is unlikely, but possible, that waste with high concentrations of metals or hydrocarbons could be encountered on site. The following additional measures should be employed when dealing with waste with hazardous characteristics:

- Personnel handling the waste must wear appropriate personal protective equipment (PPE). This would include, but not necessarily be limited to, tyvek coveralls, nitrile gloves, safety glasses, face mask (appropriate for the contaminant), and covered shoes. The PPE should be disposed of appropriately after handling the waste, this could include disposal with the waste.
- The truck trailer should be lined with plastic to prevent contamination of the truck trailer;
- The liner should be disposed with the waste at the disposal facility;

- The disposal facility must be contacted prior to loading the waste to ensure they are licensed to accept the waste, and if they have any special conditions for accepting the waste;
- If friable asbestos waste is being handled, asbestos air monitoring will be required;
- If hydrocarbon hazardous waste is being handled, monitoring using a photo-ionisation detector should be carried.
- Whether immobilisation or treatment of the hazardous waste is feasible would be assessed if hazardous waste (other than asbestos) is encountered.

In order to ensure waste is appropriately disposed to lawful facilities, licensed to accept the waste, a material tracking register, containing the following information must be kept:

- The material type and volume;
- The classification of the waste;
- Where it was re-used, i.e. location on the Project site or property address if re-used off-site (if re-used);
- Where it was disposed, i.e. landfill name and address (if disposed);
- Reference number of relevant documentation, (i.e. waste dockets, waste classification letters), if applicable.

11.3 Surface Water and Groundwater Contamination

Widespread contamination of surface water, in the form of faecal coliforms, E. Coli, nutrients and metals, has been identified both on site and immediately off-site. Widespread contamination of groundwater in the form of metals and nutrients has also been identified.

It is considered that the surface water contamination identified is likely to be associated with either grazing of cattle, or effluent irrigation (AEC 9) that occurs to the west of the Project Area,. The long history of industrialisation in this part of the Hexham Wetland has resulted in a degraded wetland system. The concentrations of faecal coliforms and E. Coli in surface water, and nutrients and metals in surface water and groundwater confirm that the Hexham Wetland is in a degraded state.

It is not considered practicable to remediate the surface and groundwater contamination within the Project Area, given the widespread nature of the contamination and the already degraded state of this portion of Hexham Wetland.

The surface water and groundwater contamination is considered to present a potential risk to human health for construction workers and appropriate management procedures will be required for the protection of site workers. During construction, site access will be restricted and once the initial surface water is removed and/or treated, further impacts could be less severe than the current faecal coliform concentrations which have occurred when access for cattle is not restricted.

11.4 Recommendations

Coffey recommends the following, in regard to soil contamination:

- Preparation of a site specific remedial action plan by a suitably qualified contaminated land consultant. The RAP would discuss potential remediation and/or management options for the identified contaminated soils and present the preferred remediation option(s) based on the final design and construction details for the project. The RAP is presented in Appendix D;
- Implementation of the remedial action plan in order to remediate and validate affected areas;
- Remediation could comprise excavation, and disposal of the waste materials, including restricted solid waste to appropriately licensed landfill. Hazardous waste would require treatment prior to disposal. Alternatively, remediation could comprise pre-treatment, capping of contamination in combination with a risk assessment and site management plan. Additional assessment in these areas will further refine the remediation options.
- Preparation of a validation report and/or site management plan(s), depending on the remediation/management option chosen.

It is also noted that during construction, a Construction Environmental Management Plan (CEMP) would be prepared and would include measures to protect workers health during construction. The CEMP would include information on how to recognise, handle and manage contamination (including asbestos) in soil and fill materials.

A Water Quality Management Plan would also be prepared as part of the CEMP to manage the surface water and groundwater contamination, and would include, but not be limited to:

- Measures to ensure that the existing contamination in surface and groundwater is not exacerbated during construction of the Project.
- Management measures for the protection of human health and the environment;
- Monitoring protocols, including frequency of monitoring, the analytes to be tested, and the adopted assessment criteria to demonstrate that contamination is not being exacerbated; and
- Contingency plans.

The water quality management plan is further discussed in Volume 1 of the EIS.

12 CUMULATIVE ASSESSMENT – QUEENSLAND RAIL (QR) NATIONAL TRAIN SUPPORT FACILITY (TSF)

Queensland Rail National (QRN) is currently preparing plans for a Train Support Facility (TSF) and adjoining industrial development located immediately to the west of the Relief Roads. The layout and key features of both projects are shown in Volume 1 of this EIS. QRN is liaising with ARTC to co-ordinate the design and approval processes.

As part of this study and report, the QRN 2008 EAR has been reviewed. Where updated (2011) reports are available, these have also been reviewed. Relevant documents reviewed comprise:

- Douglas Partners Pty Ltd (DP) (2011) Preliminary Contamination Assessment, Proposed Hexham Redevelopment, Maitland Road ad Woodlands Close, Hexham (August 2011).

Contamination has been identified within the Relief Roads Project Area (addressed within this report), and within the area investigated by DP for the TSF. The contamination identified is considered to be related to historical activities (i.e. former abandoned fuel tanks, and fill materials and effluent irrigation).

Management of contamination could comprise removal of contaminated soil, capping contaminated soils on site, restricting access to areas of the site or contaminated groundwater. At this stage the management and remediation options at the QRN site are in the process of being decided.

To prevent cumulative impacts (e.g. contamination that had been capped by one party being excavated by another party during construction) occurring from contamination, the remediation/management methods and responsibilities need to be agreed upon by both ARTC and QRN. Personnel working on both proposed developments need to be aware of the location, and proposed remediation/management, of the contamination within each proposed development area.

The proposed developments are unlikely to cause routine soil and groundwater contamination in the future, unless accidents occur (i.e. spill of fuel). In addition it is considered unlikely that existing groundwater contamination will be exacerbated by the proposed developments.

It is assumed that both developments would have up to date, industry standard environmental management procedures in place, in the event of an accidental spill, which would be implemented immediately. Based on this it is considered that potential cumulative impacts during the operational phase of both projects are likely to be negligible.

13 LIMITATIONS

The findings within this report are the result of discrete/specific sampling practices used in accordance with normal practices and standards. To the best of our knowledge they represent a reasonable interpretation of the general conditions of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

It is the nature of contaminated site investigations that the degree of variability in site conditions cannot be known completely and no sampling and analysis program can eliminate all uncertainty concerning the condition of the site. Professional judgement must be exercised in the collection and interpretation of the data.

The investigations undertaken were limited by the nature of this assessment, and are considered to provide an assessment of the likely contamination conditions at the locations sampled.

In preparing this report, current guidelines for assessment and management of contaminated land were followed. This work has been conducted in good faith in accordance with Coffey Environments understanding of the client's brief and general accepted practice for environmental consulting.

This report was prepared for Upper Hunter Valley Alliance with the objective of assessing the extent of contamination and further investigations and/or remediation (if required). No warranty, expressed or implied, is made as to the information and professional advice included in this report. The report is not intended for other parties or other uses. Anyone using this document does so at their own risk and should satisfy themselves concerning its applicability and, where necessary, should seek expert advice in relation to the particular situation.

Information within the report including borehole logs should not be used for geotechnical investigation purposes.

14 REFERENCES

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