STAGE 3
ENVIRONMENTAL SITE INVESTIGATION
PIONEER WALLGROVE QUARRY
NSW

Prepared By: Hugh Madden
Environmental Scientist

Reviewed By: Rui Henriques
Project Manager

Authorised By: John Hunt
Senior Project Manager, Environment

Date: 19/5/98

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EXECUTIVE SUMMARY

In April 1998 Pioneer Concrete Services P/L (Pioneer) engaged ADI Limited (ADI) to undertake an environmental site investigation of their Wallgrove Quarry site in NSW. The objective of this investigation was to:

- Identify the presence of contamination in Area 2, which includes quarry and road service operations.
- Identify whether the quarry overburden contains contaminants and to determine whether they are typical of such quarry operations.
- Confirm the presence of groundwater contaminants in Area 3.

The sampling plan for this investigation was designed by ERM Mitchell McCotter in consultation with Pioneer and ADI. Prior to the implementation of the sampling plan, ERM and ADI representative held a site meeting and walk over to confirm the scope of works. Specific details regarding the sampling plan can be found in the ERM Mitchell McCotter document "Pioneer Wallgrove Quarry Environmental Sampling Plan, March 1998, 97382RP2". The scope of the sampling plan involved:

- Soil sampling in Area 2. The majority of soil sampling locations were positioned throughout the Pioneer Road Services site. Other soil sampling locations were positioned on the overburden stockpile adjacent to Archbold Rd and overburden material associated with the concrete batching plant to the east of "Bob's Dam".
- Sediment sampling in Area 2. Sediment samples were collected along the drainage line that links "Bob's Dam" with the pollution control system of Pioneer Road Services' vehicle maintenance depot.
- Surface water sampling in Area 2. Samples were collected from "Bob's Dam" and from an upslope canal directing water to the dam.
- Sampling of groundwater wells located in Area 3.
- Sampling of quarried rock from the Wallgrove and Bass Point operated by Pioneer.

ADI at the time of writing this report was unaware of a site investigation criteria agreed to by the accredited Environmental Auditors, Contaminated Land representing Pioneer and Fitzpatrick. Given that the analytical data generated by this investigation will be reviewed by the auditors, ADI decided to present the data without an assessment against a site investigation criteria based on published guidelines.

For organic and inorganic contaminants present in soil/sediment, analytical data generated by this investigation were compared with background data from Area 3. These background data were part of ADI's (1995) stage 2 investigation. Assessment of the data was limited to whether or not there are concentrations exceeding background and their vertical and lateral extent where practical. Surface water and

groundwater data generated by this investigation were assessed against the guidelines published by ANZECC (1992).

Concentrations of heavy end (C_{10}-C_{36}) TPHs elevated above background levels were the dominant contaminant found with the Pioneer Road Services site. Other contaminants detected to a lesser degree were Cu, Pb, Zn, PAHs, ethlybenzene, xylenes and light end (C_6-C_9) TPHs.

In the quarry operational areas, such as, the aggregate storage zone to the east of Bob's Dam and the overburden spoil stockpile adjacent to Archbold road, the dominant contaminants found were Ni and Cr. Organic contaminants were not detected in the samples selected for analysis from these areas of the site.

With respect to mineralogy the Wallgrove breccia and Bass Point latite have similar SiO_2, Al_2O_3 and Fe_2O_3 percentages. The Wallgrove breccia was found to have higher MgO and TiO_2 percentages but lower Na_2O and K_2O percentages than the Bass Point latite. Concentrations of trace metals in particular Mn and As were similar for both the breccia and latite. Cu was the only metal in the Bass Point latite present at a higher concentrations compared to the Wallgrove breccia. All other metals were present at lower concentrations.

Surface water samples collected from Bob's Dam and an upslope canal directing water to the dam were found to contain concentrations of Cu, Pb, Zn, Cd, Cr and Ni exceeding the ANZECC (1992) guidelines for the protection of aquatic ecosystems.

Groundwater quality has improved since wells in Area 3 were last sampled (1995). Monitoring well MW2 was the only well where a targeted contaminant (Zn) exceeded the ANZECC (1992) guidelines for the protection of aquatic ecosystems. It should be noted that the concentration of Pb found at MW2 was at the upper limit of the ANZECC (1992) guidelines. It should be noted that groundwater was not encountered at any of the soil sampling locations associated with this investigation.

Based on the findings of this investigation ADI recommends that:

- An agreed site investigation criteria for the site be established.
- Additional sampling of a systematic nature be undertaken of the potential hotspots identified by this investigation with respect to background concentrations. Such data will enable a better assessment of the size of potential hotspots.
- An additional round of groundwater sampling be undertaken to confirm the improvement in groundwater quality.

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ATTACHMENTS

A. Field Sample Point Records
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ABBREVIATIONS

ANZECC	Australian and New Zealand Environment and Conservation Council
Al_2O_3	Aluminium oxide
As	Arsenic
Ba	Barium
BaO	Barium oxide
B(a)P	Benzo (a) pyrene
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
Ca	Calcium
CaO	Calcium oxide
Cd	Cadmium
Cl	Chloride
Cond	Conductivity
Cr	Chromium
Cu	Copper
DO	Dissolved Oxygen
Fe_2O_3	Iron oxide
HCO_3	Bicarbonate
Hg	Mercury
H_2O	Water
K	Potassium
K2O	Potassium oxide
LOI	Loss on ignition

Abbreviations continued

MBAS	Methyl Blue Activating Substances
Mg	Magnesium
MgO	Magnesium oxide
Mn	Manganese
Na	Sodium
NA	Not Analysed
Na_2O	Sodium oxide
NC	Not Calculable
ND	Not Detected
NO_3	Nitrate
Ni	Nickel
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PID	Photo Ionisation Detector
PO_4	Phosphate
PQL	Practical Quantitation Limit
QA/QC	Quality Control / Quality Assurance
RPD	Relative Percentage Difference
SiO_2	Silicon oxide
SO_4	Sulphate
SS	Suspended sediment
TDS	Total Dissolved Solids

Abbreviations continued

TiO_2	Titanium oxide
TPHs	Total Petroleum Hydrocarbons
Zn	Zinc

1.0 INTRODUCTION

In April 1998 Pioneer Concrete Services P/L (Pioneer) engaged ADI Limited (ADI) to undertake an environmental site investigation of their Wallgrove Quarry site in NSW. Figure 1 shows the location of the site.

The objective of this investigation was to:

- Identify the presence of contamination in Area 2, which includes quarry and road service operations.
- Identify whether the quarry overburden contains contaminants and determine whether they are typical of such quarry operations.
- Confirm the presence of groundwater contaminants in Area 3.

1.1 Scope of Work

The sampling plan for this investigation was designed by ERM Mitchell McCotter in consultation with GHD and implemented by ADI. Specific details regarding the sampling plan can be found in ERM Mitchell McCotter document "Pioneer Wallgrove Quarry Environmental Sampling Plan, March 1998, 97382RP2". " All sampling locations are shown in Figures 2, 3 and 4 which follow.

The scope of work for the investigation included:

- Soil sampling in Area 2. The majority of soil sampling locations were positioned throughout the Pioneer Road Services site. Other soil sampling locations were positioned on the overburden stockpile adjacent to Archbold Rd and overburden material placed to the east of "Bob's Dam.
- Sediment sampling in Area 2, along the drainage line that links "Bob's Dam" with the pollution control system of Pioneer Road Services' vehicle maintenance depot.
- Surface water sampling in Area 2, at "Bob's Dam" and from an upslope canal directing water to the dam.
- Sampling of groundwater wells located in Area 3.
- Sampling of rock from the Wallgrove and Bass Point quarries operated by Pioneer.

The analytical data generated by this investigation will be interpreted by accredited Environmental Auditors, Contaminated Land representing Pioneer and Fitzpatrick. As a result ADI presents the data without an assessment against a site investigation criteria based on published documents. Analytical data generated by this investigation of soil and sediment are compared with background data from Area 3. These

background data were compiled during ADI's (1995) stage 2 investigation. Assessment of the data is limited to the existence or otherwise of concentrations exceeding background, and identification of their vertical and lateral extent where practical.

Surface water and groundwater data generated by this investigation are assessed against the guidelines published by ANZECC (1992).

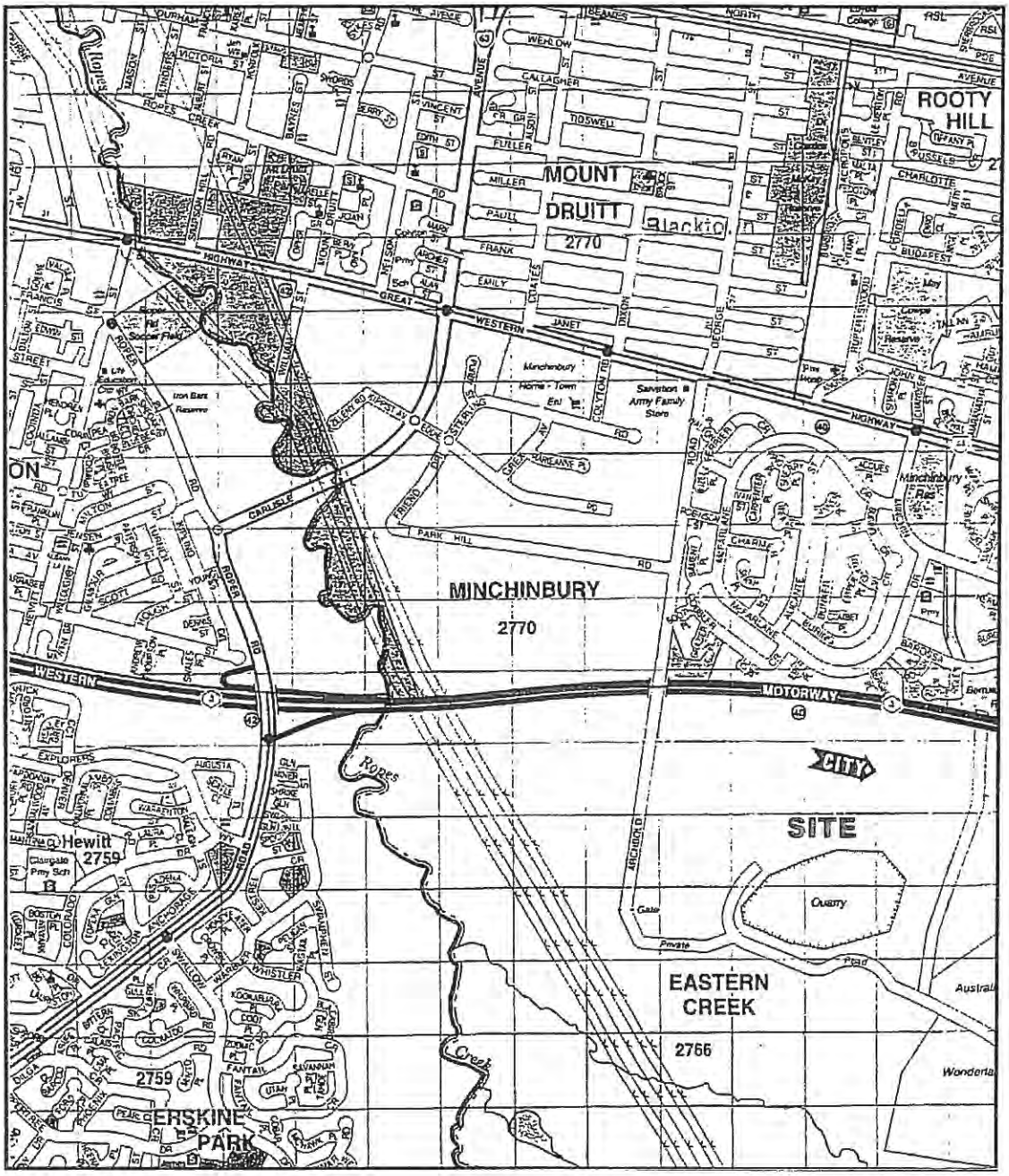
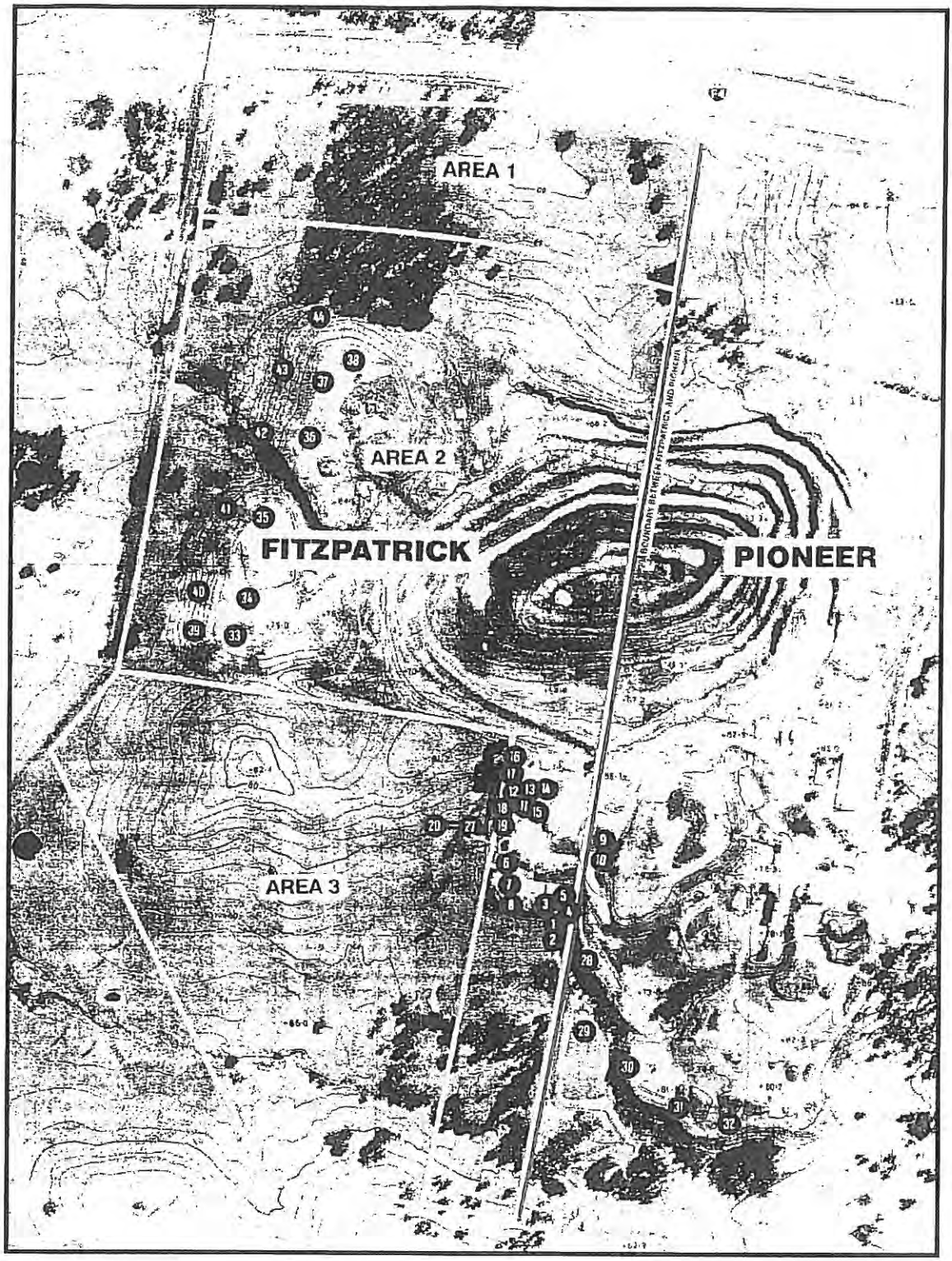


FIGURE 1

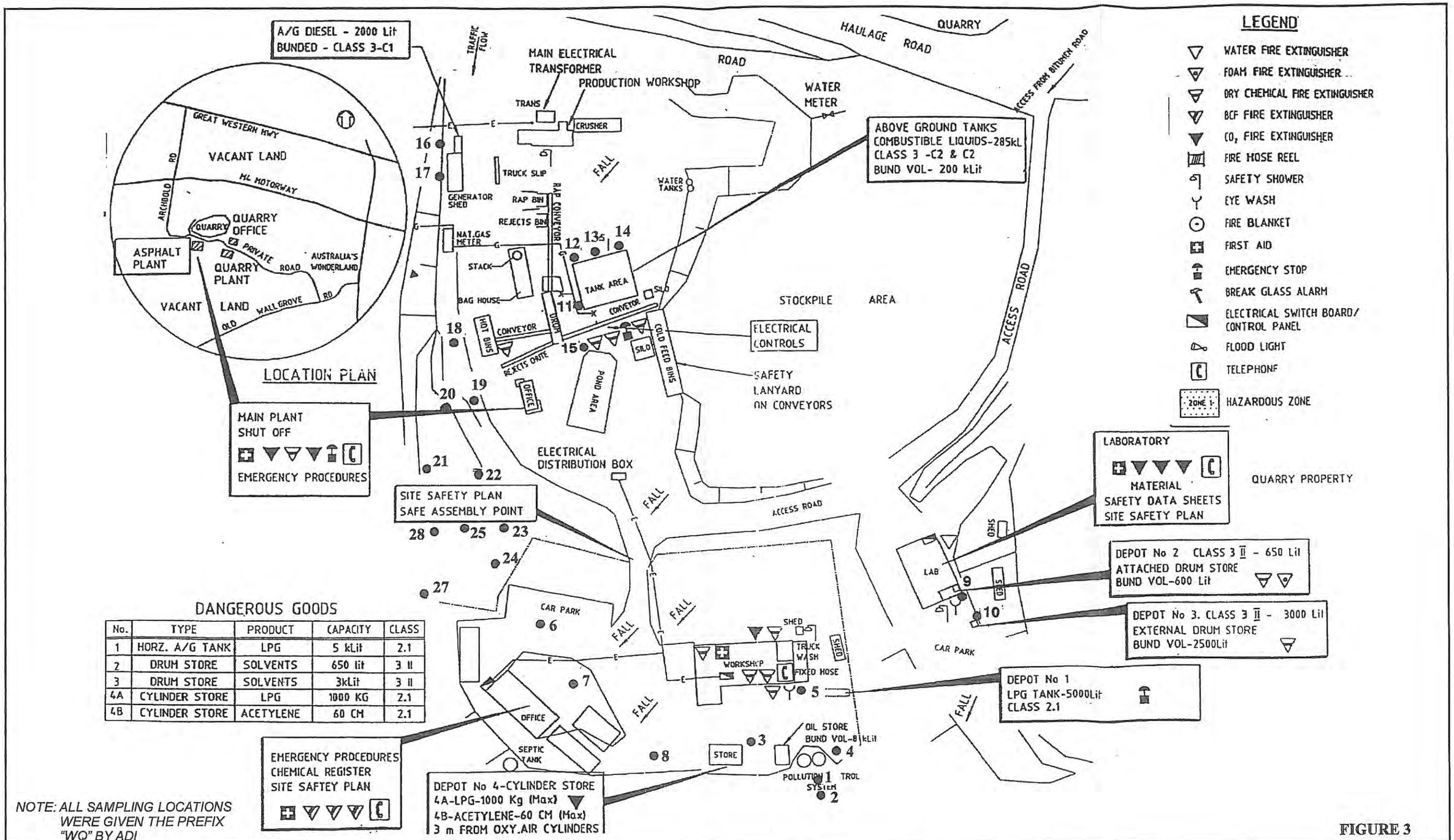
SCALE N/A	ADI Limited MAJOR PROJECTS GROUP Level 6, Westfield Towers 100 William Street East Sydney NSW 2011 PH (02) 9916 4900 FAX (02) 9358 5768	CLIENT PIONEER CONCRETE SERVICES P/L	PLAN SHOWING SITE LOCATION PIONEER WALLGROVE QUARRY	DWG. No. 204.0.1
DATE 7/5/98	ADI			JOB No. EO0055
FILE 204-1.CDR				REV. No.



NOTE : ALL SAMPLING LOCATIONS WERE GIVEN THE PREFIX "WQ" BY ADI.

FIGURE 2

SCALE N/A	ADI Limited MAJOR PROJECTS GROUP Level 6, Westfield Towers 100 William Street East Sydney NSW 2011 PH (02) 9916 4900 FAX (02) 9358 5768	CLIENT PIONEER CONCRETE SERVICES P/L	TITLE AERIAL PHOTO SHOWING ALL SOIL/SEDIMENT AND SURFACE WATER SAMPLING LOCATIONS	DWG. No. 204.0.2
DATE 7/5/98				JOB No. EO0055
FILE 204-2.CDR				REV. No.



DANGEROUS GOODS

No.	TYPE	PRODUCT	CAPACITY	CLASS
1	HORZ. A/G TANK	LPG	5 kLit	2.1
2	DRUM STORE	SOLVENTS	650 lit	3 II
3	DRUM STORE	SOLVENTS	3kLit	3 II
4A	CYLINDER STORE	LPG	1000 KG	2.1
4B	CYLINDER STORE	ACETYLENE	60 CM	2.1

NOTE: ALL SAMPLING LOCATIONS WERE GIVEN THE PREFIX "WQ" BY ADI

FIGURE 3

REVISION	SCALE		CLIENT	TITLE	DWG. No.
Information taken after Plan D185-1, after ARUP Pty Ltd.	AS SHOWN	ADI Limited MAJOR PROJECTS GROUP Level 6, Westfield Towers 100 William Street East Sydney NSW 2011 PH (02) 9916 4900 FAX (02) 9358 5768	PIONEER CONCRETE SERVICES P/L	PLAN SHOWING SAMPLING LOCATIONS WITHIN THE PIONEER ROAD SERVICES SITE	204.0.3
	DATE 7/5/97				JOB No. EO0055
	FILE 204-3.CDR	ADI			DATE OF ISSUE

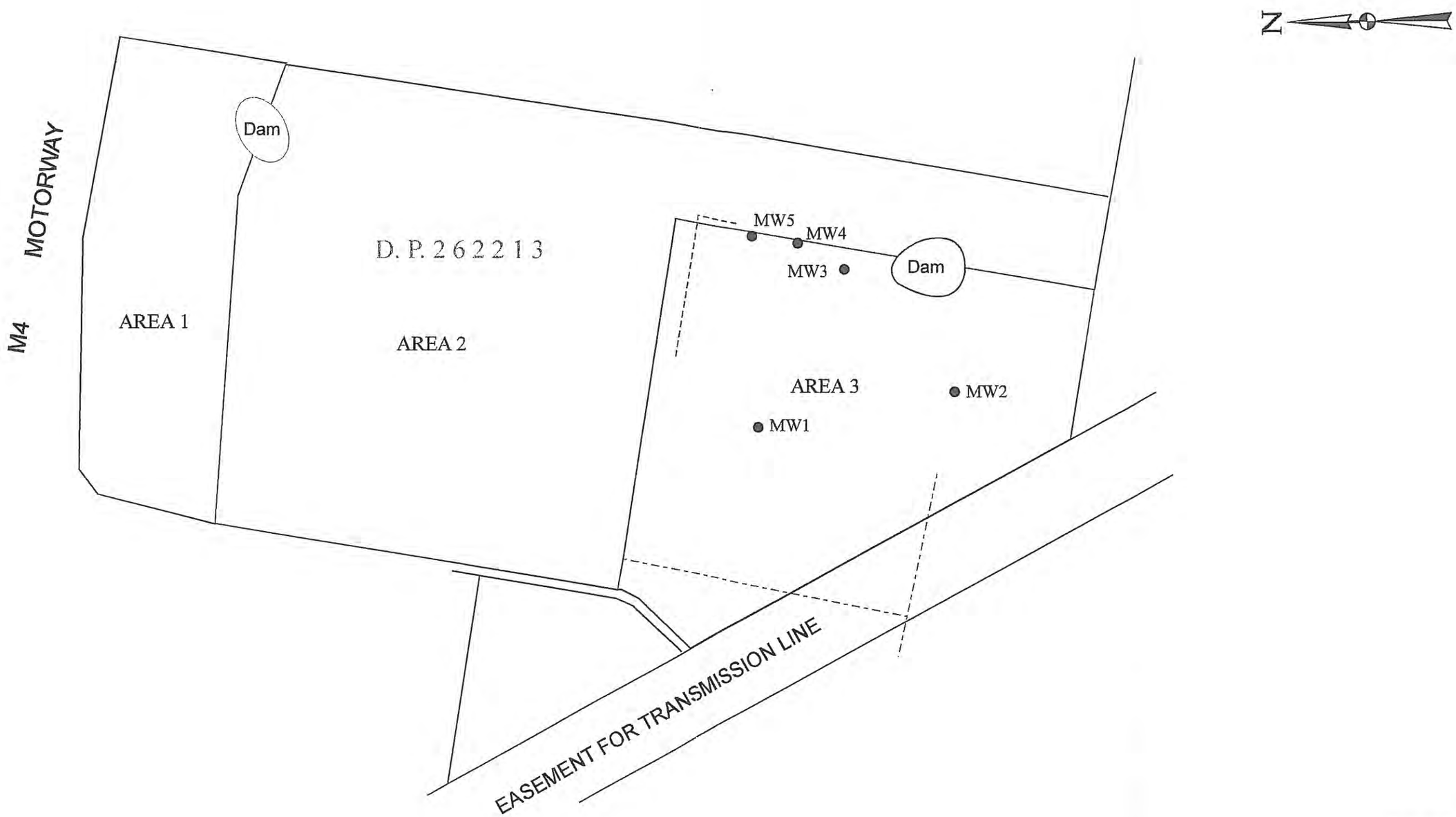


FIGURE 4

REVISION Information taken after Lafferty & Associates Plan	SCALE AS SHOWN DATE 7/5/97 FILE 204-4.CDR	ADI ADI Limited MAJOR PROJECTS GROUP Level 6, Westfield Towers 100 William Street East Sydney NSW 2011 PH (02) 9916 4900 FAX (02) 9358 5768	CLIENT PIONEER CONCRETE SERVICES P/L	TITLE PLAN SHOWING GROUNDWATER MONITORING WELLS IN AREA 3 PIONEER CONCRETE QUARRY WALLGROVE ROAD, ROPES CREEK	DWG. No. 204.0.4 JOB No. EO0055 DATE OF ISSUE

2.0 RESULTS AND DISCUSSIONS

Contaminant analytical data generated by this investigation are compared with background data from Area 3. Assessment of the data is limited to existence or otherwise of concentrations exceeding background, and identification of their vertical and lateral extent where possible. The background data comprise soil samples collected from sampling locations P7 and P10. TPHs, PAHs and BTEX were not detected. For heavy metals and arsenic the average and range of concentrations are used. Table 1 summarises the averages and ranges of contaminant concentrations present in soil from background sampling locations P7 and P10.

Table 1 Concentrations of Targeted Contaminants in Background Soil

Analyte	Average Concentration (mg/kg)	Range of Concentrations (mg/kg)
Cu	24	13 - 32
Pb	25	19 - 36
Zn	44	26 - 65
Cd	ND	ND
Cr (total)	14	10 - 18
Cr (III)	-	-
Cr (VI)	-	-
Ni	13	10 - 16
Ba	147	72 - 210
Mn	967	220 - 1560
As	-	-
Hg	0.0175	0.01 - 0.02
C6-C9	ND	ND
C10-C36	ND	ND
Benzene	ND	ND
Toluene	ND	ND
Ethylbezene	ND	ND
Xylenes	ND	ND
PAHs (total)	ND	ND
BaP	ND	ND

- Not part of the stage 2 investigation.
ND Not Detected.

Surface water and groundwater data generated by this investigation are assessed against the guidelines published by ANZECC (1992).

2.1 Soil and Sediment Investigation

2.1.1 Pioneer Road Services - Sediments

Sediment samples were collected from locations WQ1 and WQ2. Heavy end TPHs (C_{10}-C_{36}) were detected at concentrations above background at WQ2. The material sampled consists of saturated grey silty clay sediments.

PAHs, BaP, light end (C_6-C_9) TPHs and BTEX were not detected. Concentrations of Ni and Cr (III) were elevated above background at WQ2. The elevated Ni and Cr (III) concentrations are present in grey plastic clay containing shale fragments and vegetation matter and the underlying saturated grey silty clay sediments noted previously. It should be noted that the concentrations of Ni and Cr in the sediment are lower than those found in the Wallgrove quarried breccia. Tables 2 and 3 summarise the analytical results of samples selected for analysis.

Table 2 Analytical Results - Sediment Samples - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	BaP
				(mg/kg)			
WQ1	205	0.0-0.2	2.5/1.1	ND	ND	ND	ND
WQ2	210	1.0-1.2	2.0/1.3	ND	746	ND	ND

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ1	205	0.0-0.2	2.5/1.1	ND	ND	ND	ND
WQ2	210	1.0-1.2	2.0/1.3	ND	ND	ND	ND

ND Not Detected PID 123 / 456 headspace reading / ambient air reading

Table 3 Analytical Results - Sediment Samples - pH, Heavy Metals & As

Sample Point	Sample No	Depth (m)	pH	Cu	Pb	Zn	Cd
			-	(mg/kg)			
WQ1	205	0.0-0.2	4.6	21	19	30	ND
WQ1	206	0.2-0.5	4.3	15	18	16	ND
WQ2	208	0.0-0.2	8.7	27	19	64	ND
WQ2	210	1.0-1.2	8.3	33	20	70	ND

Sample Point	Sample No	Depth (m)	Cr III	Cr VI	Ni	As	Hg
			(mg/kg)				
WQ1	205	0.0-0.2	11	ND	7.5	4.5	0.025
WQ1	206	0.2-0.5	9.0	ND	6.0	4.0	0.005
WQ2	208	0.0-0.2	40	ND	62	5.0	0.025
WQ2	210	1.0-1.2	55	ND	76	5.5	0.035

ND Not Detected

2.1.2 Pioneer Road Services - Soils

Soil samples were collected from locations WQ3, WQ4, WQ5, WQ6, WQ7 and WQ8. Elevated concentrations of heavy end TPHs were detected at WQ3, WQ6 and WQ8. Elevated concentrations of heavy end TPHs and PAHs (excluding BaP) were detected at WQ4, while elevated concentrations of both light and heavy end TPHs, PAHs (excluding BaP) and xylenes were detected at WQ5.

Elevated concentrations of organic contaminants are likely confined to the surface soils with the exception of WQ5. At WQ5 a distinct stratum (2.3-2.5 m) returned elevated concentrations of organic contaminants. Soil types associated with the elevated concentrations consisted of typical overburden material comprising fine/powdery silty clays and silty sandy clays, which include gravels or shale fragments. The distinct stratum at WQ5 was not noted at adjacent sampling locations and comprised of black/grey clay.

Tables 4 summarises the analytical results of samples selected for analysis.

Table 4 Analytical Results - Soil Samples - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	BaP
				(mg/kg)			
WQ3	142	0.025-0.225	3.0/0.0	ND	1246	ND	ND
WQ3	144	0.0225-0.5	3.0/0.0	ND	ND	NA	NA
WQ4	129	0.0-0.2	6.9/0.4	ND	483	0.6	ND
WQ4	132	1.5-1.7	7.5/0.0	ND	ND	0.5	ND
WQ5	140	2.3-2.5	44.4/0.0	29	5925	4.3	ND
WQ5	141	2.6-2.8	2.1/0.0	ND	ND	ND	ND
WQ6	146	0.02-0.22	3.3/0.0	ND	137	ND	ND
WQ7	150	0.0-0.2	1.3/0.1	ND	ND	ND	ND
WQ8	155	0.05-0.25	4.2/0.4	ND	2728	ND	ND
WQ8	156	0.2-0.5	2.0/0.3	ND	624	NA	NA

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ3	142	0.025-0.225	3.0/0.0	ND	ND	ND	ND
WQ3	144	0.0225-0.5	3.0/0.0	ND	ND	ND	ND
WQ4	129	0.0-0.2	6.9/0.4	ND	ND	ND	ND
WQ4	132	1.5-1.7	7.5/0.0	ND	ND	ND	ND
WQ5	140	2.3-2.5	44.4/0.0	ND	ND	ND	4
WQ5	141	2.6-2.8	2.1/0.0	ND	ND	ND	ND
WQ6	146	0.02-0.22	3.3/0.0	ND	ND	ND	ND
WQ7	150	0.0-0.2	1.3/0.1	ND	ND	ND	ND
WQ8	155	0.05-0.25	4.2/0.4	ND	ND	ND	ND

NA Not Analysed ND Not Detected
PID 123 / 456 headspace reading / ambient air reading

2.1.3 Bitumen Laboratory - Soils

Soil samples were collected from locations WQ9 and WQ10. Elevated concentrations of heavy end TPHs were detected at both locations. The elevated concentrations of heavy end TPHs appear to be confined to the surface soil at WQ9. At WQ10 the concentrations increase with depth and the vertical extent of contamination has yet to be defined. Field observations and measurements at the time of sampling did not indicate the presence of TPHs in the samples collected from the end of hole zone at WQ10.

Material sampled at both locations is typical overburden material comprising of clays with lateritic pebbles and shale fragments, fine/powdery silty sandy clays, silty clays and sandy clays.

Table 5 summarises the analytical results of samples selected for analysis.

Table 5 Analytical Results - Bitumen Laboratory - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	BaP
				(mg/kg)			
WQ9	118	0.2-0.5	166/0.3	ND	6779	ND	ND
WQ9	120	1.5-1.7	153/0.0	ND	ND	ND	ND
WQ9	121	2.7-2.9	21/0.0	ND	ND	ND	ND
WQ10	122	0.0-0.2	1.5/0.5	ND	164	ND	ND
WQ10	126	1.5-1.7	2.7/0.6	ND	9831	NA	NA
WQ10	127	2.3-2.5	3.0/0.7	ND	3147	NA	NA
WQ10	128	2.5-2.7	3.8/0.7	ND	17158	NA	NA

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ9	118	0.2-0.5	166/0.3	ND	ND	ND	ND
WQ9	120	1.5-1.7	153/0.0	ND	ND	ND	ND
WQ9	121	2.7-2.9	21/0.0	ND	ND	ND	ND
WQ10	122	0.0-0.2	1.5/0.5	ND	ND	ND	ND
WQ10	126	1.5-1.7	2.7/0.6	ND	ND	ND	ND

NA Not Analysed ND Not Detected
PID 123 / 456 headspace reading / ambient air reading

2.1.4 Asphalt Plant Tank Farm - Soils

Soil samples were collected from locations WQ11, WQ12, WQ13, WQ14 and WQ15 in the area of the asphalt plant tank farm. Elevated concentrations of heavy end TPHs were detected at all sampling locations. Elevated concentrations of PAHs (excluding BaP) were also found at WQ12 and WQ14. The elevated concentrations of TPHs and/or PAHs appear to be confined to the top 1.0 m of soil at WQ11, 12, 13 and 15. Samples collected from the end of hole zone at WQ14 and subsequent refusal (shale or sandstone floaters) prevented the vertical extent of elevated concentrations from being determined. Based on available data elevated concentrations of heavy end TPHs and PAHs are present to a depth of 1.6 m or greater.

Material sampled at the above locations comprised either gravel fines or clays ranging from silty, silty sandy, sandy to dense clays. The clays are associated with overburden material, whereas the gravel fines are associated with the current operations of the asphalt plant.

Table 6 summarises the analytical results of samples selected for analysis.

Table 6 Analytical Results - Tank Farm - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	BaP
				(mg/kg)			
WQ11	192	0.3-0.5	237/0.0*	ND	958	ND	ND
WQ11	193	1.1-1.3	230/0.0*	ND	ND	NA	NA
WQ12	174	0.2-0.5	27/0.0	ND	2832	1.8	ND
WQ12	176	0.8-1.0	62/0.1	ND	616	ND	ND
WQ13	167	0.0-0.2	30/0.0	ND	3243	ND	ND
WQ13	171	1.5-1.7	29/0.0	ND	729	ND	ND
WQ14	096	0.0-0.2	10.3/0.5	ND	6849	0.9	ND
WQ14	100	1.6-1.8	26/0.8	ND	3507	5.9	ND
WQ15	111	0.1-0.3	0.9/0.0	ND	3197	ND	ND
WQ15	114	1.5-1.7	1.0/0.0	ND	ND	ND	ND

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ11	192	0.3-0.5	237/0.0*	ND	ND	ND	ND
WQ12	174	0.2-0.5	27/0.0	ND	ND	ND	ND
WQ12	176	0.8-1.0	62/0.1	ND	ND	ND	ND
WQ13	167	0.0-0.2	30/0.0	ND	ND	ND	ND
WQ13	171	1.5-1.7	29/0.0	ND	ND	ND	ND
WQ14	096	0.0-0.2	10.3/0.5	ND	ND	ND	ND
WQ14	100	1.6-1.8	26/0.8	ND	ND	ND	ND
WQ15	111	0.1-03	0.9/0.0	ND	ND	ND	ND
WQ15	114	1.5-1.7	1.0/0.0	ND	ND	ND	ND

NA Not Analysed ND Not Detected
PID 123 / 456 headspace reading / ambient air reading
* PID readings taken over 1 hr after samples collected due to flat batteries at end of days work.

2.1.5 Asphalt Plant Kerosene Washdown Area - Soils

Soil samples were collected from locations WQ16 and WQ17 in the area of the asphalt plant's kerosene washdown area. Elevated concentrations of both light and heavy end TPHs were detected at both locations. PAHs were not detected. However it should be noted that a number of samples had matrix characteristics that required the PQL to be raised to 5 mg/kg for individual PAHs from 0.1 mg/kg. Ethylbenzene was found at WQ16 at concentrations exceeding background levels.

At both locations the significant exceedences of background levels for organic contaminants are associated with specific stratum. At WQ16 a spongy/plastic, form holding hydrocarbon sludge was encountered at 1.3-2.3 m, while at WQ17 a mix of gravel fines, pebbles and shale fragments bound by hydrocarbons was encountered at 2.8-4.0 m. The vertical extent these significant elevated organic contaminant concentrations appears to be confined to the 1.3-2.6 m at WQ16 and 2.8-4.0 m at WQ17.

The concentration of Cu in surface soil at WQ16 is higher than the background concentrations. The elevated concentrations are confined to the top 0.2 m of soil. Surface soil at WQ16 consists of loose brown sandy clay soil. The concentrations Cu, Pb and Zn at WQ17 are higher than the background concentrations. The significantly elevated concentrations of these heavy metals are confined to the top 0.5 m of soil. The concentrations of Cu, Pb and Zn at 1.0 m are marginally higher than background. The soil sampled in the top 0.5 m at WQ17 is heterogeneous and consists of coarse sandy clay and sands which contain pieces of bitumen and shale fragments. At 1.0 m the soil sampled is typical overburden material comprising of loose coarse sands including fragments of sandstone and shale as well as lateritic pebbles. It should be noted that the concentrations of Cu, Pb and Zn detected are higher than those present in the Wallgrove quarried breccia.

Tables 7 and 8 summarise the analytical results of samples selected for analysis.

Table 7 Analytical Results - Kerosene Washdown Area - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	BaP
				(mg/kg)			
WQ16	179	0.0-0.2	13.8/0.3	ND	106	ND	ND
WQ16	183	1.3-1.5	32/0.1	26751	119123	ND*	ND*
WQ16	184	2.3-2.5	21/0.0	449	3190	ND	ND
WQ16	185	2.6-2.8	20/0.0	47	1034	NA	NA
WQ17	189	2.8-3.0	36/0.0	41	16540	ND*	ND*
WQ17	190	4.0-4.2	7.0/0.0	ND	765	ND	ND

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ16	179	0.0-0.2	13.8/0.3	ND	ND	ND	ND
WQ16	183	1.3-1.5	32/0.1	ND	ND	7000	ND
WQ16	184	2.3-2.5	21/0.0	ND	ND	ND	ND
WQ17	189	2.8-3.0	36/0.0	ND	ND	ND	ND
WQ17	190	4.0-4.2	7.0/0.0	ND	ND	ND	ND

* Matrix Interference resulted in the PQLs for individual PAHs being raised to 5 mg/kg.
NA Not Analysed ND Not Detected
PID 123 / 456 headspace reading / ambient air reading

Table 8 Analytical Results - Kerosene Washdown Area - pH, Heavy Metals & As

Sample Point	Sample No	Depth (m)	PH	Cu	Pb	Zn	Cd
			-	(mg/kg)			
WQ16	179	0.0-0.2	7.9	68	10	35	ND
WQ16	181	0.2-0.5	7.6	15	14	33	ND
WQ17	186	0.0-0.2	7.8	185	140	1580	ND
WQ17	187	0.2-0.5	7.7	95	58	580	ND
WQ17	188	1.0-1.2	NA	52	17	110	NA

Sample Point	Sample No	Depth (m)	Cr Total	Cr III/VI	Ni	As	Hg
			(mg/kg)				
WQ16	179	0.0-0.2	7.0	NA	9.5	5.0	0.010
WQ16	181	0.2-0.5	12	NA	13	4.5	0.005
WQ17	186	0.0-0.2	23	NA	14	7.5	0.010
WQ17	187	0.2-0.5	15	NA	16	6.0	0.005
WQ17	188	1.0-1.2	NA	NA	NA	NA	NA

NA Not Analysed ND Not Detected.

2.1.6 Asphalt Plant Western Boundary - Soils

Soil samples were collected from locations WQ18 and WQ19, to the west of the hot bins and dispatch office of the asphalt plant respectively. Elevated concentrations of heavy end TPHs and PAHs (excluding BaP) were detected at both locations. The

elevated TPH and/or PAH concentrations at WQ18 are confined to a depth of 5.0 m, while at WQ19 they appear to be confined to the top 2.0 m of soil.

At WQ18 significant exceedences of the background levels for heavy end TPHs and PAHs (excluding BaP) were associated with gravel and gravel fines bound together by hydrocarbons encountered at a depth of 1.5 m and extending to 4.5 m. Surface gravel fines also exhibit elevated concentrations of heavy end TPHs. Material with elevated concentrations of heavy end TPHs at WQ19 comprised gravels, gravel fines and overburden rock fragments of shale and sandstone.

Cu concentrations significantly exceed background levels in surface soil at WQ18 and WQ19. Surface soil at WQ18 and WQ19 comprised gravel and fines at both, mixed with loose bitumen and sandstone/shale fragments respectively. The concentrations of Cu present in the surface soil were also higher than that detected in the Wallgrove quarried breccia.

Tables 9 and 10 summarise the analytical results of samples selected for analysis.

Table 9 Analytical Results - Western Boundary of Asphalt Plant - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	BaP
				(mg/kg)			
WQ18	101	0.0-0.2	3.0/0.0	ND	4055	ND	ND
WQ18	104	1.5-1.7	37/0.0	ND	12002	5	ND
WQ18	105	3.0-3.2	17.5/0.0	ND	10748	62.5	ND
WQ18	116	4.6-4.8	6.0/0.3	ND	ND	ND	ND
WQ19	106	0.0-0.2	1.0/0.0	ND	11931	2.1	ND
WQ19	109	1.8-2.0	1.4/0.0	ND	ND	ND	ND

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ18	101	0.0-0.2	3.0/0.0	ND	ND	ND	ND
WQ18	104	1.5-1.7	3.0/0.0	ND	ND	ND	ND
WQ18	105	3.0-3.2	17.5/0.0	ND	ND	ND	ND
WQ18	116	4.6-4.8	6.0/0.3	ND	ND	ND	ND
WQ19	106	0.0-0.2	1.0/0.0	ND	ND	ND	ND
WQ19	109	1.8-2.0	1.4/0.0	ND	ND	ND	ND

ND Not Detected PID 123 / 456 headspace reading / ambient air reading

Table 10 Analytical Results - Western Boundary of Asphalt Plant - pH, Heavy Metals & As

Sample Point	Sample No	Depth (m)	Comp ID	pH	Cu	Pb	Zn	Cd
				-	(mg/kg)			
WQ18-19	101-106	0.0-0.2	C1	7.8	73 / 146	13 / 26	29 / 58	ND / -
WQ18-19	102-107	0.2-0.5	C2	8.2	22 / 44	15 / 30	54 / 108	ND / -

Sample Point	Sample No	Depth (m)	Comp ID	Cr III	Cr VI	Ni	As	Hg
				(mg/kg)				
WQ18-19	101-106	0.0-0.2	C1	6 / 12	ND / -	9.0 / 18	4.0 / 8	0.010 / 0.020
WQ18-19	102-107	0.2-0.5	C2	17 / 34	ND / -	24 / 48	5.0 / 10	0.020 / 0.040

Composite results presented as RAW / ADJUSTED. Adjusted = Raw x no of sub samples in composite
ND Not Detected - Not Applicable

The sub samples of C1 and the next depth sample from WQ18 and WQ19 were analysed for Cu. Table 11 summarises the analytical results.

Table 11 Analytical Results – WQ18 & WQ19- Discrete Samples – Cu

Sample Point	Sample No	Depth (m)	Cu (mg/kg)
WQ18	101	0.0-0.2	74
WQ18	102	0.2-0.5	22
WQ19	106	0.0-0.2	75
WQ19	107	0.2-0.5	20

2.1.7 Asphalt Plant Wet Scrubber Fines Storage - Soils

Soil samples were collected from locations WQ20-WQ27 (inclusive) which were positioned within the storage area for fines from a wet scrubber. Based on field observations ADI positioned the sampling locations as follows:

- WQ20, W21 and W22 in one of the wet scrubber fine deposits.
- W23, W24 and W25 in the second of the wet scrubber fine deposits.
- WQ26 and W27 in the loader access way, which is relatively level with the ground surface of the adjoining Area 3.

Elevated concentrations of heavy end TPHs were detected in all wet scrubber fine samples submitted for analysis. PAHs were also detected in scrubber fine samples at concentrations exceeding background. There was one instance where light end TPHs marginally exceeded background levels.

Significant exceedences of the background concentrations for heavy end TPHs and PAHs (excluding BaP) were noted at a depth of 1.0-1.5 m into the fines beds where

the ground conditions are moister than the surface. Surface soil samples (not scrubber fines) from WQ26 and WQ27 consisting of silty clays were found to contain concentrations of TPHs, PAHs and BTEX at background levels.

Cu is the only heavy metal present in wet scrubber fines which significantly exceeds background concentrations. The concentrations of Cu present in the scrubber fines also exceed the Cu concentrations present in the Wallgrove quarried breccia. Surface soils at WQ26 and W27, adjacent and below the level of the scrubber fines, had Cu concentrations similar to background.

Tables 12 and 13 summarise the analytical results of samples selected for analysis.

Table 12 Analytical Results - Wet Scrubber Fines - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	BaP
				(mg/kg)			
WQ20	158	0.0-0.2	1.0/0.0	ND	1790	NA	NA
WQ21	163	1.2-1.4	18.1/0.5	ND	11545	25.3	ND
WQ22	164	0.0-0.2	23.1/0.3	ND	4795	NA	NA
WQ22	166	1.2-1.4	25/0.6	ND	5574	NA	NA
WQ23	196	1.0-1.2	61/2.0	ND	17883	NA	NA
WQ24	199	0.9-1.1	17.5/2.0	ND	16923	NA	NA
WQ25	211	1.0-1.2	5.0/1.0	20	20746	15.2	ND
WQ26	239	0.0-0.2	1.6/0.0	ND	ND	NA	NA
WQ27	234	0.0-0.2	3.0/0.0	ND	ND	ND	ND

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ20	158	0.0-0.2	1.0/0.0	ND	ND	ND	ND
WQ21	163	1.2-1.4	18.1/0.5	ND	ND	ND	ND
WQ22	164	0.0-0.2	23.1/0.3	ND	ND	ND	ND
WQ22	166	1.2-1.4	25/0.6	ND	ND	ND	ND
WQ23	196	1.0-1.2	61/2.0	ND	ND	ND	ND
WQ24	199	0.9-1.1	17.5/2.0	ND	ND	ND	ND
WQ25	211	1.0-1.2	5.0/1.0	ND	ND	ND	ND
WQ26	239	0.0-0.2	1.6/0.0	ND	ND	ND	ND
WQ27	234	0.0-0.2	3.0/0.0	ND	ND	ND	ND

ND Not Detected NA Not Analysed
PID 123 / 456 headspace reading / ambient air reading

Table 13 Analytical Results - Wet Scrubber Fines - pH, Heavy Metals & As

Sample Point	Sample No	Depth (m)	Comp ID	pH	Cu	Pb	Zn	Cd
				-	(mg/kg)			
WQ20-21-22	158-160-164	0.0-0.2	C3	8.6	170 / 510	16 / 48	50 / 150	ND / -
WQ23-24-25	194-197-202	0.0-0.2	C4	8.8	150 / 450	18 / 54	40 / 120	ND / -
WQ26-27	239-234	0.0-0.2	C5	7.6	40 / 80	19 / 38	57 / 114	ND / -
WQ21	163	1.2-1.4	-	9.3	180	13	49	ND
WQ24	201	1.2-1.4	-	8.8	175	15	47	ND

Sample Point	Sample No	Depth (m)	Comp ID	Cr III	Cr VI	Ni	As	Hg
				(mg/kg)				
WQ20-21-22	158-160-164	0.0-0.2	C3	6 / 18	ND / -	11 / 33	5.0 / 10	0.010 / 0.020
WQ23-24-25	194-197-202	0.0-0.2	C4	6 / 18	ND / -	12 / 36	4.0 / 12	0.010 / 0.03
WQ26-27	239-234	0.0-0.2	C5	13 / 26	ND / -	15 / 30	6.0 / 12	0.015 / 0.03
WQ21	163	1.2-1.4	-	4.5	ND	10	5.5	0.005
WQ24	201	1.2-1.4	-	5.5	ND	10	4.5	0.015

Composite results presented as RAW / ADJUSTED. Adjusted = Raw x no of sub samples in composite
ND Not Detected - Not Applicable
PID 123 / 456 headspace reading / ambient air reading

The sub samples of C3, C4 and C5 as well as the next depth sample from WQ26 and WQ27 were analysed for Cu. Table 14 summarises the analytical results.

Table 14 Analytical Results – WQ20, 21, 22, 23, 24, 25, 26 & 27- Discrete Samples – Cu

Sample Point	Sample No	Depth (m)	Cu (mg/kg)
WQ20	158	0.0-0.2	155
WQ21	160	0.0-0.2	180
WQ22	164	0.0-0.2	180
WQ23	194	0.0-0.2	150
WQ24	197	0.0-0.2	155
WQ25	202	0.0-0.2	160
WQ26	239	0.0-0.2	31
WQ26	240	0.2-0.5	15
WQ27	234	0.0-0.2	47
WQ27	235	0.2-0.5	12

2.1.8 Concrete Batching Plant - Soils

Soil samples were collected from WQ30, WQ31 and WQ32 which were positioned below overburden storage. Samples selected for organic contaminant analysis were found to have concentrations of TPHs, PAHs and BTEX at background concentrations. Material analysed was typical of overburden and comprised medium to heavy clays combined with rock and gravel clasts of varying sizes.

Total Cr and Ni were detected at concentrations significantly exceeding background at each of the sampling locations in this area. These elevated concentrations were detected in the majority of soil samples in the top 1.0 m of soil. Soil types from 1.0 m to the end of hole zone (2.0 m) do not significantly change. It should be noted that the concentrations of Cr and Ni detected are similar to those present in the Wallgrove quarried breccia.

Tables 15 and 16 summarise the analytical results of samples selected for analysis.

Table 15 Analytical Results - Concrete Batching Plant - TPHs and BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36
				(mg/kg)	
WQ30	233	1.8-2.0	0.8/0.0	ND	ND
WQ31	228	0.8-1.0	0.9/0.0	ND	ND
WQ31	226	0.2-0.5	0.8/0.0	ND	ND
WQ32	224	1.8-2.0	1.0/0.0	ND	ND

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ30	233	1.8-2.0	0.8/0.0	ND	ND	ND	ND
WQ31	228	0.8-1.0	0.9/0.0	ND	ND	ND	ND
WQ31	226	0.2-0.5	0.8/0.0	ND	ND	ND	ND
WQ32	224	1.8-2.0	1.0/0.0	ND	ND	ND	ND

ND Not Detected PID 123 / 456 headspace reading / ambient air reading

Table 16 Analytical Results - Concrete Batching Plant - pH, Heavy Metals & As

Sample Point	Sample No	Depth (m)	Comp ID	pH	Cu	Pb	Zn	Cd
				-	(mg/kg)			
WQ30-31-32	230-225-221	0.0-0.2	C6	9.0	31 / 93	20 / 60	84 / 252	ND/ -

Sample Point	Sample No	Depth (m)	Comp ID	Cr III	Cr VI	Ni	As	Hg
				(mg/kg)				
WQ30-31-32	230-225-221	0.0-0.2	C6	66 / 198	ND / -	125 / 375	6.5 / 19.5	0.025/0.05

Composite results presented as RAW / ADJUSTED. Adjusted = Raw x no of sub samples in composite

ND Not Detected - Not Applicable

The sub samples of C6 and the next depth sample from WQ30, 31 and 32 were analysed for Cu, Pb, Zn, Cr total/III, Ni, As and Hg. Additional testing involved deeper samples from WQ30 and WQ32 which were analysed for Ni and Cr. Table 17 summarises the analytical results.

Table 17 Analytical Results – WQ30, 31 and 32 – Discrete Samples – Heavy Metals & As

Sample Point	Sample No	Depth (m)	pH	Cu	Pb	Zn	Cd
			-	(mg/kg)			
WQ30	230	0.0-0.2	NA	26	19	70	NA
WQ30	231	0.2-0.5	NA	25	14	64	NA
WQ30	232	0.8-1.0	NA	NA	NA	NA	NA
WQ31	225	0.0-0.2	NA	30	21	74	NA
WQ31	226	0.2-0.5	NA	25	14	69	NA
WQ32	221	0.0-0.2	NA	35	19	95	NA
WQ32	222	0.2-0.5	NA	24	13	77	NA
WQ32	223	0.8-1.0	NA	NA	NA	NA	NA

Sample Point	Sample No	Depth (m)	Cr Total	Cr III	Ni	As	Hg
			(mg/kg)				
WQ30	230	0.0-0.2	69	69	125	7.0	0.020
WQ30	231	0.2-0.5	83	83	97	5.5	0.030
WQ30	232	0.8-1.0	70	NA	90	NA	NA
WQ31	225	0.0-0.2	72	72	125	7.0	0.025
WQ31	226	0.2-0.5	21	21	41	5.5	0.045
WQ32	221	0.0-0.2	64	64	120	6.5	0.025
WQ32	222	0.2-0.5	65	65	105	5.0	0.030
WQ32	223	0.8-1.0	15	NA	11	NA	NA

NA Not Analysed

2.1.9 Area 2 Overburden Spoil - Soils

Soil samples were collected from locations WQ33 - WQ38 (inclusive) which were positioned along the top of the overburden spoil adjacent to Archbold Road. Observations made during sampling did not identify the presence of waste materials in the overburden spoil. TPHs, PAHs and BTEX were not detected. Of the heavy metals Ni was the only one found at concentrations above background. Ni concentrations are similar to that found in the quarried breccia from the Wallgrove operation.

Tables 18 and 19 summarise the analytical results of samples selected for analysis.

Table 18 Analytical Results - Top of Overburden Spoil - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	B(a) P
				(mg/kg)			
WQ33	248	3.5-3.7	5.3/0.0	ND	ND	ND	ND
WQ34	251	0.0-0.2	2.0/0.0	ND	ND	ND	ND
WQ35	263	5.3-5.5	0.0/0.0	ND	ND	ND	ND
WQ36	266	1.3-1.5	0.1/0.0	ND	ND	ND	ND
WQ37	273	2.3-2.5	0.0/0.0	ND	ND	ND	ND
WQ38	280	4.3-4.5	0.0/0.0	ND	ND	ND	ND

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ33	248	3.5-3.7	5.3/0.0	ND	ND	ND	ND
WQ34	251	0.0-0.2	2.0/0.0	ND	ND	ND	ND
WQ35	263	5.3-5.5	0.0/0.0	ND	ND	ND	ND
WQ36	266	1.3-1.5	0.1/0.0	ND	ND	ND	ND
WQ37	273	2.3-2.5	0.0/0.0	ND	ND	ND	ND
WQ38	280	4.3-4.5	0.0/0.0	ND	ND	ND	ND

ND Not Detected PID 123 / 456 headspace reading / ambient air reading

Table 19 Analytical Results - Top of Overburden Spoil - pH, Heavy Metals & As

Sample Point	Sample No	Depth (m)	Comp ID	pH	Cu	Pb	Zn	Cd
				-	(mg/kg)			
WQ33-34-35	243-251-257	0.0-0.2	C7	8.9	37 / 111	21 / 63	77 / 231	ND/ -
WQ36-37-38	264-269275	0.0-0.2	C8	6.5	21 / 63	17 / 51	41 / 123	ND / -

Sample Point	Sample No	Depth (m)	Comp ID	Cr III	Cr VI	Ni	As	Hg
				(mg/kg)				
WQ33-34-35	243-251-257	0.0-0.2	C7	15 / 45	ND / -	31 / 93	5.0 / 15	0.040 / 0.12
WQ36-37-38	264-269-275	0.0-0.2	C8	8.5 / 25	ND / -	13 / 39	4.0 / 12	0.030 / 0.09

Composite results presented as RAW / ADJUSTED. Adjusted = Raw x no of sub samples in composite
ND Not Detected - Not Applicable

The sub samples of C7 and C8 were analysed for Cu, Zn, Ni, Cr and Cu, Cr respectively. Table 20 summarises the analytical results.

Table 20 Analytical Results – WQ33, 34, 35, 36, 37 and 38 – Discrete Samples – Heavy Metals

Sample Point	Sample No	Depth (m)	pH	Cu	Pb	Zn	Cd
			-	(mg/kg)			
WQ33	243	0.0-0.2	NA	35	NA	69	NA
WQ34	251	0.0-0.2	NA	39	NA	80	NA
WQ35	257	0.0-0.2	NA	36	NA	66	NA
WQ36	264	0.0-0.2	NA	29	NA	NA	NA
WQ37	269	0.0-0.2	NA	18	NA	NA	NA
WQ38	275	0.0-0.2	NA	15	NA	NA	NA

Sample Point	Sample No	Depth (m)	Cr Total	Cr III/VI	Ni	As	Hg
			(mg/kg)				
WQ33	243	0.0-0.2	17	NA	34	NA	NA
WQ34	251	0.0-0.2	17	NA	42	NA	NA
WQ35	257	0.0-0.2	15	NA	25	NA	NA
WQ36	264	0.0-0.2	12	NA	NA	NA	NA
WQ37	269	0.0-0.2	10	NA	NA	NA	NA
WQ38	275	0.0-0.2	4.5	NA	NA	NA	NA

NA Not Analysed

In addition to soil samples being collected from the plateau top of the overburden spoil, samples were collected from the lee side (west facing slope) of the spoil. As with the sampling along the top of the overburden spoil, no waste material was encountered. TPHs, PAHs and BTEX were not detected.

Ni and Cr concentrations were again found to be higher that the background soil levels of Area 3. When compared to the quarried breccia the lee soils have lower concentrations of Ni and Cr. Some results for Zn were found to be slightly higher the background.

Tables 21 and 22 summarise the analytical results of samples selected for analysis.

Table 21 Analytical Results - Lee Side of Overburden Spoil - TPHs, PAHs & BTEX

Sample Point	Sample No	Depth (m)	PID (ppm)	C6-C9	C10-36	Total PAHs	B(a) P
				(mg/kg)			
WQ39	306	0.8-1.0	0.0/0.0	ND	22	ND	ND
WQ40	299	0.0-0.2	0.0/0.0	ND	ND	ND	ND
WQ41	298	1.8-2.0	0.0/0.0	ND	ND	ND	ND
WQ42	293	0.8-1.0	0.0/0.0	ND	ND	ND	ND
WQ43	287	0.2-0.5	0.0/0.0	ND	ND	ND	ND
WQ44	281	0.0-0.2	0.0/0.0	ND	ND	ND	ND

Sample Point	Sample No	Depth (m)	PID (ppm)	Benzene	Toluene	Ethlybenzene	Xylenes
				(mg/kg)			
WQ39	306	0.8-1.0	0.0/0.0	ND	ND	ND	ND
WQ40	299	0.0-0.2	0.0/0.0	ND	ND	ND	ND
WQ41	298	1.8-2.0	0.0/0.0	ND	ND	ND	ND
WQ42	293	0.8-1.0	0.0/0.0	ND	ND	ND	ND
WQ43	287	0.2-0.5	0.0/0.0	ND	ND	ND	ND
WQ44	281	0.0-0.2	0.0/0.0	ND	ND	ND	ND

ND Not Detected PID 123 / 456 headspace reading / ambient air reading

Table 22 Analytical Results - Lee Side of Overburden Spoil - pH, Heavy Metals & As

Sample Point	Sample No	Depth (m)	pH	Cu	Pb	Zn	Cd
			-	(mg/kg)			
WQ39	304	0.0-0.2	7.8	40	18	75	ND
WQ40	299	0.0-0.2	7.8	36	22	79	ND
WQ41	295	0.0-0.2	8.3	66	23	63	ND
WQ42	290	0.0-0.2	7.4	29	24	81	ND
WQ43	286	0.0-0.2	7.1	33	24	82	ND
WQ44	281	0.0-0.2	7.1	32	21	82	ND

Sample Point	Sample No	Depth (m)	Cr total	Cr III	Cr VI	Ni	As	Hg
			(mg/kg)					
WQ39	304	0.0-0.2	NA	36	ND	53	5.0	0.030
WQ40	299	0.0-0.2	44	NA	NA	68	5.5	0.025
WQ41	295	0.0-0.2	NA	20	ND	32	4.5	0.025
WQ42	290	0.0-0.2	43	NA	NA	67	5.5	0.040
WQ43	286	0.0-0.2	NA	23	NA	35	5.0	0.025
WQ44	281	0.0-0.2	18	NA	NA	29	5.0	0.030

ND Not Detected NA Not Analysed
PID 123 / 456 headspace reading / ambient air reading

2.2 Quarried Rock Investigation

Two samples of quarried material were collected from both Pioneer's Wallgrove quarry and a similar quarry located at Bass Point on the South Coast NSW. The rock samples were subjected to mineralogy assessment (partial silicate analysis) as well as standard contamination testing as per soil samples. The quarry rock sourced from Wallgrove is a breccia associated with a volcanic intrusion. The quarry rock sourced from Bass Point is latite associated with a volcanic flow.

Concentrations of trace heavy metals in particular Cu, Cd, Cr (total), Hg and Mn in the Wallgrove breccia are similar to the background levels present in Area 3 soil. Ni and Zn were found at concentrations above background levels. As and Cr (VI) were not analysed for during the stage 2 investigation of Area 3 but the concentrations are similar to those of the region.

With respect to mineralogy the Wallgrove breccia and Bass Point latite have similar SiO_2, Al_2O_3 and Fe_2O_3 percentages. The Wallgrove breccia was noted as having higher MgO and TiO_2 percentages but lower Na_2O and K_2O percentages than the Bass Point latite.

Concentrations of trace metals in particular Mn and As were similar for both the breccia and latite. Cu was the only heavy metal in the Bass Point latite that had higher concentrations when compared to the Wallgrove breccia, all other heavy metals were found at lower concentrations.

Table 23 summarises the analytical results of the mineralogy assessment of quarried rock collected from Wallgrove and Bass Point quarries. Table 24 summarises the analytical results of standard contamination testing as per soil samples.

Table 23 Analytical Results - Quarried Rock - Partial Silicate Analysis

Quarry ID	Sample No	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O
		(%)						
Wallgrove	309	56.1	12.5	9.8	4.6	4.2	2.4	2.75
Wallgrove	310	52.3	12.2	10.9	5.1	5.8	2.4	2.6
Bass Pt	311	55.5	15.5	10.0	4.4	2.7	4.45	4.81
Bass Pt	312	54.1	15.7	10.7	5.0	2.8	4.50	4.25

Quarry ID	Sample No	TiO_2	BaO	LOI	H_2O
		(%)			
Wallgrove	309	1.55	0.031	6.1	1.50
Wallgrove	310	1.70	0.034	6.9	2.65
Bass Pt	311	0.99	0.051	1.55	0.26
Bass Pt	312	1.06	0.048	1.80	0.24

Table 24 Analytical Results - Quarried Rock - Heavy Metals & As

Quarry ID	Sample No	Cu	Pb	Zn	Cd
		(mg/kg)			
Wallgrove	309	27	14	78	ND
Wallgrove	310	29	15	71	ND
Bass Pt	311	145	9.0	38	ND
Bass Pt	312	110	9.5	44	ND

Sample Point	Sample No	Cr	Cr VI	Ni	As	Hg	Mn
		(mg/kg)					
Wallgrove	309	72	ND	110	3.5	0.020	680
Wallgrove	310	70	ND	120	3.5	0.025	750
Bass Pt	311	8.0	ND	8.0	5.0	0.010	550
Bass Pt	312	8.0	ND	8.0	4.0	0.010	780

ND Not Detected

2.3 Surface Water Investigation

Surface water samples were collected from Bob's Dam (WQ29) and from an upslope canal (WQ28) directing water to the dam. Surface water samples were analysed for TSS, pH and total metals. Table 25 summarises the analytical results of the surface water samples. Field measurements including temperature, conductivity, pH and dissolved oxygen were taken during the sampling of Bob's Dam (WQ29) and are summarised in Table 26.

Concentrations of Cu, Pb, Zn, Cd, Cr and Ni exceeded the ANZECC (1992) guidelines for the protection of freshwater aquatic ecosystems. These exceedences are likely to be attributable to the high suspended sediment loads noted during sampling. At present there are no ANZECC guidelines for concentrations of Ba, Mn and SS in surface waters.

Table 25 Analytical Results - Surface Waters - TSS, pH, Heavy Metals & As

Sample Point	Sample No	PH	SS	Cu	Pb	Zn	Cd
		-	(mg/l)				
ANZECC (1992)		*6.5-9.0*	-	*0.002-0.005*	*0.001-0.005*	*0.005-0.05*	*0.0002-0.002*
WQ28	308	8.7	2100	0.019	0.10	0.17	0.0062
WQ29	218	8.7	1800	0.075	0.090	0.24	0.0060

Sample Point	Sample No	Cr	Ba	Ni	As	Mn	Hg
		(mg/l)					
ANZECC (1992)		*0.01*	-	*0.015-0.15*	*0.05*	-	*0.0001*
WQ28	308	0.19	1.2	0.16	0.04	1.4	ND
WQ29	218	0.20	1.0	0.19	0.02	0.64	ND

ND Not Detected

Table 26 Field Measurements - Bob's Dam (WQ29)

Sample ID	Temp °C	Cond MS/cm	pH -	DO mg/l
WQ29	18.5	0.864	8.86	7.39

2.4 Groundwater Investigation

Five groundwater monitoring wells were installed in Area 3 in 1995. Area 3 is a green field site which is located adjacent to and west of the Pioneer Road Services asphalt plant operations. In 1995 groundwater monitoring well MW1 was found to be dry as was the case in 1998 as part of this investigation. It should be noted that groundwater was not encountered at any of the soil sampling locations associated with this investigation.

ADI has compared the 1995 and 1998 groundwater chemistry data. In general the groundwater types initially found in Area 3 have remained the same. Groundwater present at MW2 is saline in nature and of a Na-Cl type. The groundwater present at MW3, MW4 and MW5 is fresh in nature and of a HCO3-Na-Ca type. Table 27 summarises the analytical results and field measurements for the chemistry of site groundwater.

Table 27 Groundwater Chemistry - 1998

GW ID	Sample No	PH -	Cond mS/cm	TDS mg/l	DO mg/l	Temp °C
MW2	217	6.5 / 6.3	18.4 / 13.3	12100	3.2 / 2.09	18.9
MW3	214	7.0 / 6.93	1.14 / 1.12	905	7.5 / 5.3	18.8
MW4	213	6.8 / 6.72	1.06 / 0.972	700	3.2 / 1.01	19.6
MW5	212	6.8 / 6.81	1.27 / 1.03	810	3.9 / 2.72	19.3

123 / 345 : Lab Results / Field Measurement
Temperature is a field measurement only.

GW ID	Sample No	Na	K	Ca	Mg	Cl	HCO3
		(mg/l)					
MW2	217	2630	25	730	860	7370	910
MW3	214	185	0.3	110	43	64	730
MW4	213	98	0.1	140	22	33	550
MW5	212	140	1.0	135	35	86	750

GW ID	Sample No	NO3	PO4	SO4
		(mg/l)		
MW2	217	ND	ND	110
MW3	214	0.53	ND	140
MW4	213	1.0	ND	140
MW5	212	ND	ND	51

ND Not Detected

In 1995 the following contaminants exceeded the ANZECC (1992) guidelines for protection of fresh water aquatic ecosystems:

- Pb, Zn and PAHs at MW2.
- Zn and PAHs at MW3.
- PAHs at MW4.

This investigation has only identified Zn at MW2 exceeding the ANZECC (1992) guidelines for protection of fresh water aquatic ecosystems. It should be noted that Pb was detected at the upper range of the ANZECC guideline.

TPHs, BTEX and PAHs were not detected. The concentration of Zn at MW3 has significantly decreased since 1995. Tables 28 and 29 summarise the analytical results of groundwater sampling conducted as part of this investigation.

Table 28 Analytical Results - Groundwater - Heavy Metals & As

GW ID	Sample No	Cu	Pb	Zn	Cd	Cr	Ni
		(mg/l)					
ANZECC (1992)		*0.002-0.005*	*0.001-0.005*	*0.005-0.05*	*0.0002-0.002*	*0.01*	*0.015-0.15*
MW2	217	0.003	0.005	0.075	0.0004	ND	ND
MW3	214	0.001	ND	0.012	ND	ND	ND
MW4	213	0.001	ND	0.016	ND	ND	ND
MW5	212	0.004	ND	0.015	ND	ND	ND

GW ID	Sample No	As	Hg	Ba	Mn
		(mg/l)			
ANZECC (1992)		*0.05*	*0.0001*	-	-
MW2	217	ND	ND	0.2	2.3
MW3	214	ND	ND	ND	0.02
MW4	213	ND	ND	ND	0.02
MW5	212	ND	ND	ND	0.24

ND Not Detected

Table 29 Analytical Results - Groundwater - TPHs, PAHs & BTEX

GW ID	Sample No	C6-C9	C10-36	Total PAHs
		(mg/l)		
ANZECC (1992)		-	-	*0.003*
MW2	217	ND	ND	ND
MW3	214	ND	ND	ND
MW4	213	ND	ND	ND
MW5	212	ND	ND	ND

GW ID	Sample No	Benzene	Toluene	Ethlybenzene	Xylenes
		(mg/L)			
ANZECC (1992)		*0.3*	*0.3*	*0.14*	*0.38*
MW2	217	ND	ND	ND	ND
MW3	214	ND	ND	ND	ND
MW4	213	ND	ND	ND	ND
MW5	212	ND	ND	ND	ND

ND Not Detected

3.0 QUALITY ASSURANCE / QUALITY CONTROL

All soil, sediment, rock and water samples collected by ADI were analysed by NATA registered laboratories using APHA and/or USEPA based methods. Partial silicate analysis, Cu, Pb, Zn, Cd, Cr (VI, III and total), Ni, As, Hg, Mn, Ba, pH, major ions, conductivity, TDS, DO, MBAS and SS were analysed for by Sydney Analytical Laboratories (SAL). TPHs, PAHs and BTEX were analysed for by AMDEL. Internal quality procedures reported by SAL included laboratory duplicates, laboratory blanks and the analysis of a certified reference material. Internal quality procedures reported by AMDEL included laboratory duplicates, laboratory blanks, spiked samples, duplicate spikes and surrogate spiked samples.

Tables 30, 31, 32 and 33 summarise the analytical methods used by the laboratories for this investigation.

Table 30 Analytical Methods - SAL - Soil & Sediments

Analyte	Referenced Method	Instrument	Detection Limits
pH	P3 (1:5 soil/water extract, APHA4500HB)	pH Electrode	0.1 units
Cu	P3/M1 (USEPA3050/APHA3111B)	AAS (flame)	0.5 mg/kg
Pb	P3/M1 (USEPA3050/APHA3111B)	AAS (flame)	0.5 mg/kg
Zn	P3/M1 (USEPA3050/APHA3111B)	AAS (flame)	0.5 mg/kg
Cd	P3/M1 (USEPA3050/APHA3111B)	AAS (flame)	0.5 mg/kg
Cr (total)	P3/M1 (USEPA3050/APHA3111B)	AAS (flame)	0.5 mg/kg
Cr (VI)	P1/M6(phosphate buffer solextract/APHA3500D)	spectrophotometer	0.5 mg/kg
Ni	P3/M1 (USEPA3050/APHA3111B)	AAS (flame)	0.5 mg/kg
As	P3/M7 (USEPA7061/APHA3114B)	AAS (hydride gen)	0.5 mg/kg
Hg	P1/M3 (USEPA7471/APHA3112B)	AAS (cold vapour)	0.005 mg/kg
PSA	P5 G3/G4 (HF digestion/Na_2O_2 fussion) In House Method	AAS (flame)	0.01-0.1 %

PSA Partial Silicate Analysis
P1 Analysis performed on sample as received.
P3 Sample dried, jaw crushed and sieved at 2 mm.
P5 Full crush using ring grinder <150 um.

Table 31 Analytical Methods - SAL - Waters

Analyte	Referenced Method	Instrument	Detection Limits
Cu	USEPA6020	ICP-MS	0.001 mg/l
Pb	USEPA6020	ICP-MS	0.001 mg/l
Zn	USEPA6020	ICP-MS	0.001 mg/l
Cd	USEPA6020	ICP-MS	0.0002 mg/l
Cr (total)	USPEA6020	ICP-MS	0.01 mg/l
Ni	USEPA6020	ICP-MS	0.01 mg/l
As	APHA3114B	AAS (hydride gen)	0.01 mg/l
Hg	APHA3112B	AAS (cold vap)	0.0001 mg/l
Ba	USEPA6020	ICP-MS	0.1 mg/l
Mn	APHA3111B	AAS (flame)	0.01 mg/l
pH	APHA4500HB	pH Electrode	0.1 units
Cond	APHA2510B	Cond Electrode	-
TDS	APHA2540C	gravimetric	1.0 mg/l
DO	APHA5210B	DO elctrode	0.1 mg/l
MBAS	APHA5540C	colorimetric	0.01 mg/l
Na+	APHA3500D	AAS (emission)	0.1 mg/l
K+	APHA3500D	AAS (emission)	0.1 mg/l
Ca++	APHA3111B	AAS (flame)	0.1 mg/l
Mg++	APHA3111B	AAS (flame)	0.1 mg/l
Cl-	APHA4500D	Ion Specific Electrode	1.0 mg/l
HCO3-	APHA2320B	pH Electrode	1.0 mg/l
NO3-	APHA4500F	Flow Injection Analyser	0.1 mg/l
PO4---	APHA4500F	Flow Injection Analyser	0.1 mg/l
SO4--	Dept Min Resources BaCrO4 Method	Spectrophotometer	2.0 mg/l

Samples analysed as received by the laboratory

Table 32 Analytical Methods - AMDEL - Soil & Sediments

Analyte	Referenced Method	Instrument	Detection Limits
TPHs	E1220 (USEPA3550/In House)	GC-FID	10, 20, 100, 100 mg/kg
BTEX	E1010 (USEPA5030/USEPA8020)	GC-MS-P&T	0.5, 1, 1, 3 mg/kg
PAHs	E1110 (USEPA3510/USEPA8270)	GC-MS	0.5 mg/kg - 1 mg/kg

Table 33 Analytical Methods - AMDEL - Waters

Analyte	Referenced Method	Instrument	Detection Limits
TPHs	E0220 (USEPA3550/In House)	GC-FID	20, 40, 200, 200 ug/l
BTEX	E0010 (USEPA5030/USEPA602)	GC-MS-P&T	0.5, 1, 1, 3 ug/l
PAHs	E0110 (USEPA3510/USEPA8270)	GC-MS	1-2 ug/l

3.1 Field QA/QC - Soil & Sediments

The field QA/QC programme consisted of duplicate samples collected and analysed at rate of 10%. The field duplicate samples were collected/generated by the splitting a sample collected into two during field work as required by ERM Mitchell McCotter.

Given that volatile and semi volatile contaminants were being targeted by this investigation excessive handling of the sample and homogenising was avoided during the collection of duplicate samples. The analytical data from field duplicates provides information regarding the distribution of contaminants in site soils/sediments.

The relative percentage differences (RPDs) of field duplicates indicates that the distribution of heavy metals and arsenic in site soil/sediment is uniform with individual RPDs rarely exceeding 10% and with all RPDs below 30%.

Where detected in field duplicate samples the RPDs for C_{10}-C_{36} TPHs ranged from 12 – 50 %. Only one field duplicate returned detectable concentrations of PAHs, the RPD was very high (146%).

This variable distribution of heavy end TPHs and PAHs may be attributable to the mechanism by which TPHs find their way into site soils and the position of sampling locations with respect to operational activities in the area. At this site the source of PAHs, and TPHs in soil may arises from spills, leaks or the release of fluids associated with operations of an asphalt plant and as such are unlikely to produce uniform contamination of soil. The area of site where the high RPD for PAHs was recorded was the surface soil adjacent to the tank farm of the asphalt plant (WQ14). This area was observed to be subjected to spills of hydrocarbon products such as bitumen and disturbance by plant vehicles.

C_6-C_9, BaP, benzene, toluene, ethylbenzene, xylenes and Cd were not detected in any field duplicate samples submitted for analysis. The laboratory's QA/QC will be assessed to determine the reliability of the data provided for these contaminants.

Tables 34 and 35 summarise the analytical results of the field duplicate samples, while Table 36 provides a summary of the RPD values for the analytes detected in the duplicate samples.

Table 34 Analytical Results - Field Duplicates - pH, Heavy Metals & As

Sample Point	Sample No	PH	Cu	Pb	Zn	Cd
		-	(mg/kg)			
WQ16	179	7.6	68	10	35	ND
180 dup of 179 WQ16		7.8	71	10	35	ND
RPD (%)		2.6	4.3	0.0	0.0	NC
WQ44	281	7.1	32	21	82	ND
282 dup of 281 WQ44		7.0	30	23	79	ND
RPD (%)		1.4	6.5	9.0	3.7	NC
WQ42	290	7.4	29	24	81	ND
291 dup of 290 WQ42		7.4	32	19	85	ND
RPD (%)		0.0	10	23	5	NC
WQ40	299	7.8	36	22	79	ND
300 dup of 299 WQ40		7.7	36	22	82	ND
RPD (%)		1.3	0.0	0.0	3.7	NC
WQ3	142	NA	29	16	75	ND
143 dup of 142 WQ3		NA	31	19	80	ND
RPD (%)		NC	6.7	17	6.5	NC
WQ37	269	NA	18	20	37	ND
270 dup of 269 WQ37		NA	16	20	34	ND
RPD(%)		NC	11.8	0.0	8.5	NC

Sample Point	Sample No	Cr III	Cr VI	Cr total	Ni	As	Hg
		(mg/kg)					
WQ16	179	NA	NA	7.0	9.5	5.0	0.010
180 dup of 179 WQ16		NA	NA	7.0	10	5.0	0.010
RPD (%)		NC	NC	0.0	5.1	0.0	0.0
WQ44	281	NA	NA	18	29	5.0	0.03
282 dup of 281 WQ44		NA	NA	16	28	5.5	0.03
RPD (%)		NC	NC	12	3.5	9.5	0.0
WQ42	290	NA	NA	43	67	5.5	0.040
291 dup of 290 WQ42		NA	NA	59	64	6.0	0.035
RPD (%)		NC	NC	31	4.6	8.7	13
WQ40	299	NA	NA	44	68	5.5	0.025
300 dup of 299 WQ40		NA	NA	39	61	6.5	0.020
RPD(%)		NC	NC	12	11	17	22
WQ3	142	NA	NA	75	105	5.0	0.015
143 dup of 142 WQ3		NA	NA	75	110	5.5	0.015
RPD (%)		NC	NC	0.0	4.7	9.5	0.0
WQ37	269	NA	NA	10	9.5	4.5	0.025
270 dup of 269 WQ37		NA	NA	12	8.5	4.0	0.025
RPD (%)		NC	NC	18	11	11.8	0.0

NA Not Analysed NC Not Calculable ND Not Detected

Table 35 Analytical Results - Field Duplicates - TPHs, PAHs & BTEX

Sample Point	Sample No	C6-C9	C10-36	Total PAHs	BaP
		(mg/kg)			
WQ14	096	ND	6849	0.9	ND
097 dup of 096 WQ14		ND	10650	5.8	ND
RPD(%)		NC	44	146	NC
WQ15	111	ND	3197	ND	ND
112 dup of 111 WQ15		ND	2710	ND	ND
RPD (%)		NC	16	NC	NC
WQ10	122	ND	164	ND	ND
123 dup of 122 WQ10		ND	146	ND	ND
RPD (%)		NC	12	NC	NC
WQ3	142	ND	1246	ND	ND
143 dup of 142 WQ3		ND	1898	ND	ND
RPD (%)		NC	41	NC	NC
WQ6	146	ND	137	ND	ND
147 dup of 146 WQ6		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ7	150	ND	ND	ND	ND
151 dup of 150 WQ7		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ16	179	ND	106	ND	ND
180 dup of 170 WQ16		ND	176	ND	ND
RPD (%)		NC	50	NC	NC
WQ44	281	ND	ND	ND	ND
282 dup of 281		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ31	226	ND	ND	NA	NA
227 dup of 227		ND	ND	NA	NA
RPD (%)		NC	NC	NC	NC

NA Not Analysed NC Not Calculable
ND Not Detected

Table 35 continued

Sample Point	Sample No	Benzene	Toluene	Ethlybenzene	Xylenes
		(mg/kg)			
WQ14	096	ND	ND	ND	ND
097 dup of 096 WQ14		ND	ND	ND	ND
RPD(%)		NC	NC	NC	NC
WQ15	111	ND	ND	ND	ND
112 dup of 111 WQ15		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ10	122	ND	ND	ND	ND
123 dup 122 WQ10		ND	ND	ND	ND
RPD(%)		NC	NC	NC	NC
WQ3	142	ND	ND	ND	ND
143 dup of 142 WQ3		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ6	146	ND	ND	ND	ND
147 dup of 146 WQ6		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ7	150	ND	ND	ND	ND
151 dup of 150 WQ7		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ16	179	ND	ND	ND	ND
180 dup of 170 WQ16		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ44	281	ND	ND	ND	ND
282 dup of 281		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC
WQ31	226	ND	ND	ND	ND
227 dup of 227		ND	ND	ND	ND
RPD (%)		NC	NC	NC	NC

NC Not Calculable ND Not Detected

Table 36 Summary of Field Duplicate RPDs

Analyte	Average RPD (%)	Range (%)
PH	1.3	0.0 – 2.6
Cu	5.2	0.0 – 10
Pb	8.0	0.0 – 23
Zn	3.1	0.0 – 5.0
Cd	-	-
Cr (total)	13.8	0.0 – 31
Ni	6.1	3.5 – 11
As	8.8	0.0 – 17
Hg	8.8	0.0 – 22
C6-C9	-	-
C10-C36	32.6 *	12 – 50 *
PAHs (total)	146 **	**
BaP	-	-
Benzene	-	-
Toluene	-	-
Ethylbenzene	-	-
Xylenes	-	-

** Matrix Interference responsible for

3.2 Field QA/QC – Groundwater & Surface Water

Field QA/QC associated with groundwater sampling comprised the collection of a field duplicate sample and trip blank for both laboratories. When sampling for organic contaminants a disposable bailer and bottom opening device for VOCs was used to directly fill the appropriate sample containers at each well. This negated the need to collect an equipment blank for organic contaminants. When sampling for inorganic contaminants an equipment blank was collected and a second trip blank was acidified so as to check the quality/quantity of the acid being used in the field. Organic contaminant sample containers came pre preserved from AMDEL.

Surface water sampling was conducted at the same time as groundwater sampling. Only two surface water samples were collected and as such no field duplicate samples were collected. Sampling of surface waters involved submerging then opening of sample containers until filled and subsequently capped. Surface water samples accompanied groundwater samples to the laboratories.

Tables 37 and 38 summarise the analytical results of the field duplicate samples collected during groundwater sampling. Where contaminants were found in detectable concentrations, their respective RPDs were less than 20% with the majority being less than 10%.

These results indicate that the sampling procedures followed were adequate.

TPHs, PAHs, benzene, toluene, ethylbenzene, xylenes, Pb, Cd, Cr, Ni, As and Hg were not detected in the field duplicate submitted for analysis. The laboratory's

QA/QC will be assessed to determine the reliability of the data provided for these contaminants.

Tables 39 and 40 summarise the analytical results of the trip blank, equipment blank and acid blank. The summarised results indicate that the sample handling and transport procedures (trip blanks) as well as the equipment decontamination and sample preservation techniques (equipment and acidified trip blanks) were adequate.

Table 37 Analytical Results – Field Duplicate - Inorganics

GW ID	Sample No	PH	Cu	Pb	Zn	Cd
		-	(mg/l)			
MW3	214	7.0	0.001	<0.001	0.012	<0.0002
215 dup of 214 MW3		7.0	0.001	<0.001	0.010	<0.0002
RPD (%)		0.0	0.0	NC	18	NC

GW ID	Sample No	Cr total	Ni	As	Hg
		(mg/l)			
MW3	214	<0.01	<0.01	<0.01	<0.0001
215 dup of 214 MW3		<0.01	<0.01	<0.01	<0.0001
RPD (%)		NC	NC	NC	NC

GW ID	Sample No	Cond	TDS	DO	MBAS
		mS/cm	mg/l	mg/l	mg/l
MW3	214	1.410	905	7.5	<0.01
215 dup of 214 MW3		1.400	900	7.4	<0.01
RPD (%)		0.71	0.55	1.3	NC

GW ID	Sample No	Na	K	Ca	Mg	Cl	HCO3
		(mg/l)					
MW3	214	185	0.3	110	43	64	730
215 dup of 214 MW3		180	0.3	110	43	67	735
RPD (%)		2.7	0.0	0.0	0.0	4.6	0.68

GW ID	Sample No	NO3	PO4	SO4
		(mg/l)		
MW3	214	0.53	<0.1	140
215 dup of 214 MW3		0.53	<0.1	130
RPD (%)		0.0	NC	7.4

NC Not Calculable

Table 38 Analytical Results – Field Duplicate - Organics

GW ID	Sample No	C6-C9	C10-36	Total PAHs	B(a) P
		(mg/l)			
MW3	214	ND	ND	ND	ND
215 dup of 214 MW3		ND	ND	ND	ND
RPD(%)		NC	NC	NC	NC

Sample Point	Sample No	Benzene	Toluene	Ethlybenzene	Xylenes
		(mg/kg)			
MW3	214	ND	ND	ND	ND
215 dup of 214 MW3		ND	ND	ND	ND
RPD(%)		NC	NC	NC	NC

NC Not Calculable

Table 39 Analytical Results – Trip, Equipment & Acid Blanks – Inorganics

Sample Type	Sample No	pH	Cond	TDS	DO	MBAS
		-	MS/cm	Mg/l	mg/l	mg/l
Trip blank	219	6.4	0.0022	<1	7.1	<0.01
Equip blank	216	6.7	0.0021	<1	8.6	<0.01

Sample Type	Sample No	Na	K	Ca	Mg	Cl	HCO3
		(mg/l)					
Trip blank	219	0.1	<0.1	<0.1	<0.1	<1	<1
Equip blank	216	0.2	<0.1	<0.1	<0.1	<1	<1

Sample Type	Sample No	NO3	PO4	SO4
		(mg/l)		
Trip blank	219	<0.1	<0.1	<2
Equip blank	216	<0.1	<0.1	<2

GW ID	Sample No	Cu	Pb	Zn	Cd	Cr	Ni
		(mg/l)					
Trip blank	219	<0.001	<0.001	<0.001	<0.0002	<0.01	<0.01
Equip blank	216	<0.001	<0.001	<0.001	<0.0002	<0.01	<0.01
Acid blank	220	<0.001	<0.001	<0.001	<0.0002	<0.01	<0.01

Sample Type	Sample No	As	Hg	Ba	Mn
		(mg/l)			
Trip blank	219	<0.01	<0.0001	<0.1	<0.01
Equip blank	216	<0.01	<0.0001	<0.1	<0.01
Acid blank	220	<0.01	<0.0001	<0.1	<0.01

Table 40 Analytical Results – Trip Blank – Organics

Sample Type	Sample No	C6-C9	C10-14	C15-C28	C29-C36	C6-C36	Total PAHs
		(mg/l)					
Trip blank	219	ND	ND	ND	ND	ND	ND

Sample Type	Sample No	Benzene	Toluene	Ethlybenzene	Xylenes
		(ug/L)			
Trip blank	219	ND	ND	ND	ND

ND Not Detected

3.3 Laboratory QA/QC – Soil and Sediment

3.3.1 SAL

Internal quality procedures reported by SAL included laboratory duplicates, laboratory blanks and the analysis of a certified reference material. Concentrations of heavy metals and As in the laboratory blanks were all less than the method detection limit (not detected results). Such results indicate that there was no contamination of soil/sediment samples in the laboratory environment and no carry over between sample analysis.

The RPDs associated with laboratory duplicates for analytes with detectable concentrations meet both the laboratory's and ADI's QA/QC requirements. Table 41 summarises the laboratory duplicate results.

Percentage recoveries associated with the analysis of a certified reference material for analytes with detectable concentrations meet both the laboratory's and ADI's QA/QC requirements. Table 42 summarises the results of the analysis of the certified reference material.

Based on the results of laboratory QA/QC reported the analytical results provided by SAL for soil and sediment samples are reliable.

Table 41 Analytical Results – Laboratory Duplicates – Heavy Metals & As

Sample Point	Sample No	PH	Cu	Pb	Zn	Cd
		-	(mg/kg)			
WQ44	281	7.1	32	21	82	ND
Lab dup of 281 WQ44		7.0	35	19	85	ND
RPD (%)		1.4	9	10	3.6	NC
Acceptance Criteria		*30*	*30*	*30*	*15*	-
WQ32	221	NA	35	19	95	NA
Lab dup of 221 WQ32		NA	37	17	93	NA
RPD (%)		NC	5.6	5.6	2.1	NC
Acceptance Criteria		-	*30*	*30*	*15*	-

Sample Point	Sample No	Cr total	Ni	As	Hg
		(mg/kg)			
WQ44	281	18	29	5.0	0.030
Lab dup of 281 WQ44		20	31	5.5	0.025
RPD (%)		10.5	6.7	9.5	18
Acceptance Criteria		*30*	*30*	*50*	*50*
WQ32	221	64	120	6.5	0.025
Lab dup of 221 WQ32		64	120	7.0	0.030
RPD (%)		0.0	0.0	7.4	18

The acceptance criteria shown is derived as follows:
RPD <50% applies for low level (low level is considered to be <20 x detection limit)
RPD <30% applies for medium level (medium level is considered to be 20-100 x detection limit)
RPD<15% applies for high level (high level is considered to be >100 x detection limit)
No acceptance criteria exists for lab duplicates where results are <2 x detection limit)
These acceptance criteria are those of SAL and have been adopted by ADI.
NA Not Analysed NC Not Calculable ND Not Detected

Table 42 Analytical Results – Certified Reference Material – Heavy Metals & As

Sample Details	Cu	Pb	Zn	Cd
	(mg/kg)			
Analytical Result	20	24	115	ND
Expected Result	18.5	22.7	119	-
% Recovery	108	106	97	NC
Acceptance Criteria	*90-115*	*90-110*	*90-110*	-
Analytical Result	17	23	125	ND
Expected Result	18.5	22.7	119	-
% Recovery	*92*	*101*	*105*	-
Acceptance Criteria	*90-115*	*90-110*	*90-110*	-

Sample Details	Cr total	Ni	As	Hg
	(mg/kg)			
Analytical Result	79	53	12	0.14
Expected Result	123	55.3	11.1	0.129
% Recovery	64	96	108	109
Acceptance Criteria	*60-80*	*90-110*	*90-120*	*85-110*
Analytical Result	89	56	13	0.13
Expected Result	123	55.3	11.1	0.129
% Recovery	72	101	117	101
Acceptance Criteria	*60-80*	*90-110*	*90-120*	*85-110*

The acceptance criteria shown are those of SAL and have been adopted by ADI.
NC Not Calculable ND Not Detected
- Not present in certified reference material given the PQL/method detection limit.

3.3.2 AMDEL

Internal quality procedures reported by AMDEL included laboratory blanks, laboratory duplicates, spiked samples, duplicate spikes and surrogate spikes (PAHs only).

Concentrations of TPHs, BTEX and PAHs detected in blank samples were all less than the method detection limits (not detected results). These results indicate that there was no contamination of soil/sediment samples in the laboratory environment and no carry over between sample analysis.

Given that the majority of analytical testing associated with this project was for organic contaminants in soil/sediment numerous laboratory duplicates were analysed by AMDEL. Non detect results were returned for C_6-C_9, benzene, toluene, ethylbenzene, xylenes and the majority of individual PAHs. The RPD values for analytes with detectable concentrations meet the laboratory's quality system requirements.

Table 43 provides a summary of the laboratory duplicate RPDs for analytes that returned detectable concentrations.

Table 44 summarises the percentage recoveries associated with spiked soil samples analysed by AMDEL. The percentage recoveries of spiked samples analysed by AMDEL meet their quality system requirements.

Table 45 summarises the results of duplicate spiked soil samples analysed by AMDEL. The RPDs of laboratory duplicate spiked samples analysed by AMDEL meet their quality system requirements.

Table 46 summarises the percentage recoveries of surrogate spikes (PAHs only) analysed by AMDEL. The reported percentage recoveries indicate that the method for PAHs used by AMDEL is reliable.

Based on the results of laboratory QA/QC reported the analytical results provided by AMDEL for soil and sediment samples are reliable.

Table 43 Summary of Laboratory Duplicate RPDs

Analyte	Average RPD (%)	Range (%)	Acceptance Criteria (%)
C10-C14	23	4 – 35	30/50
C15-C28	25	18 - 32	30/50
C29-C36	19.5	0 - 33	30/50
C6-C36 (total)	20	0 - 30	30/50
Phenanthrene	11 *	-	30/50

*Single duplicate RPD value
The acceptance criteria shown is that of AMDEL and has been adopted by ADI. 30 or 50% is dependent on the concentrations present with respect to PQL of method.

Table 44 Summary of % Recoveries - Laboratory Spiked Samples

Analyte	Average Percentage Recovery (%)	Range of Percentage Recoveries (%)	Acceptance Criteria (%)
C6-C9	87	73-116	70-130
C15-C28	93	78-111	70-130
C6-C36 (total)	89	76-104	70-130
Benzene	107	100-110	70-130
Toluene	110	110*	70-130
Ethylbenzene	110	110*	70-130
Xylenes	106	93-110	70-130
Naphthalene	91	76-100	70-130
Acenaphthylene	88	74-96	70-130
Acenaphthene	90	76-100	70-130
Fluorene	90	75-100	70-130
Phenanthrene	87	76-102	70-130
Anthracene	87	76-100	70-130
Fluoranthene	88	74-100	70-130
Pyrene	88	72-100	70-130
Benz (a) anthracene	89	70-102	70-130
Chrysene	92	76-102	70-130
Benzo (b/k)fluoranthene	89	70-98	70-130
Benzo (a) pyrene	91	76-100	70-130
Indeno (1,2,3-cd) pyrene	92	75-132	70-130
Dibenz (a-h)anthracene	86	75-102	70-130
Benzo (g,h,i) perylene	89	70-104	70-130

* all % recoveries reported were the same value
The acceptance criteria shown are those of AMDEL and have been adopted by ADI.

Table 45 Summary of RPDs - Laboratory Duplicate Spikes

Analyte	Average RPD (%)	Range of RPDs (%)	Acceptance Criteria (%)
C6-C9	5.5	0.0-10	30/50
C15-C28	5.2	0.0-14	30/50
C6-C36 (total)	4.0	0.0-12	30/50
Benzene	2.2	0.0-10	30/50
Toluene	1.1	0.0-10	30/50
Ethylbenzene	4.6	0.0-11	30/50
Xylenes	2.6	0.0-10	30/50
Napthalene	3.9	0.0-26	30/50
Acenaphthylene	4.9	0.0-27	30/50
Acenaphthene	4.3	0.0-26	30/50
Fluorene	3.9	0.0-24	30/50
Phenanthrene	4.8	0.0-23	30/50
Anthracene	4.8	0.0-29	30/50
Fluoranthene	4.7	0.0-28	30/50
Pyrene	5.2	0.0-31	30/50
Benz (a) anthracene	6.3	0.0-35	30/50
Chrysene	3.1	0.0-18	30/50
Benzo (b/k)fluoranthene	6.1	0.0-39	30/50
Benzo (a) pyrene	3.7	0.0-16	30/50
Indeno (1,2,3-cd) pyrene	8.9	0.0-42	30/50
Dibenz (a-h)anthracene	5.1	0.0-33	30/50
Benzo (g,h,i) perylene	6.3	0.0-29	30/50

The acceptance criteria shown is that of AMDEL and has been adopted by ADI. 30 or 50% is dependent on the concentrations present with respect to PQL of method.

Table 46 Summary of % Recoveries - PAH Surrogate Spikes

PAH Surrogates	Average Percentage Recovery (%)	Range of Percentage Recoveries (%)	Acceptance Criteria (%)
2-Fluorobiphenyl	101	80-119	60-130
p-Terphenyl-d14	98	58*-128	60-130
Anthracene-d10	101	88-123	60-130

* low % recovery due to matrix interference.
The acceptance criteria shown are those of AMDEL and have been adopted by ADI.

3.4 Laboratory QA/QC - Groundwater & Surface Water

3.4.1 SAL

Internal quality procedures reported by SAL included a laboratory duplicate and a laboratory blank. Concentrations of heavy metals and As in the laboratory blank were all less than the method detection limit (not detected results) as were most of the ionic species. Where detected the concentrations of ionic species in the blank are at levels marginally above the PQL. Such results indicate that there was no contamination of water samples in the laboratory environment and no carry over between sample analysis.

The RPD values for analytes with detectable concentrations meet the laboratory's QA/QC requirements. Table 47 summarises the laboratory duplicate results.

Based on the results of the lab blank and the acceptable RPD values associated with the laboratory duplicate the analytical results for water samples provided by SAL are reliable.

Table 47 Analytical Results - Laboratory Duplicate

GW ID	Sample No	pH	Cu	Pb	Zn	Cd
		-	(mg/l)			
MW4	213	6.8	0.001	<0.001	0.016	<0.0002
Lab dup of 213 MW4		6.7	0.002	<0.001	0.014	<0.0002
RPD (%)		1.5	67	NC	13	NC
Acceptance Criteria		*10*	-	-	*20*	-

GW ID	Sample No	Cr total	Ni	As	Hg	Ba	Mn
		(mg/l)					
MW4	213	<0.01	<0.01	<0.01	<0.0001	<0.10	0.02
Lab dup of 213 MW4		<0.01	<0.01	<0.01	<0.0001	<0.10	0.02
RPD (%)		NC	NC	NC	NC	NC	0.0
Acceptance Criteria		-	-	-	-	-	*50*

GW ID	Sample No	Cond	TDS	DO	MBAS
		mS/cm	mg/l	mg/l	mg/l
MW4	213	1.060	700	3.2	<0.01
Lab dup of 213 MW4		1.050	690	3.0	<0.01
RPD (%)		1.0	1.4	6.5	NC
Acceptance Criteria		*10*	*10*	*20*	-

Table 47 continued

GW ID	Sample No	Na	K	Ca	Mg	Cl	HCO3
		(mg/l)					
MW4	213	98	0.1	140	22	33	550
Lab dup of 213 MW4		99	0.2	135	22	35	540
RPD (%)		1.0	67	3.6	0.0	0.0	1.8
Acceptance Criteria		*10*	-	*10*	*10*	*20*	*10*

GW ID	Sample No	NO3	PO4	SO4
		(mg/l)		
MW4	213	1.0	<0.1	140
Lab dup of 213 MW4		1.0	<0.1	135
RPD (%)		0.0	NC	3.6
Acceptance Criteria		*20*	-	*10*

The acceptance criteria shown is that of SAL and has been adopted by ADI.
The criteria is a concentration/method detection based criteria and is derived as follows:
RPD <50% applies for low level (low level is considered to be <10 x detection limit)
RPD <20% applies for medium level (medium level is considered to be 10-50 x detection limit)
RPD<10% applies for high level (high level is considered to be >50 x detection limit)
No acceptance criteria exists for lab duplicates where results are <2 x detection limit)

3.4.2 AMDEL

Internal quality procedures reported by AMDEL included a laboratory blank, laboratory duplicate, spiked sample, duplicate spike and surrogate spike (PAHs only).

Concentrations of TPHs, BTEX and PAHs detected in the blank sample were all less than the method detection limits (not detected results). These results indicate that there was no contamination of water samples in the laboratory environment and no carry over between sample analysis.

Concentrations of TPHs, BTEX and PAHs detected in the lab duplicate were all less than the method detection limit (not detected results). This situation prevents the calculation of RPDs and further interpretation.

Table 48 summarises the percentage recoveries associated with spiked water samples analysed by AMDEL. The percentage recoveries of spiked samples analysed by AMDEL meet their quality system requirements.

Table 49 summarises the results of a duplicate spiked water sample analysed by AMDEL. The RPDs of the laboratory duplicate spiked sample analysed by AMDEL meet their quality system requirements.

Table 50 summarises the percentage recoveries of surrogate spikes (PAHs only) analysed by AMDEL. The reported percentage recoveries indicate that the method for PAHs used by AMDEL is reliable.

Based on the results of laboratory QA/QC reported the analytical results provided by AMDEL for water samples are reliable.

Table 48 Summary of % Recoveries - Spiked Samples

Analyte	Percentage Recovery (%)	Acceptance Criteria (%)
C6-C9	111	70-130
C15-C28	115	70-130
C6-C36 (total)	113	70-130
Benzene	90	70-130
Toluene	100	70-130
Ethylbenzene	100	70-130
Xylenes	100	70-130
Napthalene	72	70-130
Acenaphthylene	71	70-130
Acenaphthene	71	70-130
Fluorene	71	70-130
Phenanthrene	79	70-130
Anthracene	88	70-130
Fluoranthene	79	70-130
Pyrene	76	70-130
Benz (a) anthracene	71	70-130
Chrysene	73	70-130
Benzo (b/k)fluoranthene	70	70-130
Benzo (a) pyrene	71	70-130
Indeno (1,2,3-cd) pyrene	82	70-130
Dibenz (a-h)anthracene	85	70-130
Benzo (g,h,i) perylene	85	70-130

The acceptance criteria shown are those of AMDEL and have been adopted by ADI.

Table 49 Summary of RPDs - Laboratory Duplicate Spiked Samples

Analyte	RPD (%)	Acceptance Criteria (%)
C6-C9	1.0	20
C15-C28	1.0	20
C6-C36 (total)	0.0	20
Benzene	0.0	20
Toluene	11	20
Ethylbenzene	11	20
Xylenes	11	20
Napthalene	1.0	20
Acenaphthylene	1.0	20
Acenaphthene	0.0	20
Fluorene	1.0	20
Phenanthrene	3.0	20
Anthracene	1.0	20
Fluoranthene	3.0	20
Pyrene	1.0	20
Benz (a) anthracene	0.0	20
Chrysene	0.0	20
Benzo (b/k)fluoranthene	0.0	20
Benzo (a) pyrene	0.0	20
Indeno (1,2,3-cd) pyrene	0.0	20
Dibenz (a-h)anthracene	5.0	20
Benzo (g,h,i) perylene	17	20

The acceptance criteria shown is that of AMDEL and has been adopted by ADI

Table 50 Summary of % Recoveries - PAH Surrogate Spikes

PAH Surrogates	Average Percentage Recovery (%)	Range of Percentage Recoveries (%)	Acceptance Criteria (%)
2-Fluorobiphenyl	88	73-111	60-130
p-Terphenyl-d14	125	119-130	60-130
Anthracene-d10	100	95-103	60-130

The acceptance criteria shown are those of AMDEL and have been adopted by ADI.

4.0 CONCLUSIONS & RECOMMENDATIONS

ADI at the time of writing this report was unaware of site investigation criteria agreed to by the accredited Environmental Auditors, Contaminated Land, representing Pioneer and Fitzpatrick. Given that the analytical data generated by this investigation will be reviewed by the auditors, ADI decided to present the data without an assessment against a site investigation criteria based on published guidelines. As a result analytical data generated by this investigation for soil/sediment are compared with background data from Area 3. This background data was part of ADI's (1995) stage 2 investigation. Assessment of the data was limited to whether or not there are concentrations exceeding background and their vertical and lateral extent where practical. Surface water and groundwater data generated by this investigation was assessed against the guidelines published in ANZECC (1992).

In our opinion given the targeted nature of the soil/sediment sampling plan, it is not practical to discuss/estimate the size of potential hotspots found as a result of this investigation. We believe that such a discussion should follow on from additional sampling of a systematic nature and the agreement by the auditors on site investigation criteria.

Table 51 summarises the soil/sediment sampling locations and the contaminants found to exist at concentrations above background.

Table 51 Summary of Soil/Sediment Sampling Locations with Concentrations Above Background

Sampling Location	Contaminants Above Background
WQ2	C_{10}-C_{36} TPHs, Cr and Ni
WQ3	C_{10}-C_{36} TPHs
WQ4	C_{10}-C_{36} TPHs and PAHs
WQ5	C_6-C_9 and C_{10}-C_{36} TPHs, PAHs and Xylenes
WQ6	C_{10}-C_{36} TPHs
WQ8	C_{10}-C_{36} TPHs
WQ9	C_{10}-C_{36} TPHs
WQ10	C_{10}-C_{36} TPHs
WQ11	C_{10}-C_{36} TPHs
WQ12	C_{10}-C_{36} TPHs and PAHs
WQ13	C_{10}-C_{36} TPHs
WQ14	C_{10}-C_{36} TPHs and PAHs
WQ15	C_{10}-C_{36} TPHs
WQ16	C_6-C_9 and C_{10}-C_{36} TPHs, PAHs, Ethylbenzene, Cu
WQ17	C_6-C_9 and C_{10}-C_{36} TPHs, PAHs, Cu, Pb and Zn
WQ18	C_{10}-C_{36} TPHs, PAHs and Cu
WQ19	C_{10}-C_{36} TPHs, PAHs and Cu
WQ20	C_{10}-C_{36} TPHs and Cu
WQ21	C_{10}-C_{36} TPHs, PAHs and Cu
WQ22	C_{10}-C_{36} TPHs and Cu

Table 51 continued

Sampling Location	Contaminants Above Background
WQ23	C_{10}-C_{36} TPHs and Cu
WQ24	C_{10}-C_{36} TPHs and Cu
WQ25	C_{10}-C_{36} TPHs, PAHs and Cu
WQ30	Cr and Ni
WQ31	Cr and Ni
WQ32	Cr and Ni
WQ33	Ni
WQ34	Ni
WQ35	Ni
WQ36, 37 and 38	potential for Ni based on WQ33, 34 and 35 results.
WQ39	Ni and Cr
WQ40	Ni and Cr
WQ41	Ni
WQ42	Ni and Cr
WQ43	Ni
WQ44	Ni

With respect to mineralogy the Wallgrove breccia and Bass Point latite have similar SiO_2, Al_2O_3 and Fe_2O_3 percentages. The Wallgrove breccia was found to have higher MgO and TiO_2 percentages but lower Na_2O and K_2O percentages than the Bass Point latite. Concentrations of trace metals in particular Mn and As were similar for both the breccia and latite. Cu was the only heavy metal in the Bass Point latite present at higher concentrations compared with the Wallgrove breccia. All other metals were found at lower concentrations.

It should be noted that concentrations of trace metals in particular Cu, Cd, Cr (total), Hg and Mn in the Wallgrove breccia are similar to the background concentrations of Area 3 soil. Ni and Zn were found at concentrations above background. As and Cr (VI) were not analysed for during the stage 2 investigation of Area 3 but the concentrations are similar to those of the region.

Of the targeted analytes Cu, Pb, Zn, Cd, Cr and Ni were found to exceed the ANZECC (1992) guidelines for the protection of freshwater aquatic ecosystems in samples collected from Bob's Dam (WQ29) and WQ28 and upslope canal directing water to the dam. These exceedences are likely to be attributable to the high suspended sediment loads noted during sampling.

Groundwater monitoring wells installed in Area 3 in 1995 were resampled as part of this investigation. Monitoring well MW2 was the only well to have a contaminant (Zn) present at a concentration exceeding the ANZECC (1992) guidelines for the protection of freshwater aquatic ecosystems. It should be noted that the concentration of Pb detected at MW2 was at the upper range of the ANZECC guideline. Given the improvement in groundwater quality since 1995 ADI recommends that a further round of sampling be undertaken to confirm the quality of the groundwater.

ATTACHMENT A

FIELD SAMPLE POINT RECORDS

Summary of Soil Sampling Locations Logs - Pioneer Wallgrove Quarry

ımple Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
Q14	096	0.0-0.2	black/grey gravels and fines	10.3/0.5
14/04/98	097	0.0-0.2	duplicate of 096	
	098	0.2-0.5	grey gravel fines	6.0/0.3
	099	0.5-0.6	green grey silty clay	1.5/0.4
		0.6-1.6	green grey silty clay	
	100	1.6-1.8	green grey silty clay	26/0.8
		1.8	refusal	
WQ18	101	0.0-0.2	gravel and fines, loose bitumen included	3.0/0.0
14/04/98		0.2	brown silty clay encountered, very thin lense , to thin to sample	
	102	0.2-0.5	light grey with a tinge of brown gravels and fines	1.4/0.0
	103	0.5-0.7	grey with a tinge of brown/red silty clay, very dry and fine, shale and sandstone fragments	0.9/0.0
		0.5-1.5	grey with a tinge of brown/red silty clay, very dry and fine, shale and sandstone fragments	
	104	1.5-1.7	black gravels and fines hydrocarbon stained heavy end odour noted	37/0.0
		1.7-3.0	black gravels and fines hydrocarbon stained heavy end odour noted	
	105	3.0-3.2	black gravels and fines, sticky/tacky due to hydrocarbons	17.5/0.0
		3.2-4.0	black grey gravel fines, not sticky as 3.0-3.2m heavy end odour noted	
	115	4.0-4.2	black grey gravel fines, not sticky as 3.0-3.2m	10.4/0.0
		4.2-4.5	black grey gravel fines, not sticky as 3.0-3.2m	
		4.5	green/grey clays, faint heavy end odour	
	116	4.6-4.8	green/grey clays, faint heavy end odour	6.0/0.3

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ19		surface	bitumen road way - very thin	
'/04/98	106	0.0-0.2	grey gravels and fines, shale and sandstone fragments	1.0/0.0
	107	0.2-0.5	brown silty clay, very powdery fragments of shale and sandstone	0.9/0.0
		0.5-1.0	brown silty clay, very powdery fragments of shale and sandstone, but less rocky than 0.2-0.5m	
	108	1.0-1.1	brown silty clay, very powdery fragments of shale and sandstone, but less rocky than 0.2-0.5m	0.4/0.0
		1.1-1.8	brown silty clay, very powdery fragments of shale and sandstone, but less rocky than 0.2-0.5m	
	109	1.8-2.0	coarse yellow brown sands and round pebbles	1.4/0.0
		2.0-2.2	brown with a tinge of yellow, very powdery very dry silty clays with small rock fragments	
	110	2.2-2.4	brown with a tinge of yellow, very powdery very dry silty clays with small rock fragments	1.0/0.0
		2.4-3.0	brown with a tinge of yellow, very powdery very dry silty clays with small rock fragments	
WQ15		0.0-0.1	bitumen paved surface	
14/04/98	111	0.1-0.3	black grey gravel and fines	0.9/0.0
	112	0.1-0.3	duplicate of 111	
		0.3-0.4	brown green sandy clay, moist	
	113	0.4-0.6	brown green sandy clay, moist	0.4/0.0
		0.6-1.0	brown green sandy clay, moist	
		1.0-1.5	light green/grey sandy clay, moist	
	114	1.5-1.7	light green/grey sandy clay, moist	1.0/0.0
		1.7	refusal	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ9		0.0-0.02	bitumen pavement	
/04/98	117	0.02-0.2	brown silty sandy fines and gravels	7.0/0.3
	118	0.2-0.5	black silty sandy fines and gravels	166/0.3
		0.5-0.6	thin lense of crushed or heavily weathered sandstone, coarse sandy texture	
	119	0.6-0.8	brown orange clay, moist plastic, small sandstone and shale rocks	63/0.1
		0.8-1.5	brown orange clay, moist plastic, small sandstone and shale rocks	
	120	1.5-1.7	brown grey clay and shale fragments	153/0.0
		1.7-2.7	brown grey clay and shale fragments	
	121	2.7-2.9	brown sandy clay, moist with shale fragments	28/0.0
WQ10		surface	gravels and patchy bitumen paving	
15/04/98	122	0.0-0.2	brown very sandy clay some gravel and pebbles	1.5/0.5
	123	0.0-0.2	duplicate of 122	
	124	0.2-0.5	brown very sandy clay some gravel and pebbles	2.4/0.5
		0.5-0.6	grey brown silty clay and gravels	
	125	0.6-0.8	grey brown silty clay and gravels	2.5/0.7
		0.8-1.5	grey brown silty clay and gravels	
		1.5	brown silty clay, black fines and gravels. faint sweet odour noted (unknown)	
	126	1.5-1.7	brown silty clay, black fines and gravels. faint sweet odour noted (unknown)	2.7/0.6
		1.7-2.3	brown silty clay, black fines and gravels. faint sweet odour noted (unknown)	
	127	2.3-2.5	brown grey silty clay	3.0/0.7
	128	2.5-2.7	grey brown sandy fines, pieces of brown clay lateritic pebbles some gravels	3.8/0.7
		2.7-3.0	grey brown sandy fines, pieces of brown clay lateritic pebbles some gravels	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ4		surface	gravels	
·/04/98	129	0.0-0.2	grey with a tinge of brown silty clay, loose, fine and dry, some gravels	6.9/0.4
	130	0.2-0.5	grey with a tinge of brown silty clay, loose, fine some shale fragments	6.6/0.0
		0.5-0.9	grey with a tinge of brown silty clay, loose, fine some shale fragments	
		0.9-1.0	brown clay some shale fragments and gravels	
	131	1.0-1.2	brown clay some shale fragments and gravels	6.7/0.0
		1.2-1.5	brown clay some shale fragments and gravels	
	132	1.5-1.7	grey with a tinge of brown silty clay, loose, fine very loose, dry some shale fragments	7.5/0.0
		1.7-1.9	grey with a tinge of brown silty clay, loose, fine very loose, dry some shale fragments	
	133	1.9-2.1	yellow brown clay with shale fragments, clay is denser that material above	7.0/0.0
		2.1-2.5	yellow brown clay with shale fragments, clay is denser that material above	
	134	2.5-2.7	grey very fine silty clay, dry and loose with shale fragments	5.0/0.0
		2.7-3.0	grey very fine silty clay, dry and loose with shale fragments	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ5		0.0-0.15	concrete paving	
7/04/98	135	0.15-0.35	grey road base gravels, moist due to coring	2.7/0.0
	136	0.15-0.35	duplicate of 135	
		0.35-0.4	grey road base gravels, moist due to coring	
	137	0.4-0.6	grey sandy silty clay with shale fragments	3.1/0.0
		0.6-0.7	grey sandy silty clay with shale fragments	
	138	0.7-0.9	brown orange clay and shale fragments	3.6/0.0
		0.9-1.5	brown orange clay and shale fragments	
		1.5-1.6	brown grey silty clay, loose with shale fragments	
	139	1.6-1.8	brown grey silty clay, loose with shale fragments	15.6/0.0
		1.8-2.3	brown grey silty clay, loose with shale fragments	
	140	2.3-2.5	black grey lense faint sweetish odour	44.4/0.0
		2.5-2.6	grey brown sandy clay, moist with nodules of extremely weathered shale and sandstone	
	141	2.6-2.8	grey brown sandy clay, moist with nodules of extremely weathered shale and sandstone	2.1/0.0
WQ3		0.0-0.025	bitumen paving	
15/04/98	142	0.025-0.0225	black grey sandy silty fines and gravels	3.0/0.0
	143	0.025-0.0225	duplicate of 142	
	144	0.0225-0.5	brown grey sandy clay some shale and sandstone pebbles	3.0/0.0
	145	0.5-0.7	grey brown sandy silty clay, shale fragments	3.0/0.0
		0.7-3.0	grey brown sandy silty clay, shale fragments	

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Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ6		0.0-0.02	bitumen pavement	
5/04/98	146	0.02-0.22	black/green silty sandy clay	3.3/0.0
	147	0.02-0.22	duplicate of 146	
	148	0.22-0.5	brown/orange and green sandy clay	3.6/0.0
		0.5-0.6	yellow fine silty sandy clay, powdery and very dry, fragments of shale	
	149	0.6-0.8	yellow fine silty sandy clay, powdery and very dry, fragments of shale	1.0/0.0
		0.8-1.4	yellow fine silty sandy clay, powdery and very dry, fragments of shale	
		1.4	Refusal	
WQ7	150	0.0-0.2	brown sandy loam topsoil and grass	1.3/0.1
16/04/98	151	0.0-0.2	duplicate of 150	
	152	0.2-0.5	black grey fines, shale and gravel rocks	1.2/0.0
		0.5-1.2	black grey fines, shale and gravel rocks	
	153	1.2-1.5	brown tinge of yellow coarse sandy clay	7.0/0.7
		1.5-1.9	brown tinge of yellow coarse sandy clay	
	154	1.9-2.2	yellow sandy clay and shale fragments	1.6/0.0
		2.2-2.7	yellow sandy clay and shale fragments	
		2.7	Refusal	
WQ8		0.0-0.05	bitumen paving	
16/04/98	155	0.05-0.25	grey silty sandy clay fines, gravel and shale fragments	4.2/0.4
	156	0.25-0.5	grey silty sandy clay fines, gravel and shale fragments	2.0/0.3
	157	0.5-0.7	grey brown silty sandy clay, very loose, shale fragments	2.0/0.0
		0.7-3.0	grey brown silty sandy clay, very loose, shale fragments	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ20	158	0.0-0.2	brown sandy silty clay fines from wet scrubber	1.0/0.0
7/04/98	159	0.2-0.3	brown sandy silty clay fines from wet scrubber	0.7/0.0
		0.3	Refusal	
Q21	160	0.0-0.2	brown sandy silty clay fines from wet scrubber	13/0.3
17/04/98	161	0.2-0.5	brown sandy silty clay fines from wet scrubber	8.7/0.3
		0.5-0.7	darker brown and moist sandy silty clay fines from wet scrubber faint heavy end odour noted	
	162	0.7-0.9	darker brown and moist sandy silty clay fines from wet scrubber faint heavy end odour noted	11/0.2
		0.9-1.2	darker brown and moist sandy silty clay fines from wet scrubber faint heavy end odour noted	
	163	1.2-1.4	darker brown and moist sandy silty clay fines from wet scrubber faint heavy end odour noted	18.1/0.5
WQ22	164	0.0-0.2	brown sandy silty clay fines	23.1/0.3
17/04/98	165	0.2-0.5	brown sandy silty clay fines	13.7/0.5
		0.5-1.2	brown sandy silty clay fines	
	166	1.2-1.4	brown sandy silty clay fines	25/0.6
WQ13		surface	yellow coarse sand, moist, spill response material	
20/04/98	167	0.0-0.2	black grey gravels and gravel fines	30/0.0
	168	0.2-0.5	black grey large gravels and gravel fines	16/0.0
	169	0.2-0.5	black grey large gravels and gravel fines	
		0.5-0.8	black grey large gravels and gravel fines	
	170	0.8-1.0	black grey silty clay, moist	16.6/0.0
		1.0-1.5	black grey silty clay, moist	
	171	1.5-1.7	grey green silty sandy clay, dry	29/0.0
		1.7-2.0	grey green silty sandy clay, dry	
	172	2.3-2.5	light grey green sandy silty clay, loose and dry	27/0.0
		2.5	Refusal	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ12		surface	yellow coarse sand, moist, spill response material	
1/04/98	173	0.0-0.2	black grey gravels and fines	23.0/0.0
	174	0.2-0.5	black grey gravels and fines	27/0.0
	175	0.6-0.8	brown green clay, nodules of extremely weathered shale/sandstone	32/0.1
	176	0.8-1.0	brown orange sandy clay some green mottles	62/0.1
	177	1.0-1.2	grey brown green silty clay	25/0.1
		1.2-1.5	grey brown green silty clay	
		1.5-2.0	grey green silty clay, minor brown mottles	
		2.0-2.3	green sandy silty clay	
	178	2.3-2.5	green sandy silty clay	17/0.3
		2.5-2.8	green sandy silty clay	
		2.8	Refusal	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ16		surface	grassed area	
/04/98	179	0.0-0.2	brown sandy clay soil, very loose	13.8/0.3
	180	0.0-0.2	duplicate of 179	
	181	0.2-0.5	coarse brown/yellow sands, dry, numerous small gravel rocks, some coated in dry bituminous material	6.0/0.3
	182	0.5-0.6	brown grey silty sandy fine clay, very loose, dry shale fragments and gravels, some gravels coated in dry bituminous	13/0.3
		0.6-1.0	brown grey silty sandy fine clay, very loose, dry shale fragments and gravels, some gravels coated in dry bituminous	
		1.0-1.3	hydrocarbon sludge, saturated fines, very tacky, holds forms, spongy/plastic characteristics	
	183	1.3-1.5	hydrocarbon sludge, saturated fines, very tacky, holds forms, spongy/plastic characteristics end of this stratum is unknown, possible displacement into soil bore wall	32/0.1
	184	2.3-2.5	dark brown black/grey sandy silty fines fragments of shale	21/0.0
		2.5-2.6	brown silty sandy clay	
	185	2.6-2.8	brown silty sandy clay	20/0.0

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ17		surface	grassed area	
/04/98	186	0.0-0.2	coarse sandy clay soil, very loose, small pebbles and numerous pieces of bitumen.	11.5/0.0
	187	0.2-0.5	brown coarse sands, black gravel fines, shale fragments, pieces of bitumen and/or gravel coated in bituminous material	13.0/0.0
		0.5-1.0	brown trending to black coarse sands, gravel fines shale fragments, pieces of bitumen and/or gravel coated in bituminous material	
	188	1.0-1.2	black brown coarse sandy fines, very loose sandstone fragments, lateritic pebbles, shale and gravels	15.2/0.0
		1.2-2.8	black brown coarse sandy fines, very loose sandstone fragments, lateritic pebbles, shale and gravels	
	189	2.8-3.0	grey brown gravel fines and pebbles, shale rocks very tacky due to hydrocarbons	36/0.0
		3.0-4.0	grey brown gravel fines and pebbles, shale rocks hydrocarbon coated, not tacky	
	190	4.0-4.2	brown orange clay, dense and stiff trending into green/brown	7.0/0.0
WQ11		0.0-0.002	bitumen paving	
20/04/98	191	0.002-0.2	black grey gravels and gravel fines	227/0.0
		0.2-0.3	black grey gravels and gravel fines	
	192	0.3-0.5	grey brown green dense stiff clay	237/0.0
		0.5-1.1	grey brown green dense stiff clay	
	193	1.1-1.3	brown orange clay, stiff and dense	230/0.0
		1.5-2.1	brown orange clay, stiff and dense	
		2.2	Refusal	
			PID readings taken over 1 hr after collection due to flat batteries.	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ23 /04/98	194	0.0-0.2	brown silty sandy clay - fines from wet scrubber faint heavy end TPH odour noted	4.0/0.5
	195	0.2-0.5	brown silty sandy clay - fines from wet scrubber faint heavy end TPH odour noted	12/0.5
		0.5-0.85	brown silty sandy clay - fines from wet scrubber faint heavy end TPH odour noted	
		0.85-1.0	grey brown silty sandy clay - fines from wet scrubber, stronger heavy end TPH odour noted	
	196	1.0-1.2	grey brown silty sandy clay - fines from wet scrubber, stronger heavy end TPH odour noted	61/2.0
		1.2-1.5	grey brown silty sandy clay - fines from wet scrubber, stronger heavy end TPH odour noted PID readings taken over 1 hr after collection due to flat batteries	
WQ24 21/04/98	197	0.0-0.2	brown silty sandy clay - fines from wet scrubber very faint heavy end TPH odour noted	3.8/3.0
	198	0.2-0.5	brown silty sandy clay - fines from wet scrubber faint heavy end TPH odour noted	4.0/2.0
		0.5-0.8	brown silty sandy clay - fines from wet scrubber faint heavy end TPH odour noted	
		0.8-0.9	brown silty sandy clay - fines from wet scrubber moister and stronger heavy end TPH odour noted	
	199	0.9-1.1	brown silty sandy clay - fines from wet scrubber moister and stronger heavy end TPH odour noted	17.5/2.0
		1.1-1.2	brown silty sandy clay - fines from wet scrubber moister and stronger heavy end TPH odour noted	
	200	1.2-1.4	brown silty sandy clay - fines from wet scrubber moister and stronger heavy end TPH odour noted	6.0/3.0
	201	1.2-1.4	duplicate of 200 PID readings taken over 1 hr after collection due to flat batteries	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ25	202	0.0-0.2	brown silty sandy clay - fines from wet scrubber	3.2/2.3
/04/98			faint heavy end TPH odour noted	
	203	0.0-0.2	203 is a duplicate of 202	
	204	0.2-0.5	slightly moister brown silty sandy clays - fines from wet scrubber, faint heavy end TPH odour	3.1/1.8
		0.5-0.7	slightly moister brown silty sandy clays - fines from wet scrubber, faint heavy end TPH odour	
		0.7-0.9	increasing moisture brown silty sandy clays - fines from wet scrubber, heavy end TPH odour	
	211	1.0-1.2	moist brown silty sandy clays - fines from wet scrubber, heavy end TPH odour	50/1.0
		1.2-1.4	moist brown silty sandy clays - fines from wet scrubber, heavy end TPH odour	
WQ1	205	0.0-0.2	orange grey clay, dense, stiff and moist	2.5/1.1
21/04/98	206	0.2-0.5	drier orange grey clay, dense and stiff	2.1/1.3
		0.5-0.7	orange grey clay some shale fragments	
		0.7-0.8	orange grey clay, some red mottling, becoming friable due to dryness.	
	207	1.0-1.2	grey orange clay with red mottles, stiff and dense but friable	1.5/1.3
		1.2	Refusal, weathered shale	
WQ2	208	0.0-0.2	grey plastic clay, shale fragments, vegetation and moist	1.9/1.2
21/04/98				
	209	0.2-0.5	grey plastic clay, shale and gravel, some vegetation	1.8/1.4
		0.5-0.8	grey plastic clay, shale and gravel, some vegetation	
		0.8-1.0	saturated grey silty clay sediments	
	210	1.0-1.2	saturated grey silty clay sediments	2.0/1.3
		1.2-1.4	saturated grey silty clay sediments	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
'Q32 /04/98	221	0.0-0.2	Crushed aggregate on surface, dark grey/brown clays, some vegetation matter. Slightly moist no odour.	0.0/0.0
	222	0.2-0.5	Gravels mixed with fine grey clays, some sand lenses , moist no odour	0.8/0.0
		0.5-0.8	Tan brown/grey mottled heavy clay, moist, some gravels, earthy odour	
	223	0.8-1.0	Tan brown/grey mottled heavy clay, moist, some gravels, earthy odour	0.9/0.0
		1.0-1.5	Tan brown/grey heavy clay, moist but becoming drier, no odour	
		1.5-1.8	Tan brown/grey heavy clay, becoming stiffer, similar moisture levels as per 1.0-1.5m, no odour	
	224	1.8-2.0	Tan brown/grey heavy clay, becoming stiffer, similar moisture levels as per 1.5-1.8 m, no odour	1.0/0.0
WQ31 28/04/98	225	0.0-0.2	Surface gravels/aggregate mixed with dark brown/ grey clay and some clays, moist and no odour	0.7/0.0
	226	0.2-0.5	Large pieces of gravel/rock in medium tan/grey/red mottled clay, moist and no odour	0.8/0.0
	227	0.2-0.5	duplicate of 226	
		0.5-0.8	Large rocks mixed with tan coloured medium clay, slightly moist, no odour	
	228	0.8-1.0	Large rocks mixed with tan coloured medium clay, slightly moist, no odour	0.9/0.0
		1.0-1.5	Large rocks with medium brown clay, becoming dry and friable, no odour	
		1.5-1.8	Medium tan clay, some sands, large rocks, earthy odour, slightly moist	0.9/0.0

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
'/Q26		Surface	Bitumen	
./04/98	239	0.0-0.2	Fine brown silty clay. some gravels, dry and no odour	1.6/0.0
	240	0.2-0.5	Mottled tan, orange and black uniform sandy clay dry and no odour	1.4/0.0
		0.5-0.8	Mottled tan, orange and black uniform sandy clay becoming moist, no odour	
	241	0.8-1.0	Mottled tan, orange and black uniform sandy clay becoming moist, no odour	1.5/0.0
		1.0-1.3	Mottled tan, orange and black uniform sandy clay becoming moist, no odour	
	242	1.3-1.5	Mottled tan, orange and black uniform sandy clay becoming moist, no odour	0.8/0.0

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
''Q33 ./04/98	243	0.0-0.2	Grey sandstone rocks and boulders, easily breaks associated grey fines of a sandy clay texture, some shale present also	4.0/0.0
	244	0.0-0.2	duplicate of 243	
	245	0.2-0.5	Grey sandstone rocks and boulders, easily breaks associated grey fines of a sandy clay texture, some shale present also	4.2/0.0
		0.5-1.5	Grey sandstone rocks and boulders, easily breaks associated grey fines of a sandy clay texture, some shale present also	
	246	1.5-1.7	Orange/brown moist, plastic clay with small v hard white rocks (quartz like)	4.0/0.0
		1.5-2.5	Orange/brown moist, plastic clay with small v hard white rocks (quartz like)	
	247	2.5-2.7	Orange/brown v coarse sandy clay	5.2/0.0
		2.7-3.5	Orange/brown v coarse sandy clay increasing shale and sandstone rocks (grey) of large size mixed throughout clay	
	248	3.5-3.7	Orange/brown v coarse sandy clay increasing shale and sandstone rocks (grey) of large size mixed throughout clay	5.3/0.0
		3.5-4.5	Orange/brown v coarse sandy clay increasing shale and sandstone rocks (grey) of large size mixed throughout clay	
	249	4.5-4.7	Grey gravelly clay (small round pebbles) and rocks of a large size (shale and sandstone)	1.4/0.0
		4.7-5.5	Grey gravelly clay (small round pebbles) and rocks of a large size (shale and sandstone)	
	250	5.5-5.7	Yellow/brown sandy clay, stiff and dry	1.9/0.0
		5.7-6.0	Yellow/brown sandy clay, stiff and dry	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
"Q34 /04/98	251	0.0-0.2	Grey sandstone and shale rocks/boulders, grey sandy clay, numerous rock fragments	2.0/0.0
	252	0.2-0.5	Grey sandstone and shale rocks/boulders, grey sandy clay, numerous rock fragments	
		0.5-1.5	Grey sandstone and shale rocks/boulders, grey sandy clay, numerous rock fragments	
	253	1.5-1.7	Yellow brown sandstone as well as mudstone/shale mixed with a coarse sandy clay soil	0.0/0.0
		1.5-2.5	Yellow brown sandstone as well as mudstone/shale mixed with a coarse sandy clay soil	
	254	2.5-2.7	Grey/green sandstone and grey sandy clay fines	0.0/0.0
		2.7-3.5	Grey sandstone and shale, very strong/hard rocks and grey sandy clay	
	255	3.5-3.7	Grey sandstone and shale, very strong/hard rocks and grey sandy clay	2.0/0.0
		3.7-4.5	Grey sandstone and shale, very strong/hard rocks and grey sandy clay	
		4.5-4.8	Darker and moister grey sandy clay, shale, sandstone and metasediments (greenish in colour)	
	256	4.8-5.0	Darker and moister grey sandy clay, shale, sandstone and metasediments (greenish in colour)	1.0/0.0
		5.0	Refusal	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
7Q35	257	0.0-0.2	Grey shale rocks and grey black fine clay	0./0.0
/04/98	258	0.0-0.2	duplicate of 257	
	259	0.2-0.5	Grey shale rocks and grey black fine clay	0.0/0.0
		0.5-1.5	Grey shale rocks and grey black fine clay	0.0/0.0
		1.5-2.5	Metasediments of shale and sandstone, v hard and grey clay	
	260	2.5-2.7	Metasediments of shale and sandstone, v hard and grey clay	0.0/0.0
		2.7-3.5	Metasediments of shale and sandstone, v hard and grey clay	
	261	3.5-3.7	Metasediments of shale and sandstone, v hard and grey clay	0.0/0.0
		3.5-4.5	Grey brown shale rock, sandstone rock v hard and dense (meta sediment), sandy clay grey soil	
	262	4.5-4.7	Grey brown shale rock, sandstone rock v hard and dense (meta sediment), sandy clay grey soil	0.0/0.0
		4.7-5.3	Grey sandstone/shale and meta sediments Grey rocky clay soil	
	263	5.3-5.5	Grey sandstone/shale and meta sediments Grey rocky clay soil	0.0/0.0
		5.5-6.0	Grey sandstone/shale and meta sediments Grey rocky clay soil	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
'VQ36 :/04/98	264	0.0-0.2	Surface gravels and some grass over grey brown sandy clay soil, large pieces of metasediment rocks dry with no odour	0.0/0.0
	265	0.2-0.5	Becoming a dark brown clay with metasediment gravels and rocks, dry with no odour	0.0/0.0
		0.5-1.3	Becoming a dark brown clay with metasediment gravels and rocks (some larger boulders), dry with no odour, becoming slightly moist	
	266	1.3-1.5	Massive tan/red clay, very uniform and moist, no odour	0.0/0.0
		1.5-2.6	Massive tan/red clay, very uniform and moist, no odour	
		2.6-3.3	Gravelly dark brown/grey clayey soil , includes fragments of metasediments (shale, sandstone)	
	267	3.3-3.5	Gravelly dark brown/grey clayey soil , includes fragments of metasediments (shale, sandstone) slightly moist with no odour	0.0/0.0
		3.5-4.3	Gravelly dark brown/grey clayey soil , includes fragments of metasediments (shale, sandstone) slightly moist with no odour	
	268	4.3-4.5	Gravelly dark brown/grey clayey soil , includes fragments of metasediments (shale, sandstone) slightly moist with no odour	0.0/0.0
		5.0	Refusal	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
VQ37 4/04/98	269	0.0-0.2	Red/tan medium clay with some vegetation (grass) slightly moist, no odour	0.0/0.0
	270	0.0-0.2	duplicate of 269	
	271	0.2-0.5	Tan/grey mottled heavy clay, moist with some vegetation matter, no odour	0.0/0.0
		0.5-1.3	Grey clay, becoming drier and friable, inclusions of gravel, no odour	
	272	1.3-1.5	Grey clay, becoming drier and friable, inclusions of gravel, no odour	0.0/0.0
		1.5-2.0	Grey clay, becoming drier and friable, inclusions of gravel, no odour	
		2.0-2.3	Green/grey clay with large pieces of metasediment , slightly moist, no odour	
	273	2.3-2.5	Green/grey clay with large pieces of metasediment , slightly moist, no odour	0.0/0.0
		2.5-4.3	Green/grey clay with large pieces of metasediment , slightly moist, no odour	
	274	4.3-4.5	Green/grey clay with large pieces of metasediment , slightly moist, no odour	0.0/0.0
		4.5	Refusal	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
VQ38	275	0.0-0.2	Uniform tan medium clay, moist, no odour some vegetation matter and no odour	0.0/0.0
)/04/98	276	0.2-0.5	Tan medium clay, moist, no odour, some gravel and rocks	0.0/0.0
		0.5-1.3	Dry, hard packed dark brown clay, some large rocks (metasediments), no odour	
	277	1.3-1.5	Dry, hard packed dark brown clay, some large rocks (metasediments), no odour	
		1.5-2.3	Dark green/grey clay with large metasediment boulders (1.5m long), very dry, no odour	
	278	2.3-2.5	Dark green/grey clay with large metasediment boulders (1.5m long), very dry, no odour	0.0/0.0
		2.5-3.3	Dark green-grey clay becoming moist, no odour, large metasediment boulders and shale rock	
	279	3.3-3.5	Dark green-grey clay becoming moist, no odour, large metasediment boulders and shale rock	0.0/0.0
		3.5-4.3	Dark green-grey clay becoming moist, no odour, large metasediment boulders and shale rock	
	280	4.3-4.5	Dark green-grey clay becoming moist, no odour, large metasediment boulders and shale rock	0.0/0.0
		4.5	Refusal	

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
VQ39 /04/98	304	0.0-0.2	Medium brown clay loam with vegetation matter, metasediment inclusions, moist and no odour	0.0/0.0
	305	0.2-0.5	Trending into a brown sandy clay, less vegetation matter, metasediment gravels and cobbles, moist and no odour	0.0/0.0
		0.5-0.8	Grey green clay, shale fragments, large metasediment rocks, moist and no odour	
	306	0.8-1.0	Grey green clay, shale fragments, large metasediment rocks, moist and no odour	0.0/0.0
		1.0-1.8	Grey green clay, shale fragments, no odour, boulder size metasediment dominant item	
	307	1.8-2.0	Grey green clay, shale fragments, no odour, boulder size metasediment dominant item	0.0/0.0
WQ40 29/04/98	299	0.0-0.2	Medium brown clay loam, moist, some vegetation matter, some small metasediments gravels/pebbles , no odour	0.0/0.0
	300	0.0-0.2	duplicate of 299	
	301	0.2-0.5	Trending to a tan medium clay which is slightly sandy , some vegetation matter and pebbles and cobble sized metasediments, no odour	0.0/0.0
		0.5-0.8	Tan/caramel medium clay, shale and metasediment sandstone increasing to larger boulders	
	302	0.8-1.0	Tan/caramel medium clay, shale and metasediment sandstone increasing to larger boulders	0.0/0.0
		1.0-1.8	Grey green clay with large quantities of shale present moist with no odour	
	303	1.8-2.0	Grey green clay with large quantities of shale present moist with no odour	0.0/0.0

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
VQ41 /04/98	295	0.0-0.2	Brown clay loamy soil, vegetation matter, moist with no odour, small metasediment inclusions	0.0/0.0
	296	0.2-0.5	Grey medium clay, vegetation matter, some pebbles , moist with no odour	0.0/0.0
		0.5-0.8	Grey-green clay dominated by metasediments of shale , wet with no odour	
	297	0.8-1.0	Grey-green clay dominated by metasediments of shale , wet with no odour	0.0/0.0
		1.0-1.8	Grey-green clay dominated by metasediments of shale , wet with no odour	
	298	1.8-2.0	Grey-green clay dominated by metasediments of shale , wet with no odour	0.0/0.0
WQ42 29/04/98	290	0.0-0.2	Brown loamy clay topsoil, vegetation matter, some metasediment rocks and boulders, moist and no odour	0.0/0.0
	291	0.0-0.2	duplicate of 290	
	292	0.2-0.5	Dark tan loamy clay topsoil with increased clay content , decreasing vegetation matter, metasediment boulders, moist and no odour	0.0/0.0
		0.5-0.8	Tan/red medium clay, decreasing vegetation matter, meta sediment rocks/boulders, moist and no odour	
	293	0.8-1.0	Tan/red medium clay, decreasing vegetation matter, meta sediment rocks/boulders, moist and no odour	0.0/0.0
		1.0-1.8	Shale layering (not in situ), dark green/grey colouring, green/grey clay, wet and no odour	
	294	1.8-2.0	Shale layering (not in situ), dark green/grey colouring, green/grey clay, wet and no odour	0.0/0.0

Sample Location	Sample No	Sample Interval (m)	Stratigraphy Notes	PID (ppm)
WQ43 1/04/98	286	0.0-0.2	Medium brown loamy clay topsoil, some shale and quartzite inclusions, earthy odour, moist, some vegetation matter.	0.0/0.0
	287	0.2-0.5	Orange/white/tan brown clay, moist, metasediment inclusions, some vegetation matter.	0.0/0.0
		0.5-0.8	Orange/white/tan brown clay matrix dominated by layers of shale, moist and no odour	
	288	0.8-1.0	Orange/white/tan brown clay matrix dominated by layers of shale, moist and no odour	0.0/0.0
		1.0-1.8	Dark brown clay and large metasediment rocks, moist and no odour	
	289	1.8-2.0	Dark brown clay and large metasediment rocks. moist and no odour	0.0/0.0
WQ44 29/04/98	281	0.0-0.2	Medium brown loamy clay topsoil, vegetation, slightly moist and an earthy odour.	0.0/0.0
	282	0.0-0.2	duplicate of 281	
	283	0.2-0.5	Trending to a tan coloured clay moist, several large metasediment rocks and no odour	0.0/0.0
		0.5-0.8	Red-tan mottled sandy clay with metasediment boulders/ rocks, moist and no odour	
	284	0.8-1.0	Red-tan mottled sandy clay with metasediment boulders/ rocks, moist and no odour	0.0/0.0
		1.0-1.5	Red-tan mottled sandy clay with metasediment boulders/ rocks, moist and no odour	
		1.5-1.8	Green-grey clayey soil matrix with large metasediment rocks/boulders, moist and no odour	
	285	1.8-2.0	Green-grey clayey soil matrix with large metasediment rocks/boulders, moist and no odour	0.0/0.0

GROUNDWATER FIELD DATA SHEET

WELL NO MW1

Project No	EO0055	**Project Name**	Pioneer
Purging Date	21.4.98	**Sampling Date**	22.4.98
Sample No/s	-		
Static Water Level (mBTOC - before purging)	Dry	**Depth of Well (m)**	12.76
WL after purging (m)	Dry	**WL at time of sampling (m)**	Dry
Purging Equipment	Disposable Bailer	**Sampling Equipment**	Disp. Bailer
Well Volume (L)	-	**Volume Removed (L)**	-

Sample Measurements

Vol (L)	Temp (°C)	EC (µS/cm)	pH	DO (ppm)	Comments
-	-	-	-	-	-

Notes

..Well dry on both purging and sampling dates.

Weather - overcast.

GROUNDWATER FIELD DATA SHEET

WELL NO MW3

Project No EO0055

Project Name Pioneer

Purging Date 21.4.98

Sampling Date 22.4.98

Sample No/s 214 (215 Dup)

Static Water Level (mBTOC - before purging) 3.75

Depth of Well (m) 8.04

WL after purging (m) Dry

WL at time of sampling (m) 3.74

Purging Equipment Disposable Bailer

Sampling Equipment Disp. Bailer

Well Volume (L) 9

Volume Removed (L) 18

Sample Measurements

Vol (L)	Temp (°C)	EC (mS/cm)	pH	DO (ppm)	Comments
18	18.8	1.12	6.93	5.3	Clear, becoming murky brown.
					Turbidity - 198*
					* - Nephelometric turbidity units.

Notes

Weather - Overcast.

GROUNDWATER FIELD DATA SHEET

WELL NO MW5

Project No	EO0055	**Project Name**	Pioneer
Purging Date	21.4.98	**Sampling Date**	22.4.98
Sample No/s	212		
Static Water Level (mBTOC - before purging)	5.49	**Depth of Well (m)**	8.01
WL after purging (m)	8.05	**WL at time of sampling (m)**	5.43
Purging Equipment	Disposable Bailer	**Sampling Equipment**	Disp. Bailer
Well Volume (L)	6	**Volume Removed (L)**	19

Sample Measurements

Vol (L)	Temp (°C)	EC (mS/cm)	pH	DO (ppm)	Comments
19	19.3	1.03	6.81	2.72	Clear, becoming murky grey-brown.
					Turbidity - 226*
					* - Nephelometric turbidity units.

Notes

Weather - Overcast and drizzle.

Well adjacent to hotmix plant. Plant not operating during sampling.

SURFACE WATER DATA SHEET

SAMPLE POINT NO WQ28

Project No EO0055

Project Name Pioneer

Purging Date n.a.

Sampling Date 29.4.98

Sample No/s 308

Sample Measurements

Vol (L)	Temp (°C)	EC (mS/cm)	pH	DO (ppm)	Comments
n.a.	-	-	-	-	murky brown turbid water

Notes

Fine and Sunny.

Sample point upstream from WQ29 (dam)

ATTACHMENT B

NATA REPORTS AND COC FORMS

amdel

Registered No. 1464

NATA

Test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ENVIRONMENTAL AND INDUSTRIAL SERVICES DIVISION
Trading as Australian Analytical Laboratories Pty Ltd
ACN 001 491 667

Correspondence to:
PO BOX 514
HORNSBY NSW 2077

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1) Cover Page
2) Analysis Report Pages
3) QA/QC Appendix

REPORT No : 8E00580

ATTENTION : Mr Hugh Madden

CLIENT : ADI Limited Technology Group

SAMPLES : 15

REFERENCE : --

DATE RECEIVED : 15/04/98

DATE REPORTED : 27/04/98

Method	Description	Extracted	Analysed
E1010	Benzene, Toluene, Ethylbenzene & Xylenes	15/04/98	21/04/98
E1110	Polynuclear Aromatic Hydrocarbons	17/04/98	23/04/98
E1220	Total Petroleum Hydrocarbons	17/04/98	21/04/98
E7500	Moisture (%w/w)	17/04/98	17/04/98

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for schemes indicated with * NATA registration does not cover the performance of this service.

PLEASE SEE ATTACHED PAGES FOR RESULTS

per G.W. ANDERSON
Manager Environmental Sydney

amdel

ɔ Number : 8E00580

ient : ADI Limited Technology Group

ference : --

	Lab No	E45542	E45543	E45544	E45545	E45546
		096		100	101	104
	Sample Id	WQ14	097	WQ14	WQ18	WQ18
Analyte	PQL					
Moisture Content	1	7	6	13	6	5
E1220 TPH in Soil						
Total C6-C36	-	6849	10650	3507	4055	12002
C6-C9 Fraction	10	nd	nd	nd	nd	nd
C10-C14 Fraction	20	56	121	459	nd	2679
C15-C28 Fraction	100	943	1900	1814	272	6605
C29-C36 Fraction	100	5850	8629	1234	3782	2718
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd	nd	nd	nd	nd
Toluene	1	nd	nd	nd	nd	nd
Ethylbenzene	1	nd	nd	nd	nd	nd
Total Xylenes	3	nd	nd	nd	nd	nd

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

amdel

b Number : 8E00580

lient : ADI Limited Technology Group

eference : --

	Lab No	E45547	E45548	E45549	E45550	E45551
		105	106	109	111	
	Sample Id	WQ18	WQ19	WQ19	WQ15	112
Analyte	PQL					
Moisture Content	1	5	8	8	6	7
E1220 TPH in Soil						
Total C6-C36	-	10748	11931	nd	3197	2710
C6-C9 Fraction	10	nd	nd	nd	nd	nd
C10-C14 Fraction	20	2185	92	nd	nd	nd
C15-C28 Fraction	100	4052	1537	nd	200	136
C29-C36 Fraction	100	4511	5197	nd	3018	2574
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd	nd	nd	nd	nd
Toluene	1	nd	nd	nd	nd	nd
Ethylbenzene	1	nd	nd	nd	nd	nd
Total Xylenes	3	nd	nd	nd	nd	nd

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

b Number : 8E00580

ient : ADI Limited Technology Group

:ference : --

	Lab No	E45552	E45553	E45554	E45555	E45556
		114	116	118	120	121
	Sample Id	WQ15	WQ18	WQ9	WQ9	WQ9
Analyte	PQL					
Moisture Content	1	24	22	6	16	16
E1220 TPH in Soil						
Total C6-C36	-	nd	nd	6779	nd	nd
C6-C9 Fraction	10	nd	nd	nd	nd	nd
C10-C14 Fraction	20	nd	nd	nd	nd	nd
C15-C28 Fraction	100	nd	nd	485	nd	nd
C29-C36 Fraction	100	nd	nd	6294	nd	nd
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd	nd	nd	nd	nd
Toluene	1	nd	nd	nd	nd	nd
Ethylbenzene	1	nd	nd	nd	nd	nd
Total Xylenes	3	nd	nd	nd	nd	nd

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

b Number : 8E00580 Page 4 of 6

lient : ADI Limited Technology Group plus Cover Page

eference : --

	Lab No	E45542	E45543	E45544	E45545	E45546
		096		100	101	104
	Sample Id	WQ14	097	WQ14	WQ18	WQ18
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd	nd	nd	nd	1.4
Acenaphthylene	0.5	nd	nd	nd	nd	nd
Acenaphthene	0.5	nd	nd	0.7	nd	0.8
Fluorene	0.5	nd	0.6	1.3	nd	1.7
Phenanthrene	0.5	0.9	3.1	3.4	nd	1.1
Anthracene	0.5	nd	nd	nd	nd	nd
Fluoranthene	0.5	nd	1.2	nd	nd	nd
Pyrene	0.5	nd	0.9	0.5	nd	nd
Benz(a)anthracene	0.5	nd	nd	nd	nd	nd
Chrysene	0.5	nd	nd	nd	nd	nd
Benzo(b) & (k)fluoranthene	1	nd	nd	nd	nd	nd
Benzo(a)pyrene	0.5	nd	nd	nd	nd	nd
Indeno(1.2.3-cd)pyrene	0.5	nd	nd	nd	nd	nd
Dibenz(a.h)anthracene	0.5	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	0.5	nd	nd	nd	nd	nd
al PAH	-	0.9	5.8	5.9	nd	5
2-Fluorobiphenyl-SURROGATE		98	93	94	88	101
p-Terphenyl-D14-SURROGATE	-	98	98	97	91	101

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = Not Detected (<PQL)

-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified

Leachates : mg/L (ppm) in leachate

ɔb Number : 8E00580

lient : ADI Limited Technology Group

eference : --

	Lab No	E45547	E45548	E45549	E45550	E45551
		105	106	109	111	
	Sample Id	WQ18	WQ19	WQ19	WQ15	112
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	13.8	nd	nd	nd	nd
Acenaphthylene	0.5	1.0	nd	nd	nd	nd
' 'naphthene	0.5	3.4	nd	nd	nd	nd
Fluorene	0.5	11.2	nd	nd	nd	nd
Phenanthrene	0.5	30.7	1.5	nd	nd	nd
Anthracene	0.5	1.6	nd	nd	nd	nd
Fluoranthene	0.5	nd	nd	nd	nd	nd
Pyrene	0.5	0.8	0.6	nd	nd	nd
Benz(a)anthracene	0.5	nd	nd	nd	nd	nd
Chrysene	0.5	nd	nd	nd	nd	nd
Benzo(b) & (k)fluoranthene	1	nd	nd	nd	nd	nd
Benzo(a)pyrene	0.5	nd	nd	nd	nd	nd
Indeno(1.2.3-cd)pyrene	0.5	nd	nd	nd	nd	nd
Dibenz(a.h)anthracene	0.5	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	0.5	nd	nd	nd	nd	nd
al PAH	-	62.5	2.1	nd	nd	nd
2-Fluorobiphenyl-SURROGATE		102	89	88	93	92
p-Terphenyl-D14-SURROGATE	-	99	97	93	97	97

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = Not Detected (<PQL)

-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified

Leachates : mg/L (ppm) in leachate

amdel

b Number : 8E00580

.ient : ADI Limited Technology Group

:eference : --

	Lab No	E45552	E45553	E45554	E45555	E45556
		114	116	118	120	121
	Sample Id	WQ15	WQ18	WQ9	WQ9	WQ9
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd	nd	nd	nd	nd
Acenaphthylene	0.5	nd	nd	nd	nd	nd
' 'naphthene	0.5	nd	nd	nd	nd	nd
;luorene	0.5	nd	nd	nd	nd	nd
Phenanthrene	0.5	nd	nd	nd	nd	nd
Anthracene	0.5	nd	nd	nd	nd	nd
Fluoranthene	0.5	nd	nd	nd	nd	nd
Pyrene	0.5	nd	nd	nd	nd	nd
Benz(a)anthracene	0.5	nd	nd	nd	nd	nd
Chrysene	0.5	nd	nd	nd	nd	nd
Benzo(b) & (k)fluoranthene	1	nd	nd	nd	nd	nd
Benzo(a)pyrene	0.5	nd	nd	nd	nd	nd
Indeno(1.2.3-cd)pyrene	0.5	nd	nd	nd	nd	nd
Dibenz(a.h)anthracene	0.5	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	0.5	nd	nd	nd	nd	nd
al PAH	-	nd	nd	nd	nd	nd
2-Fluorobiphenyl-SURROGATE		91	95	96	98	102
p-Terphenyl-D14-SURROGATE	-	97	98	97	101	106

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

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QA/QC APPENDIX NO. 8E00580

Method	Description
E1010	Benzene, Toluene, Ethylbenzene & Xylene
E1110	Polynuclear Aromatic Hydrocarbons
E1220	Total Petroleum Hydrocarbons

Chromatography QA/QC

	Yes	No	N/A
Retention Time Window Within Acceptance Criteria(±2%)	√		
Check Standard Within Acceptance Criteria(±10%)	√		
Recalibration Within Acceptance Criteria(±15%)	√		

Other QA/QC

Holding time conforming With Method Specification	√		
Chain of Custody Attached	√		

N/A = Not Applicable

Comments

1. Laboratory QA/QC including Duplicates, Matrix Spike Duplicates, and check/reference samples are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results available on request. (Where applicable)
3. Surrogate description and recoveries are recorded in the Report. (Where applicable)
4. Acceptance criteria for specific analytes are listed on each QA/QC page.
5. Practical Quantitation Limit (PQL is typically 2-10 x method detection limit (MDL)).
6. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted.
7. Results are uncorrected for matrix spike or surrogate recoveries.

per G.W. ANDERSON
Manager Environmental Sydney

amdel

) Number : 8E00580

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
:1220 TPH in Soil							
'otal C6-C36	950	725	760	76%	80%	78%	5%
:6-C9 Fraction	400	295	305	73%	76%	74%	4%
:15-C28 Fraction	550	430	455	78%	83%	80%	6%
:1010 BTEX (P&T) in Soil							
lenzene	10	11.0	11.0	110%	110%	110%	0%
ıene	10	11	11	110%	110%	110%	0%
:thylbenzene	10	11	11	110%	110%	110%	0%
'otal Xylenes	30	33	33	110%	110%	110%	0%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

amdel

b Number : 8E00580

AQC : Laboratory Duplicates

Analyte	PQL	Dupl 1	Dupl 2	Average	RPD (%)
E1220 TPH in Soil					
Total C6-C36	-	5048	6849	5948	30%
C6-C9 Fraction	10	nd	nd		
C10-C14 Fraction	20	39	56	47	35%
C15-C28 Fraction	100	723	943	833	26%
C29-C36 Fraction	100	4286	5850	5068	30%
E1010 BTEX (P&T) in Soil					
zene	0.5	nd	nd		
Toluene	1	nd	nd		
Ethylbenzene	1	nd	nd		
Total Xylenes	3	nd	nd		

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
E1220 TPH in Soil						
Total C6-C36	-	nd				
C6-C9 Fraction	10	nd				
C10-C14 Fraction	20	nd				
C28 Fraction	100	nd				
C29-C36 Fraction	100	nd				
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd				
Toluene	1	nd				
Ethylbenzene	1	nd				
Total Xylenes	3	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

amdel

b Number : 8E00580

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1110 PAH's in Soil							
Naphthalene	5	5.0	5.0	100%	100%	100%	0%
Acenaphthylene	5	4.8	4.7	96%	94%	95%	2%
Acenaphthene	5	5.0	5.0	100%	100%	100%	0%
Fluorene	5	5.0	4.9	100%	98%	99%	2%
Phenanthrene	5	4.8	5.2	96%	104%	100%	8%
Anthracene	5	5.0	4.9	100%	98%	99%	2%
Fluoranthene	5	5.0	5.2	100%	104%	102%	4%
Pyrene	5	5.0	5.2	100%	104%	102%	4%
Benz(a)anthracene	5	4.8	4.9	96%	98%	97%	2%
Chrysene	5	5.1	5.2	102%	104%	103%	2%
Benzo(b) & (k)fluoranthene	10	10	10	96%	96%	96%	0%
Benzo(a)pyrene	5	4.8	4.7	96%	94%	95%	2%
Indeno(1.2.3-cd)pyrene	5	4.8	4.7	96%	94%	95%	2%
Dibenz(a.h)anthracene	5	5.1	5.1	102%	102%	102%	0%
Benzo(g.h.i)perylene	5	5.2	5.2	104%	104%	104%	0%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

amdel

) Number : 8E00580

AQC : Laboratory Duplicates

Analyte	PQL	Dupl 1	Dupl 2	Average	RPD (%)
.1110 PAH's in Soil					
laphthalene	0.5	nd	nd		
.cenaphthylene	0.5	nd	nd		
.cenaphthene	0.5	nd	nd		
luorene	0.5	nd	nd		
henanthrene	0.5	0.8	0.9	0.85	11%
nthracene	0.5	nd	nd		
luoranthene	0.5	nd	nd		
ene	0.5	nd	nd		
enz(a)anthracene	0.5	nd	nd		
hrysene	0.5	nd	nd		
enzo(b) & (k)fluoranthene	1	nd	nd		
enzo(a)pyrene	0.5	nd	nd		
ndeno(1.2.3-cd)pyrene	0.5	nd	nd		
ibenz(a.h)anthracene	0.5	nd	nd		
enzo(g.h.i)perylene	0.5	nd	nd		

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
E1110 PAH's in Soil						
Naphthalene	0.5	nd				
Acenaphthylene	0.5	nd				
Acenaphthene	0.5	nd				
prene	0.5	nd				
Phenanthrene	0.5	nd				
Anthracene	0.5	nd				
Fluoranthene	0.5	nd				
Pyrene	0.5	nd				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	nd				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1.2.3-cd)pyrene	0.5	nd				
Dibenz(a.h)anthracene	0.5	nd				
Benzo(g.h.i)perylene	0.5	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

ADI Limited, Major Projects Group
PO Box A221 Sydney South NSW 1235
Telephone: (02) 9916 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cnr Links & Forrester Roads St Marys NSW 2760 direct (02) 9673 8110
Telephone: (02) 9833 8033 Fax: (02) 9833 8022 mobile 0417266908
ACN 008 642 751

ADI

CHAIN OF CUSTODY FORM

02151

ADI P/O 6060. (to be faxed)

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: HUGH MADDEN | CONTACT NUMBER: 0417266908 HUGH MADDEN

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	PAH	ANALYTE	MATRIX	CONTAINER	PRESERVATION
096 ✓	WQ14	–	HM	E45542	14.4.98	SOIL	2	✓	✓	✓	TPH	M1	C2	P2 – P3
097 ✓	–	–	"	43	"	"	2	✓	✓	✓	BTEX	M1	C4	P2 – P3
098 ✓	WQ14	–	"		"	"	2	PLEASE HOLD.			BTEX	M1	C2	P2 – P3
099 ✓	WQ14	–	"		"	"	1	PLEASE HOLD.			PAH	M1	C2	P2 – P3
100 ✓	WQ14	–	"	44	"	"	2	✓	✓	✓				
101 ✓	WQ18	–	"	45	"	"	2	✓	✓	✓				
102 ✓	WQ18	–	"		"	"	2	PLEASE HOLD						
103 ✓	WQ18	–	"		"	"	2	PLEASE HOLD						
104 ✓	WQ18	–	"	46	"	"	2	✓	✓	✓				
105 ✓	WQ18	–	"	47	"	SOIL	2	✓	✓	✓				
106 ✓	WQ19	–	"	48	"	"	2	✓	✓	✓				
107 ✓	WQ19	–	"		"	"	2	PLEASE HOLD						
108 ✓	WQ19	–	"		"	"	2	PLEASE HOLD						
109 ✓	WQ19	–	"	49	"	"	2	✓	✓	✓				
110 ✓	WQ19	–	"		"	"	2	PLEASE HOLD						

PH + VOC 8E00580

COMMENTS: WHERE A VOC VIAL IS PROVIDE USE IT FOR BTEX. OTHERWISE TAKE SAMPLE FROM 250ML JAR.
TPH METHOD – E1220, BTEX METHOD – E1010, PAH METHOD – E1110.
HOLD ALL SAMPLES IN REFRIGERATION – DO NOT DISPOSE
4 DAY TURNAROUND REQUESTED – fax results to H. MADDEN (02) 9833 8022.

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NO · Please Notify ADI Limited if Integrity Seal is found broken
(please circle)

DESPATCH METHOD: AMDEL PICK UP FROM ADI OFFICE | DATE/TIME: 15/4/98 6.30 AM | PREPARED BY: (signature) Hugh Madden

RECEIVED BY: (signature) R Hodson | DATE/TIME: 15/4/98 8:50 | CHECKED BY: (signature) Hugh Madden

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 1500ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered < 0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO3 pH<2
P5 H2SO4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report · 2nd Pink Project File (temp) · 3rd Green Book Copy

ADI Limited, Major Projects Group
PO Box A221 Sydney South NSW 1235
Telephone: (02) 9910 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Car Links & Forrester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 642 751

ADI

CHAIN OF CUS

ADI PO : 6060 (TO BE [illegible]

direct (02) 9673 8110
mobile 0417266908

CONTACT NUMBER: 0417266908

CONTACT PERSON: HUGH MADDEN

PROJECT: PIONEER

TO: AMDEL

ANALYSIS REQUIRED

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	PAH	ANALYTE	MATRIX	CONTAINER	PRESERVATION
											TPH	M1	C2	P2-P3
											BTEX	M1	C4	P2-P3
											BTEX	M1	C2	P2-P3
											PAH	M1	C2	P2-P3
111 ✓	WQ15	–	HM	E45550	14.4.98	SOIL	2	✓	✓	✓				
112 ✓	–	–	"	51	"	"	2	✓	✓	✓				
113 ✓	WQ15	–	"		"	"	1	PLEASE HOLD						
114 ✓	WQ15	–	"	52	"	"	1	✓	✓	✓				
115 ✓	WQ18	–	"		"	"	2	PLEASE HOLD.						
116 ✓	WQ18	–	"	53	"	"	2	✓	✓	✓				
117 ✓	WQ9	–	"		14.4.98	"	2	PLEASE HOLD						
118 ✓	WQ9	–	"	54	"	"	1	✓	✓	✓				
119 ✓	WQ9	–	"		"	"	1	✓	✓	✓				
120 ✓	WQ9	–	"	55	"	"	1	✓	✓	✓				
121 ✓	WQ9	–	"	56	"									
BGD														

RECEIVED
11 APR 1998
BEOC580

COMMENTS: WHERE VOC VIAL IS PROVIDED USE IT FOR BTEX, OTHERWISE TAKE SAMPLE FROM 250ml JAR.
TPH METHOD - E1220, BTEX METHOD - E1010, PAH METHOD - E1110
HOLD ALL SAMPLES IN REFRIGERATION - DO NOT DISPOSE.
4-DAY TURNAROUND REQUESTED fax results to H. MADDEN (02) 9833 8022

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined polypropylene cap
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NO (please circle)

Please Notify ADI Limited if Integrity Seal is found broken

DESPATCH METHOD: AMDEL PICK UP FROM ADI OFFICE

DATE/TIME: 15/4/98 6:30 AM

PREPARED BY: Hugh Madden (signature)

RECEIVED BY: R Gordon (signature)

DATE/TIME: 15/4/98 9:50

CHECKED BY: Hugh Madden. (signature)

1st White original: to lab/return with NATA report

2nd Pink Project File (temp)

3rd Green Book Copy

ADI

Telephone: (02) 9916 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cnr Links & Forrester Roads St Marys NSW 2760 direct (02) 9673 8110
Telephone: (02) 9833 8033 Fax: (02) 9833 8022 mobile 0417266908
ACN 008 642 751

CHAIN OF CUSTODY FORM

02152

ADI PO : 6060 (to be faxed).

PROJECT: PIONEER TO: AMDEL CONTACT PERSON: HUGH MADDEN CONTACT NUMBER: 0417266908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	PAH	ANALYTE	MATRIX	CONTAINER	PRESERVATION
111	WQ15	–	HM		14.4.98	SOIL	2.	✓	✓	✓	TPH	M1	C2	P2-P3
112	"	–	"		"	"	2.	✓	✓	✓	BTEX	M1	C4	P2-P3
113	WQ15	–	"		"	"	1	PLEASE HOLD			BTEX	M1	C2	P2-P3
114	WQ15	–	"		"	"	1	✓	✓	✓	PAH	M1	C2	P2-P3
115	WQ18	–	"		"	"	2	PLEASE HOLD.						
116	WQ18	–	"		"	"	1	✓	✓	✓				
117	WQ9	–	"		14.4.98	"	2	PLEASE HOLD						
118	WQ9	–	"		"	"	2.	✓	✓	✓				
119	WQ9	–	"		"	"	1	PLEASE HOLD.						
120	WQ9	–	"		"	"	1	✓	✓	✓				
121	WQ9	–	"		"	"	1	✓	✓	✓				

ANALYSIS REQUIRED

COMMENTS: WHERE VOC VIAL IS PROVIDED USE IT FOR BTEX. OTHERWISE TAKE SAMPLE FROM 250mL JAR.
TPH METHOD - E1220, BTEX METHOD - E1010, PAH METHOD - E1110
HOLD ALL SAMPLES IN REFRIGERATION - DO NOT DISPOSE.
4-DAY TURNAROUND REQUESTED fax results to H. MADDEN (02)9 8338022

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NO Please Notify ADI Limited if Integrity Seal is found broken

(please circle)

DESPATCH METHOD: AMDEL PICK UP FROM ADI OFFICE	DATE/TIME: 15/4/98 6.30 AM	PREPARED BY: (signature) Hugh Madden
RECEIVED BY: (signature)	DATE/TIME:	CHECKED BY: (signature) Hugh Madden.

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report 2nd Pink Project File (temp) 3rd Green Book Copy

ENVIRONMENTAL AND INDUSTRIAL SERVICES DIVISION
Trading as Australian Analytical Laboratories Pty Ltd
ACN 001 491 667

Correspondence to:
PO BOX 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 1630
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1) Cover Page
2) Analysis Report Pages
3) QA/QC Appendix

REPORT No : 8E00597

ATTENTION : Mr Hugh Madden

CLIENT : ADI Limited Technology Group

SAMPLES : 10

REFERENCE : 6060

DATE RECEIVED : 16/04/98

DATE REPORTED : 27/04/98

Method	Description	Extracted	Analysed
E1010	Benzene, Toluene, Ethylbenzene & Xylene	16/04/98	21/04/98
E1110	Polynuclear Aromatic Hydrocarbons	16/04/98	17/04/98
E1220	Total Petroleum Hydrocarbons	16/04/98	17/04/98
E7500	Moisture (%w/w)	21/04/98	21/04/98

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued.
Note that for schemes indicated with * NATA registration does not cover the performance of this service.

PLEASE SEE ATTACHED PAGES FOR RESULTS

per G.W. ANDERSON
Manager Environmental Sydney

b Number : 8E00597

ient : ADI Limited Technology Group

eference : 6060

	Lab No	E45613	E45614	E45615	E45616	E45617
		122		129	132	140
	Sample Id	WQ10	123	WQ4	WQ4	WQ5
Analyte	PQL					
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd	nd	nd	nd	nd
Toluene	1	nd	nd	nd	nd	nd
Ethylbenzene	1	nd	nd	nd	nd	nd
Total Xylenes	3	nd	nd	nd	nd	4
E1220 TPH in Soil						
Total C6-C36	-	164	146	483	nd	5954
C6-C9 Fraction	10	nd	nd	nd	nd	29
C10-C14 Fraction	20	nd	nd	26	nd	1028
C15-C28 Fraction	100	nd	nd	130	nd	1993
C29-C36 Fraction	100	164	146	327	nd	2904
Moisture Content	1	11	7	5	7	8

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

amdel

ob Number : 8E00597
lient : ADI Limited Technology Group
eference : 6060

	Lab No	E45618	E45619	E45620	E45621	E45622
		141	142		146	
	Sample Id	WQ5	WQ3	143	WQ6	147
Analyte	PQL					
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd	nd	nd	nd	nd
Toluene	1	nd	nd	nd	nd	nd
Ethylbenzene	1	nd	nd	nd	nd	nd
Total Xylenes	3	nd	nd	nd	nd	nd
E1220 TPH in Soil						
Total C6-C36	-	nd	1246	1898	137	nd
C6-C9 Fraction	10	nd	nd	nd	nd	nd
C10-C14 Fraction	20	nd	nd	nd	nd	nd
C15-C28 Fraction	100	nd	236	329	nd	nd
C29-C36 Fraction	100	nd	1010	1569	137	nd
Moisture Content	1	19	6	6	19	16

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

b Number : 8E00597

ient : ADI Limited Technology Group

:ference : 6060

	Lab No	E45613	E45614	E45615	E45616	E45617
		122		129	132	140
	Sample Id	WQ10	123	WQ4	WQ4	WQ5
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd	nd	nd	nd	2.3
Acenaphthylene	0.5	nd	nd	nd	nd	nd
' 'naphthene	0.5	nd	nd	nd	nd	nd
Fluorene	0.5	nd	nd	nd	nd	0.6
Phenanthrene	0.5	nd	nd	0.6	0.5	1.4
Anthracene	0.5	nd	nd	nd	nd	nd
Fluoranthene	0.5	nd	nd	nd	nd	nd
Pyrene	0.5	nd	nd	nd	nd	nd
Benz(a)anthracene	0.5	nd	nd	nd	nd	nd
Chrysene	0.5	nd	nd	nd	nd	nd
Benzo(b) & (k)fluoranthene	1	nd	nd	nd	nd	nd
Benzo(a)pyrene	0.5	nd	nd	nd	nd	nd
Indeno(1.2.3-cd)pyrene	0.5	nd	nd	nd	nd	nd
Dibenz(a.h)anthracene	0.5	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	0.5	nd	nd	nd	nd	nd
al PAH	-	nd	nd	0.6	0.5	4.3
2-Fluorobiphenyl-SURROGATE		107	109	117	119	105
p-Terphenyl-D14-SURROGATE	-	105	108	113	116	98

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = Not Detected (<PQL)

-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified

Leachates : mg/L (ppm) in leachate

amdel

ıb Number : 8E00597

lient : ADI Limited Technology Group

eference : 6060

	Lab No	E45618	E45619	E45620	E45621	E45622
		141	142		146	
	Sample Id	WQ5	WQ3	143	WQ6	147
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd	nd	nd	nd	nd
Acenaphthylene	0.5	nd	nd	nd	nd	nd
' 'naphthene	0.5	nd	nd	nd	nd	nd
Fluorene	0.5	nd	nd	nd	nd	nd
Phenanthrene	0.5	nd	nd	nd	nd	nd
Anthracene	0.5	nd	nd	nd	nd	nd
Fluoranthene	0.5	nd	nd	nd	nd	nd
Pyrene	0.5	nd	nd	nd	nd	nd
Benz(a)anthracene	0.5	nd	nd	nd	nd	nd
Chrysene	0.5	nd	nd	nd	nd	nd
Benzo(b) & (k)fluoranthene	1	nd	nd	nd	nd	nd
Benzo(a)pyrene	0.5	nd	nd	nd	nd	nd
Indeno(1.2.3-cd)pyrene	0.5	nd	nd	nd	nd	nd
Dibenz(a.h)anthracene	0.5	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	0.5	nd	nd	nd	nd	nd
al PAH	-	nd	nd	nd	nd	nd
2-Fluorobiphenyl-SURROGATE		96	98	97	112	86
p-Terphenyl-D14-SURROGATE	-	116	102	101	112	88

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

carmel

QA/QC APPENDIX NO. 8E00597

Method	Description
E1010	Benzene, Toluene, Ethylbenzene & Xylene
E1110	Polynuclear Aromatic Hydrocarbons
E1220	Total Petroleum Hydrocarbons

Chromatography QA/QC

	Yes	No	N/A
Retention Time Window Within Acceptance Criteria(±2%)	√		
Check Standard Within Acceptance Criteria(±10%)	√		
Recalibration Within Acceptance Criteria(±15%)	√		

Other QA/QC

Holding time conforming With Method Specification	√		
Chain of Custody Attached	√		

N/A = Not Applicable

Comments

1. Laboratory QA/QC including Duplicates, Matrix Spike Duplicates, and check/reference samples are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results available on request. (Where applicable)
3. Surrogate description and recoveries are recorded in the Report. (Where applicable)
4. Acceptance criteria for specific analytes are listed on each QA/QC page.
5. Practical Quantitation Limit (PQL is typically 2-10 x method detection limit (MDL)).
6. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted.
7. Results are uncorrected for matrix spike or surrogate recoveries.

per G.W. ANDERSON
Manager Environmental Sydney

amdel

b Number : 8E00597

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1220 TPH in Soil							
Total C6-C36	950	775	775	82%	82%	82%	0%
C6-C9 Fraction	400	325	325	81%	81%	81%	0%
C15-C28 Fraction	550	450	450	82%	82%	82%	0%
E1010 BTEX (P&T) in Soil							
Benzene	10	11.0	11.0	110%	110%	110%	0%
[illegible]ene	10	11	11	110%	110%	110%	0%
Ethylbenzene	10	11	11	110%	110%	110%	0%
Total Xylenes	30	33	33	110%	110%	110%	0%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

amdel

b Number : 8E00597

AQC : Laboratory Duplicates

Analyte	PQL	Dupl 1	Dupl 2	Average	RPD (%)
:1220 TPH in Soil					
'otal C6-C36	-	163	164	163	0%
:6-C9 Fraction	10	nd	nd		
:10-C14 Fraction	20	nd	nd		
:15-C28 Fraction	100	nd	nd		
:29-C36 Fraction	100	163	164	163	0%
:1010 BTEX (P&T) in Soil					
zene	0.5	nd	nd		
Toluene	1	nd	nd		
Ethylbenzene	1	nd	nd		
Total Xylenes	3	nd	nd		

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

amdel

b Number : 8E00597

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
:1110 PAH's in Soil							
laphthalene	5	4.9	4.9	98%	98%	98%	0%
ıcenaphthylene	5	4.6	4.6	92%	92%	92%	0%
ıcenaphthene	5	4.8	4.8	96%	96%	96%	0%
luorene	5	4.8	4.8	96%	96%	96%	0%
henanthrene	5	4.4	4.4	88%	88%	88%	0%
ınthracene	5	4.5	4.5	90%	90%	90%	0%
ranthene	5	4.5	4.5	90%	90%	90%	0%
yrene	5	4.6	4.6	92%	92%	92%	0%
Benz(a)anthracene	5	4.5	4.5	90%	90%	90%	0%
Chrysene	5	4.8	4.8	96%	96%	96%	0%
Benzo(b) & (k)fluoranthene	10	9	9	94%	94%	94%	0%
Benzo(a)pyrene	5	4.7	4.7	94%	94%	94%	0%
ndeno(1.2.3-cd)pyrene	5	4.1	4.1	82%	82%	82%	0%
Dibenz(a.h)anthracene	5	4.0	4.0	80%	80%	80%	0%
Benzo(g.h.i)perylene	5	4.6	4.6	92%	92%	92%	0%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

amdel

b Number : 8E00597

AQC : Laboratory Duplicates

Analyte	PQL	Dupl 1	Dupl 2	Average	RPD (%)
E1110 PAH's in Soil					
Naphthalene	0.5	nd	nd		
Acenaphthylene	0.5	nd	nd		
Acenaphthene	0.5	nd	nd		
Fluorene	0.5	nd	nd		
Phenanthrene	0.5	nd	nd		
Anthracene	0.5	nd	nd		
Fluoranthene	0.5	nd	nd		
ene	0.5	nd	nd		
Benz(a)anthracene	0.5	nd	nd		
Chrysene	0.5	nd	nd		
Benzo(b) & (k)fluoranthene	1	nd	nd		
Benzo(a)pyrene	0.5	nd	nd		
Indeno(1.2.3-cd)pyrene	0.5	nd	nd		
Dibenz(a.h)anthracene	0.5	nd	nd		
Benzo(g.h.i)perylene	0.5	nd	nd		

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
1110 PAH's in Soil						
Naphthalene	0.5	nd				
Acenaphthylene	0.5	nd				
Acenaphthene	0.5	nd				
Pyrene	0.5	nd				
Phenanthrene	0.5	nd				
Anthracene	0.5	nd				
Fluoranthene	0.5	nd				
Pyrene	0.5	nd				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	nd				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1.2.3-cd)pyrene	0.5	nd				
Dibenz(a.h)anthracene	0.5	nd				
Benzo(g.h.i)perylene	0.5	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

PO Box A221 Sydney South NSW 1235
Telephone: (02) 9910 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cor Links & Forrester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 642 751

ADI

direct (02) 9673 8110
mobile 0417266908

CHAIN OF CUSTODY FORM

02153

ADI P/O 6060 (to be faxed),

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: HUGH MADDEN | CONTACT NUMBER: 04-17266908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	PAH										ANALYTE	MATRIX	CONTAINER	PRESERVATION
122	WQ10	–	HM	E45613	15.4.98	SOIL	2	✓	✓	✓										TPH	M1	C2	P2-P3
123	–	–	"	14	"	"	2	✓	✓	✓										BTEX	M1	C2	P2-P3
124	WQ10	–	"		"	"	2	PLEASE HOLD												BTEX	M1	C2	P2-P3
125	WQ10	–	"		"	"	2	PLEASE HOLD												PAH	M1	C2	P2-PC
126	WQ10	–	"		"	"	2	PLEASE HOLD															
127	WQ10	–	"		"	"	1	PLEASE HOLD															
128	WQ10	–	"		"	"	2	PLEASE HOLD															
129	WQ4	–	"	15	"	"	2	✓	✓	✓													
130	WQ4	–	"		"	"	2	PLEASE HOLD															
131	WQ4	–	"		"	"	1	PLEASE HOLD															
132	WQ4	–	"	16	"	"	1	✓	✓	✓													
133	WQ4	–	"		"	"	1	PLEASE HOLD															
134	WQ4	–	"		"	"	1	PLEASE HOLD															
135	WQ5	–	"		"	"	1	PLEASE HOLD															
136	–	–	"		"	"	1	PLEASE HOLD															

RECEIVED 16 APR 1998 SE

COMMENTS: WHERE VOC VIAL IS PROVIDED USE IT FOR BTEX, OTHERWISE TAKE SAMPLE FROM 250ml JAR.
TPH METHOD - E1220, BTEX METHOD E1010, PAH METHOD E110.
HOLD ALL SAMPLES IN REFRIGERATION - DO NOT DISPOSE
4-DAY TURNAROUND REQUESTED fax results to H. MADDEN (02) 9833 8022

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal intact? YES NO (please circle) Please Notify ADI Limited if Integrity Seal is found broken

DESPATCH METHOD: AMDEL PICK UP FROM ADI OFFICE	DATE/TIME: 16/4/98 6.30AM	PREPARED BY: (signature) Hugh Madden
RECEIVED BY: (signature)	DATE/TIME: 16/4/98 4 pm	CHECKED BY: (signature) Hugh Madden

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report | 2nd Pink Project File (temp) | 3rd Green Book Copy

08 THU 18:58 FAX 00 AMDEL LIMIT 777 ADI

ADI

PO Box A221 Sydney South NSW 1235
Telephone: (02) 9916 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cnr Links & Forrester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 642 751

direct (02) 9673 8110
mobile 0417266408

CHAIN OF CUSTODY FORM

02154

ADI P/O 6060 (to be faxed).

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: HUGH MADDEN | CONTACT NUMBER: 0417266408

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	PAH	ANALYTE	MATRIX	CONTAINER	PRESERVATION
137	WQ5	–	HM		15.4.98	SOIL	1	PLEASE HOLD			TPH	M1	C2	P2-P3
138	WQ5	–	"		"	"	1	PLEASE HOLD			BTEX	M1	C2	P2-P3
139	WQ5	–	"		"	"	1	PLEASE HOLD			PAH	M1	C2	P2-P3
140	WQ5	–	"	E45617	"	"	1	✓	✓	✓	BTEX	M1	C4	P2-P3
141	WQ5	–	"	18	"	"	1	✓	✓	✓				
142	WQ3	–	"	19	"	"	1	✓	✓	✓				
143	–	–	"	20	"	"	1	✓	✓	✓				
144	WQ3	–	"		"	"	1	PLEASE HOLD						
145	WQ3	–	"		"	"	1	PLEASE HOLD						
146	WQ6	–	"	21	"	"	1	✓	✓	✓				
147	–	–	"	22	"	"	1	✓	✓	✓				
148	WQ6	–	"		15.4.98	"	1	PLEASE HOLD						
149	WQ6	–	"		"	"	1	PLEASE HOLD						

360

RECEIVED 16 APR 1998 06:00 54

COMMENTS: WHERE A VOLVIAL IS PROVIDED USE IT FOR BTEX, OTHERWISE TAKE SAMPLE FROM 260 mL JAR
TPH METHOD – E1220, BTEX METHOD – E1010, PAH METHOD – E1110.
HOLD ALL SAMPLES IN REFRIGERATION – DO NOT DISPOSE
4 DAY TURNAROUND REQUESTED – fax results to H. MADDEN
(02) 9833 8022

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NO Please Notify ADI Limited if Integrity Seal is found broken
(please circle)

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO3 pH<2
P5 H2SO4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

DESPATCH METHOD:	DATE/TIME:	PREPARED BY:
AMDEL PICK UP FROM ADI OFFICE	16/4/98 6:30AM.	(signature) Hugh Madden
RECEIVED BY: (signature) R. Orange	DATE/TIME: 16/4/98 9am	CHECKED BY: (signature) Hugh Madden.

1st White original, to lab/return with NATA report | 2nd Pink Project File (temp) | 3rd Green Book Copy

amdel

Registered No. 1464

test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ENVIRONMENTAL AND INDUSTRIAL SERVICES DIVISION
Trading as Australian Analytical Laboratories Pty Ltd
ACN 001 491 667

Correspondence to:
PO BOX 514
HORNSBY NSW 2077

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1) Cover Page
2) Analysis Report Pages
3) QA/QC Appendix

REPORT No : 8E00597A

ATTENTION : Mr Hugh Madden

CLIENT : ADI Limited Technology Group

SAMPLES : 2

REFERENCE : 6060

DATE RECEIVED : 27/04/98

DATE REPORTED : 01/05/98

Method	Description	Extracted	Analysed
E1010	Benzene,Toluene,Ethylbenzene & Xylene	27/04/98	28/04/98
E1220	Total Petroleum Hydrocarbons	27/04/98	28/04/98
E7500	Moisture (%w/w)	28/04/98	28/04/98

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued.
Note that for schemes indicated with * NATA registration does not cover the performance of this service.

PLEASE SEE ATTACHED PAGES FOR RESULTS

per G.W. ANDERSON
Manager Environmental Sydney

amdel

ob Number : 8E00597A
'lient : ADI Limited Technology Group
eference : 6060

	Lab No	E45723	E45724			
		126	144			
	Sample Id	WQ10	WQ3			
Analyte	PQL					
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd	--			
Toluene	1	nd	--			
Ethylbenzene	1	nd	--			
Total Xylenes	3	nd	--			
E1220 TPH in Soil						
Total C6-C36	-	9831	nd			
C6-C9 Fraction	10	nd	nd			
C10-C14 Fraction	20	nd	nd			
C15-C28 Fraction	100	798	nd			
C29-C36 Fraction	100	9033	nd			
Moisture Content	1	5%	11%			

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

carmdel

QA/QC APPENDIX NO. 8E00597A

Method	Description
E1010	Benzene, Toluene, Ethylbenzene & Xylene
E1220	Total Petroleum Hydrocarbons

Chromatography QA/QC

	Yes	No	N/A
Retention Time Window Within Acceptance Criteria(±2%)	√		
Check Standard Within Acceptance Criteria(±10%)	√		
Recalibration Within Acceptance Criteria(±15%)	√		

Other QA/QC

Holding time conforming With Method Specification	√		
Chain of Custody Attached	√		

N/A = Not Applicable

Comments

1. Laboratory QA/QC including Duplicates, Matrix Spike Duplicates, and check/reference samples are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results available on request. (Where applicable)
3. Surrogate description and recoveries are recorded in the Report. (Where applicable)
4. Acceptance criteria for specific analytes are listed on each QA/QC page.
5. Practical Quantitation Limit (PQL is typically 2-10 x method detection limit (MDL)).
6. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted.
7. Results are uncorrected for matrix spike or surrogate recoveries.

per G.W. ANDERSON
Manager Environmental Sydney

amdel

ob Number : 8E00597A

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1010 BTEX (P&T) in Soil							
Benzene	10	11	10	110%	100%	105%	10%
Toluene	10	11	11	110%	110%	110%	0%
Ethylbenzene	10	11	11	110%	110%	110%	0%
Total Xylenes	30	32	32	107%	107%	107%	0%
E1220 TPH in Soil							
Total C6-C36	950	910	965	96%	102%	99%	6%
C6-C9 Fraction	400	330	365	83%	91%	87%	10%
C15-C28 Fraction	550	550	620	100%	113%	106%	12%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd				
Toluene	1	nd				
Ethylbenzene	1	nd				
Total Xylenes	3	nd				
E1220 TPH in Soil						
Total C6-C36	-	nd				
C6-C9 Fraction	10	nd				
C10-C14 Fraction	20	nd				
C15-C28 Fraction	100	nd				
C29-C36 Fraction	100	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

ADI
Major Projects Group
Environment Division
Cnr Links & Forrester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 612 751

direct no 9 673 8110
mobile no. 041 7266908

CHAIN OF CUSTODY FORM

02166

ADI PO (6060) - to be faxed.

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: CONTACT - HUGH MADDEN | CONTACT NUMBER: 041 7266908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX										ANALYTE	MATRIX	CONTAINER	PRESERVATION
126	WQ10	-	HM	E45123	15/4/98	SOIL	2	✓	✓										TPH	M1	C2	P2-P3
																			BTEX	M1	C4	P2-P3

AMDEL HAS THIS SAMPLE IN ITS CUSTODY

8E00597A

COMMENTS: 48 HR TURNAROUND REQUESTED.
TPH METHOD - E1220, BTEX METHOD - E1010.
HOLD ALL SAMPLES IN REFRIGERATION - DO NOT DISPOSE.
FAX RESULTS TO H. MADDEN (02) 9833 8022.

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NO (NA) (please circle) Please Notify ADI Limited if Integrity Seal is found broken

DESPATCH METHOD: fax request	DATE/TIME: 26-4-98 1630.	PREPARED BY: (signature) Hugh Madden
RECEIVED BY: (signature) B. Orange	DATE/TIME: 27/4/98 12 pm	CHECKED BY: (signature) Hugh Madden

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report | 2nd Pink Project File (temp) | 3rd Green Book Copy

ADI
PO Box A221 Sydney South NSW 1235
Telephone: (02) 9916 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cnr Links & Forrester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 642 751

fasc: 1702 1104

direct number 96738110
mobile :0417266908

CHAIN OF CUSTODY FORM

02167

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: HUGH MADDEN | CONTACT NUMBER: 0417266908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	ANALYTE	MATRIX	CONTAINER	PRESERVATION
144	WQ3		HM	64372	15.4.98	SOIL	1	✓	TPH	M1	C2	P2-P3

AMDEL HAS THIS SAMPLE IN ITS CUSTODY.

RECEIVED 8E00597A

COMMENTS: 48 HR TURNAROUND REQUESTED.
TPH METHOD - E1220. HOLD ALL SAMPLES IN REFRIGERATION - DO NOT DISPOSE.
FAX RESULTS TO H. MADDEN (02) 9833 8022.

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NA NO (please circle) Please Notify ADI Limited if Integrity Seal is found broken

DESPATCH METHOD: fasc required.	DATE/TIME: 26.4.98 1640	PREPARED BY: (signature) Hugh Madden
RECEIVED BY: (signature) B. Clarke	DATE/TIME: 27/4/98 12pm	CHECKED BY: (signature) Hugh Madden

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report | 2nd Pink Project File (temp) | 3rd Green Book Copy

ENVIRONMENTAL AND INDUSTRIAL SERVICES DIVISION
Trading as Australian Analytical Laboratories Pty Ltd
ACN 001 491 667

Correspondence to:
PO BOX 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 1630
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1) Cover Page
2) Analysis Report Pages
3) QA/QC Appendix

REPORT No : 8E00603

ATTENTION : Mr Hugh Madden

CLIENT : ADI Limited Technology Group

SAMPLES : 3

REFERENCE : 6060

DATE RECEIVED : 17/04/98

DATE REPORTED : 27/04/98

Method	Description	Extracted	Analysed
E1010	Benzene,Toluene,Ethylbenzene & Xylene	17/04/98	21/04/98
E1110	Polynuclear Aromatic Hydrocarbons	17/04/98	20/04/98
E1220	Total Petroleum Hydrocarbons	17/04/98	18/04/98
E7500	Moisture (%w/w)	17/04/98	17/04/98

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued.
Note that for schemes indicated with * NATA registration does not cover the performance of this service.

PLEASE SEE ATTACHED PAGES FOR RESULTS

per G.W. ANDERSON
Manager Environmental Sydney

amdel

ob Number : 8E00603
lient : ADI Limited Technology Group
eference : 6060

	Lab No	E45632	E45633	E45634		
	Sample Id	150 WQ7	151	155 WQ8		
Analyte	PQL					
Moisture Content	1	7	7	8		
E1220 TPH in Soil						
Total C6-C36	-	nd	nd	2728		
C6-C9 Fraction	10	nd	nd	nd		
C10-C14 Fraction	20	nd	nd	nd		
C15-C28 Fraction	100	nd	nd	1177		
C29-C36 Fraction	100	nd	nd	1550		
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd	nd	nd		
Toluene	1	nd	nd	nd		
Ethylbenzene	1	nd	nd	nd		
Total Xylenes	3	nd	nd	nd		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

ɔb Number : 8E00603

:lient : ADI Limited Technology Group

:eference : 6060

	Lab No	E45632	E45633	E45634		
	Sample Id	150 WQ7	151	155 WQ8		
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd	nd	nd		
Acenaphthylene	0.5	nd	nd	nd		
' naphthene	0.5	nd	nd	nd		
Fluorene	0.5	nd	nd	nd		
Phenanthrene	0.5	nd	nd	nd		
Anthracene	0.5	nd	nd	nd		
Fluoranthene	0.5	nd	nd	nd		
Pyrene	0.5	nd	nd	nd		
Benz(a)anthracene	0.5	nd	nd	nd		
Chrysene	0.5	nd	nd	nd		
Benzo(b) & (k)fluoranthene	1	nd	nd	nd		
Benzo(a)pyrene	0.5	nd	nd	nd		
Indeno(1.2.3-cd)pyrene	0.5	nd	nd	nd		
Dibenz(a.h)anthracene	0.5	nd	nd	nd		
Benzo(g.h.i)perylene	0.5	nd	nd	nd		
al PAH	-	nd	nd	nd		
2-Fluorobiphenyl-SURROGATE		112	116	116		
p-Terphenyl-D14-SURROGATE	-	128	118	107		

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = Not Detected (<PQL)

-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified

Leachates : mg/L (ppm) in leachate

amdel

QA/QC APPENDIX NO. 8E00603

Method	Description
E1010	Benzene, Toluene, Ethylbenzene & Xylene
E1110	Polynuclear Aromatic Hydrocarbons
E1220	Total Petroleum Hydrocarbons

Chromatography QA/QC

	Yes	No	N/A
Retention Time Window Within Acceptance Criteria(±2%)	√		
Check Standard Within Acceptance Criteria(±10%)	√		
Recalibration Within Acceptance Criteria(±15%)	√		

Other QA/QC

Holding time conforming With Method Specification	√		
Chain of Custody Attached	√		

N/A=Not Applicable

Comments

1. Laboratory QA/QC including Duplicates, Matrix Spike Duplicates, and check/reference samples are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results available on request. (Where applicable)
3. Surrogate description and recoveries are recorded in the Report. (Where applicable)
4. Acceptance criteria for specific analytes are listed on each QA/QC page.
5. Practical Quantitation Limit (PQL is typically 2-10 x method detection limit (MDL)).
6. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted.
7. Results are uncorrected for matrix spike or surrogate recoveries.

per G.W. ANDERSON
Manager Environmental Sydney

amdel

:b Number : 8E00603

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1220 TPH in Soil							
Total C6-C36	950	755	775	80%	81%	81%	1%
C6-C9 Fraction	400	315	335	79%	84%	81%	6%
C15-C28 Fraction	550	440	440	80%	80%	80%	0%
E1010 BTEX (P&T) in Soil							
Benzene	10	11.0	10.0	110%	100%	105%	10%
.ene	10	11	10	110%	100%	105%	10%
Ethylbenzene	10	11	10	110%	100%	105%	10%
Total Xylenes	30	33	30	110%	100%	105%	10%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

amdel

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
E1220 TPH in Soil						
Total C6-C36	-	nd				
C6-C9 Fraction	10	nd				
C10-C14 Fraction	20	nd				
-C28 Fraction	100	nd				
C29-C36 Fraction	100	nd				
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd				
Toluene	1	nd				
Ethylbenzene	1	nd				
Total Xylenes	3	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

amdel

ob Number : 8E00603

QAQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1110 PAH's in Soil							
Naphthalene	5	4.7	4.6	94%	92%	93%	2%
Acenaphthylene	5	4.6	4.4	92%	88%	90%	4%
Acenaphthene	5	4.9	4.7	98%	94%	96%	4%
Fluorene	5	4.7	4.6	94%	92%	93%	2%
Phenanthrene	5	5.1	4.9	102%	98%	100%	4%
Anthracene	5	4.7	4.7	94%	94%	94%	0%
[illegible]ranthene	5	4.9	4.8	98%	96%	97%	2%
Pyrene	5	4.9	4.8	98%	96%	97%	2%
Benz(a)anthracene	5	5.1	4.7	102%	94%	98%	8%
Chrysene	5	5.0	5.0	100%	100%	100%	0%
Benzo(b) & (k)fluoranthene	10	10	9	96%	93%	95%	3%
Benzo(a)pyrene	5	4.8	4.6	96%	92%	94%	4%
Indeno(1.2.3-cd)pyrene	5	5.0	4.8	100%	96%	98%	4%
Dibenz(a.h)anthracene	5	5.0	4.8	100%	96%	98%	4%
Benzo(g.h.i)perylene	5	5.0	4.8	100%	96%	98%	4%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
E1110 PAH's in Soil						
Naphthalene	0.5	nd				
Acenaphthylene	0.5	nd				
Acenaphthene	0.5	nd				
rene	0.5	nd				
Phenanthrene	0.5	nd				
Anthracene	0.5	nd				
Fluoranthene	0.5	nd				
Pyrene	0.5	nd				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	nd				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1.2.3-cd)pyrene	0.5	nd				
Dibenz(a.h)anthracene	0.5	nd				
Benzo(g.h.i)perylene	0.5	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

ADI

PO Box A221 Sydney South NSW 1235
Telephone: (02) 9916 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cnr Links & Forester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 642 751

(home (02) 96738110
mobile 041726 6908

CHAIN OF CUSTODY FORM

02155

ADI PO 6060 (to be faxed)

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: HUGH MADDEN | CONTACT NUMBER: 041726 6908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	PAH	ANALYTE	MATRIX	CONTAINER	PRESERVATION
150 ✓	WQ7	–	HM	E45652	16.4.98	SOIL	2	✓	✓	✓	TPH	M1	C2	P2-P3
151 ✓	–	–	"	33	"	"	2	✓	✓	✓	BTEX	M1	C2	P2-P3
152 ✓	WQ7	–	"	–	"	"	1	PLEASE HOLD			BTEX	M1	C4	P2-P3
153 ✓	WQ7	–	"	–	"	"	2	PLEASE HOLD			PAH	M1	C2	P2-P3
154 ✓	WQ7	–	"	–	"	"	1	PLEASE HOLD						
155 ✓	WQ8	–	"	34	"	"	1	✓	✓	✓				
156 ✓	WQ8	–	"		"	"	1	PLEASE HOLD						
157 ✓	WQ8	–	"		"	"	1	PLEASE HOLD.						

860

RECEIVED 17 APR 1998 SE00603

COMMENTS: WHERE A 40ml VIAL IS PROVIDED USE IT FOR BTEX ANALYSIS. OTHERWISE TAKE SAMPLE FROM 250ml JAR.
TPH METHOD – E1220, BTEX METHOD – E1010, PAH METHOD – E1110.
HOLD ALL SAMPLES IN REFRIGERATION – DO NOT DISPOSE.
4 DAY TURNAROUND REQUESTED – FAX RESULTS TO H. MADDEN (02) 9833 8022.

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NO Please Notify ADI Limited if Integrity Seal is found broken (please circle)

DESPATCH METHOD: AMDEL PICKUP FROM ADI OFFICE | DATE/TIME: 17/4/98 6.30AM. | PREPARED BY: (signature) Hugh Madden.

RECEIVED BY: (signature) B. Orange | DATE/TIME: 17/4/98 9am | CHECKED BY: (signature) Hugh Madden.

17/4/98.

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report | 2nd Pink Project File (temp) | 3rd Green Book Copy

amdel

Registered No. 1464

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ACN 001 491 667

Correspondence to:
PO BOX 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 1630
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1) Cover Page
2) Analysis Report Pages
3) QA/QC Appendix

REPORT No : 8E00612

ATTENTION : Mr Hugh Madden

CLIENT : ADI Limited Technology Group

SAMPLES : 4

REFERENCE : 6060

DATE RECEIVED : 20/04/98

DATE REPORTED : 27/04/98

Method	Description	Extracted	Analysed
E1010	Benzene, Toluene, Ethylbenzene & Xylene	21/04/98	22/04/98
E1220	Total Petroleum Hydrocarbons	21/04/98	22/04/98
E7500	Moisture (%w/w)	21/04/98	22/04/98

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued.
Note that for schemes indicated with * NATA registration does not cover the performance of this service.

PLEASE SEE ATTACHED PAGES FOR RESULTS

per G.W. ANDERSON
Manager Environmental Sydney

amdel

) Number : 8E00612
ient : ADI Limited Technology Group
ference : 6060

	Lab No	E45637	E45638	E45639	E45640
		158	163	164	166
	Sample Id	WQ20	WQ21	WQ22	WQ22
Analyte	PQL				
E1010 BTEX (P&T) in Soil					
enzene	0.5	nd	nd	nd	nd
'oluene	1	nd	nd	nd	nd
ylbenzene	1	nd	nd	nd	nd
'otal Xylenes	3	nd	nd	nd	nd
E1220 TPH in Soil					
'otal C6-C36	-	1790	11545	4795	5574
:6-C9 Fraction	10	nd	nd	nd	nd
:10-C14 Fraction	20	28	2329	799	812
:15-C28 Fraction	100	896	7209	3085	3632
:29-C36 Fraction	100	865	2006	911	1130
Moisture Content	1	19%	18%	12%	12%

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

gandel

QA/QC APPENDIX NO. 8E00612

Method	Description
E1010	Benzene, Toluene, Ethylbenzene & Xylene
E1220	Total Petroleum Hydrocarbons

Chromatography QA/QC	Yes	No	N/A
Retention Time Window Within Acceptance Criteria(±2%)	√		
Check Standard Within Acceptance Criteria(±10%)	√		
Recalibration Within Acceptance Criteria(±15%)	√		
Other QA/QC			
Holding time conforming With Method Specification	√		
Chain of Custody Attached	√		

N/A=Not Applicable

Comments

1. Laboratory QA/QC including Duplicates, Matrix Spike Duplicates, and check/reference samples are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results available on request. (Where applicable)
3. Surrogate description and recoveries are recorded in the Report. (Where applicable)
4. Acceptance criteria for specific analytes are listed on each QA/QC page.
5. Practical Quantitation Limit (PQL is typically 2-10 x method detection limit (MDL)).
6. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted.
7. Results are uncorrected for matrix spike or surrogate recoveries.

per G.W. ANDERSON
Manager Environmental Sydney

amdel

Job Number : 8E00612

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1220 TPH in Soil							
Total C6-C36	950	760	745	80%	78%	79%	2%
C6-C9 Fraction	400	305	295	76%	73%	75%	4%
C15-C28 Fraction	550	455	450	83%	82%	82%	1%
E1010 BTEX (P&T) in Soil							
Benzene	10	11	11	110%	110%	110%	0%
Toluene	10	11	11	110%	110%	110%	0%
Ethylbenzene	10	11	11	110%	110%	110%	0%
Total Xylenes	30	32	33	107%	110%	108%	3%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
:1220 TPH in Soil						
'otal C6-C36	-	nd				
:6-C9 Fraction	10	nd				
:10-C14 Fraction	20	nd				
..-C28 Fraction	100	nd				
:29-C36 Fraction	100	nd				
:1010 BTEX (P&T) in Soil						
3enzene	0.5	nd				
Toluene	1	nd				
Ethylbenzene	1	nd				
Total Xylenes	3	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

PO Box A221 Sydney South NSW 1235
Telephone: (02) 9916 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cnr Links & Forester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 642 751

ADI

direct no. (02)9673-8110
mobile (0417266908)

CHAIN OF CUSTODY FORM

02156

ADI PO 6060 (to be faxed)

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: HUGH MADDEN | CONTACT NUMBER: 0417266908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	ANALYTE	MATRIX	CONTAINER	PRESERVATION
158	WQ20	–	HM	E45637	17.4.98	SOIL	2	✓	✓	TPH	M1	C2	P2-P3
159	WQ20	–	"		"	"	2	PLEASE HOLD		BTEX	M1	C4	P2-P3
160	WQ21	–	"		"	"	2	PLEASE HOLD					
161	WQ21	–	"		17.4.98	SOIL	2	PLEASE HOLD					
162	WQ21	–	"	[illegible]	"	"	2	PLEASE HOLD					
163	WQ21	–	"	39	"	"	2	✓	✓				
164	WQ22	–	"	39	"	"	2	✓	✓				
165	WQ22	–	"		"	"	2	PLEASE HOLD					
166	WQ22	–	"	40	"	"	2	✓	✓				

REH

RECEIVED
23 APR 1998
8000612

COMMENTS: 48 HR TURNAROUND REQUESTED. AMDEL QUOTE E980403.GA
TPH - METHOD E1220, BTEX METHOD - E1010.
HOLD ALL SAMPLES IN REFRIGERATION - DO NOT DISPOSE
FAX RESULTS TO H. MADDEN at (02)9833 8022.

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NO (please circle) Please Notify ADI Limited if Integrity Seal is found broken

DESPATCH METHOD: AMDEL PICK UP FROM ADI OFFICE.	DATE/TIME: 20/4/98 6:30AM	PREPARED BY: (signature) Hugh Madden
RECEIVED BY: (signature) [illegible]	DATE/TIME: 20/4/98 4:30p.m	CHECKED BY: (signature) Hugh Madden

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report | 2nd Pink Project File (temp) | 3rd Green Book Copy

amdel

Registered No. 1464

NATA

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Trading as Australian Analytical Laboratories Pty Ltd
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PO BOX 514
HORNSBY NSW 1630

5 Kelray Place
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Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1) Cover Page
2) Analysis Report Pages
3) QA/QC Appendix

REPORT No : 8E00612A

ATTENTION : Mr Hugh Madden

CLIENT : ADI Limited Technology Group

SAMPLES : 1

REFERENCE : 6060

DATE RECEIVED : 24/04/98

DATE REPORTED : 01/05/98

Method	Description	Extracted	Analysed
E1110	Polynuclear Aromatic Hydrocarb	27/04/98	28/04/98
E7500	Moisture (%w/w)	27/04/98	27/04/98

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued.
Note that for schemes indicated with * NATA registration does not cover the performance of this service.

PLEASE SEE ATTACHED PAGES FOR RESULTS

per G.W. ANDERSON
Manager Environmental Sydney

amdel

ob Number : 8E00612A
lient : ADI Limited Technology Group
eference : 6060

	Lab No	E45638				
	Sample Id	163-WQ21				
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	5.2				
Acenaphthylene	0.5	0.8				
naphthene	0.5	1.7				
Fluorene	0.5	3.5				
Phenanthrene	0.5	7.2				
Anthracene	0.5	1.3				
Fluoranthene	0.5	2.4				
Pyrene	0.5	2.6				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	0.6				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1.2.3-cd)pyrene	0.5	nd				
Dibenz(a.h)anthracene	0.5	nd				
Benzo(g.h.i)perylene	0.5	nd				
l PAH	-	25.3				
2-Fluorobiphenyl-SURROGATE	1	106				
Anthracene-d10-SURROGATE	1	88				
d14-Terphenyl-SURROGATE	1	101				
Moisture Content	1	18%				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

amdel

QA/QC APPENDIX NO. 8E00612A

Method	Description
E1110	Polynuclear Aromatic Hydrocarbons

Chromatography QA/QC

	Yes	No	N/A
Retention Time Window Within Acceptance Criteria(±2%)	√		
Check Standard Within Acceptance Criteria(±10%)	√		
Recalibration Within Acceptance Criteria(±15%)	√		

Other QA/QC

Holding time conforming With Method Specification	√		
Chain of Custody Attached	√		

N/A = Not Applicable

Comments

1. Laboratory QA/QC including Duplicates, Matrix Spike Duplicates, and check/reference samples are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results available on request. (Where applicable)
3. Surrogate description and recoveries are recorded in the Report. (Where applicable)
4. Acceptance criteria for specific analytes are listed on each QA/QC page.
5. Practical Quantitation Limit (PQL is typically 2-10 x method detection limit (MDL)).
6. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted.
7. Results are uncorrected for matrix spike or surrogate recoveries.

per G.W. ANDERSON
Manager Environmental Sydney

amdel

b Number : 8E00612A

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1110 PAH's in Soil							
Naphthalene	5	4.7	4.4	94%	89%	91%	5%
Acenaphthylene	5	4.5	4.2	89%	83%	86%	6%
Acenaphthene	5	4.6	4.3	91%	87%	89%	5%	
Fluorene	5	4.6	4.3	91%	86%	89%	6%
Phenanthrene	5	4.2	4.0	84%	80%	82%	5%
Anthracene	5	4.3	4.2	86%	85%	86%	2%
Fluoranthene	5	4.4	4.3	87%	85%	86%	3%
Pyrene	5	4.4	4.2	87%	85%	86%	3%
Benz(a)anthracene	5	4.3	4.2	87%	83%	85%	4%
Chrysene	5	4.6	4.4	92%	87%	90%	6%
Benzo(b) & (k)fluoranthene	10	9	8	90%	79%	85%	13%
Benzo(a)pyrene	5	4.5	3.8	89%	76%	83%	16%
Indeno(1.2.3-cd)pyrene	5	3.9	3.5	78%	71%	75%	10%
Dibenz(a.h)anthracene	5	3.9	3.7	78%	75%	76%	4%
Benzo(g.h.i)perylene	5	4.5	3.5	89%	70%	80%	23%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
E1110 PAH's in Soil						
Naphthalene	0.5	nd				
Acenaphthylene	0.5	nd				
Acenaphthene	0.5	nd				
..orene	0.5	nd				
Phenanthrene	0.5	nd				
Anthracene	0.5	nd				
Fluoranthene	0.5	nd				
Pyrene	0.5	nd				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	nd				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1.2.3-cd)pyrene	0.5	nd				
Dibenz(a.h)anthracene	0.5	nd				
Benzo(g.h.i)perylene	0.5	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

ADI

Telephone: (02) 9916 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cnr Links & Forrester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 642 751

direct: (02) 9 673 8110
mobile 0417266908

CHAIN OF CUSTODY FORM

02165

ADI PO (6060) to be faxed both

PROJECT: PIONEER	TO: AMDEL	CONTACT PERSON: HUGH MADDEN	CONTACT NUMBER: 9673 8110 / 0417266908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	ANALYSIS REQUIRED: PAH												ANALYTE	MATRIX	CONTAINER	PRESERVATION
163	WQ21		HM	E45638	17.4.98	SOIL	2.	✓												PAH	M1	C2	P2-P3

AMDEL HAS THIS SAMPLE IN ITS CUSTODY.

RECEIVED 24 APR 1998 ADI LIMITED

COMMENTS: 48 HR TURNAROUND REQUESTED, FAX RESULTS TO H. MADDEN (02) 9833 8022.
PAH METHOD - E110.

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? YES NO N/A (please circle) Please Notify ADI Limited if Integrity Seal is found broken

DESPATCH METHOD: FAX REQUEST	DATE/TIME: 24.4.98 0845	PREPARED BY: (signature) Hugh Madden
RECEIVED BY: (signature) A. Spillman	DATE/TIME: 24.4.98 Tam	CHECKED BY: (signature) Hugh Madden

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polyethylene bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered (0.45um)
P2 none/frozen
P3 chilled to 4°C (away from light)
P4 HNO3 pH<2
P5 H2SO4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report 2nd Pink Project File (temp) 3rd Green Book Copy

amdel

Registered No. 1464

Associate of the Registered Laboratories Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ENVIRONMENTAL AND INDUSTRIAL SERVICES DIVISION
Trading as Australian Analytical Laboratories Pty Ltd
ACN 001 491 667

Correspondence to:
PO BOX 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 1630
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1) Cover Page
2) Analysis Report Pages
3) QA/QC Appendix

REPORT No : 8E00625

ATTENTION : Mr Hugh Madden

CLIENT : ADI Limited Technology Group

SAMPLES : 11

REFERENCE : 02158-02159

DATE RECEIVED : 21/04/98

DATE REPORTED : 01/05/98

Method	Description	Extracted	Analysed
E1010	Benzene,Toluene,Ethylbenzene & Xylene	22/04/98	29/04/98
E1110	Polynuclear Aromatic Hydrocarbons	22/04/98	23/04/98
E1220	Total Petroleum Hydrocarbons	22/04/98	28/04/98
E7500	Moisture (%w/w)	23/04/98	23/04/98

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued.
Note that for schemes indicated with * NATA registration does not cover the performance of this service.

PLEASE SEE ATTACHED PAGES FOR RESULTS

per G.W. ANDERSON
Manager Environmental Sydney

amdel

b Number : 8E00625
lient : ADI Limited Technology Group
eference : 02158-02159

	Lab No	E45641	E45642	E45643	E45644	E45645
	Sample Id	167-WQ13	171-WQ13	174-WQ12	176-WQ12	179-WQ16
Analyte	PQL					
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd	nd	nd	nd	nd
Toluene	1	nd	nd	nd	nd	nd
Ethylbenzene	1	nd	nd	nd	nd	nd
Total Xylenes	3	nd	nd	nd	nd	nd
E1220 TPH in Soil						
Total C6-C36	-	3243	729	2832	616	106
C6-C9 Fraction	10	nd	nd	nd	nd	nd
C10-C14 Fraction	20	288	97	779	157	nd
C15-C28 Fraction	100	1227	632	1186	321	106
C29-C36 Fraction	100	1727	nd	866	138	nd
Moisture Content	1	9%	15%	6%	14%	4%

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

Job Number : 8E00625
Client : ADI Limited Technology Group
Reference : 02158-02159

	Lab No	E45646	E45647	E45648	E45649	E45650
	Sample Id	180	183-WQ16	184-WQ16	189-WQ17	190-WQ17
Analyte	PQL					
E1010 BTEX (P&T) in Soil						
Benzene	**0.5**	nd	*	nd	nd	nd
Toluene	**1**	nd	*	nd	nd	nd
Ethylbenzene	**1**	nd	*	nd	nd	nd
Total Xylenes	**3**	nd	*	nd	nd	nd
E1220 TPH in Soil						
Total C6-C36	**-**	176	145874	3639	16581	765
C6-C9 Fraction	**10**	nd	26751	449	41	nd
C10-C14 Fraction	**20**	nd	13715	37	3656	70
C15-C28 Fraction	**100**	176	17799	450	6092	695
C29-C36 Fraction	**100**	nd	87610	2704	6793	nd
Moisture Content	**1**	4%	7%	8%	13%	16%

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

* : Analysed by GC/FID due to the high concentration of TPH. The only peak within the retention time windows for BTEX compounds corresponded to Ethylbenzene at 7000ppm.

amdel

ob Number : 8E00625
lient : ADI Limited Technology Group
eference : 02158-02159

	Lab No	E45651				
	Sample Id	192-WQ11				
Analyte	PQL					
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd				
Toluene	1	nd				
Ethylbenzene	1	nd				
Total Xylenes	3	nd				
E1220 TPH in Soil						
Total C6-C36	-	958				
C6-C9 Fraction	10	nd				
C10-C14 Fraction	20	41				
C15-C28 Fraction	100	293				
C29-C36 Fraction	100	624				
Moisture Content	1	19%				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

amdel

ob Number : 8E00625
lient : ADI Limited Technology Group
eference : 02158-02159

	Lab No	E45641	E45642	E45643	E45644	E45645
	Sample Id	167-WQ13	171-WQ13	174-WQ12	176-WQ12	179-WQ16
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd	nd	nd	nd	nd
Acenaphthylene	0.5	nd	nd	nd	nd	nd
Acenaphthene	0.5	nd	nd	nd	nd	nd
Fluorene	0.5	nd	nd	0.7	nd	nd
Phenanthrene	0.5	nd	nd	1.1	nd	nd
Anthracene	0.5	nd	nd	nd	nd	nd
Fluoranthene	0.5	nd	nd	nd	nd	nd
Pyrene	0.5	nd	nd	nd	nd	nd
Benz(a)anthracene	0.5	nd	nd	nd	nd	nd
Chrysene	0.5	nd	nd	nd	nd	nd
Benzo(b) & (k)fluoranthene	1	nd	nd	nd	nd	nd
Benzo(a)pyrene	0.5	nd	nd	nd	nd	nd
Indeno(1.2.3-cd)pyrene	0.5	nd	nd	nd	nd	nd
Dibenz(a.h)anthracene	0.5	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	0.5	nd	nd	nd	nd	nd
Total PAH	-	nd	nd	1.8	nd	nd
2-Fluorobiphenyl-SURROGATE	-	104	99	92	97	95
d14-Terphenyl-SURROGATE	-	80	89	70	84	99

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

amdel

b Number : 8E00625
lient : ADI Limited Technology Group
eference : 02158-02159

	Lab No	E45646	E45647	E45648	E45649	E45650
	Sample Id	180	183-WQ16	184-WQ16	189-WQ17	190-WQ17
Analyte	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd	*<5	nd	*<5	nd
Acenaphthylene	0.5	nd	*<5	nd	*<5	nd
Acenaphthene	0.5	nd	*<5	nd	*<5	nd
Fluorene	0.5	nd	*<5	nd	*<5	nd
Phenanthrene	0.5	nd	*<5	nd	*<5	nd
Anthracene	0.5	nd	*<5	nd	*<5	nd
Fluoranthene	0.5	nd	*<5	nd	*<5	nd
Pyrene	0.5	nd	*<5	nd	*<5	nd
Benz(a)anthracene	0.5	nd	*<5	nd	*<5	nd
Chrysene	0.5	nd	*<5	nd	*<5	nd
Benzo(b) & (k)fluoranthene	1	nd	*<5	nd	*<5	nd
Benzo(a)pyrene	0.5	nd	*<5	nd	*<5	nd
Indeno(1.2.3-cd)pyrene	0.5	nd	*<5	nd	*<5	nd
Dibenz(a.h)anthracene	0.5	nd	*<5	nd	*<5	nd
Benzo(g.h.i)perylene	0.5	nd	*<5	nd	*<5	nd
Total PAH	-	nd	*	nd	*	nd
2-Fluorobiphenyl-SURROGATE	-	98	80	91	110	90
d14-Terphenyl-SURROGATE	-	110	60*	82	58*	81

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate
* : Matrix interference which caused PQLs to be raised and low surrogate recovery.

amdel

ob Number : 8E00625
lient : ADI Limited Technology Group
eference : 02158-02159

Analyte	Lab No	E45651				
	Sample Id	192-WQ11				
	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd				
Acenaphthylene	0.5	nd				
Acenaphthene	0.5	nd				
Fluorene	0.5	nd				
Phenanthrene	0.5	nd				
Anthracene	0.5	nd				
Fluoranthene	0.5	nd				
Pyrene	0.5	nd				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	nd				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1.2.3-cd)pyrene	0.5	nd				
Dibenz(a.h)anthracene	0.5	nd				
Benzo(g.h.i)perylene	0.5	nd				
Total PAH	-	nd				
2-Fluorobiphenyl-SURROGATE	-	87				
d14-Terphenyl-SURROGATE	-	82				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = Not Detected (<PQL)
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified
Leachates : mg/L (ppm) in leachate

amdel

QA/QC APPENDIX NO. 8E00625

Method	Description
E1010	Benzene, Toluene, Ethylbenzene & Xylene
E1110	Polynuclear Aromatic Hydrocarbons
E1220	Total Petroleum Hydrocarbons

Chromatography QA/QC

	Yes	No	N/A
Retention Time Window Within Acceptance Criteria(±2%)	√		
Check Standard Within Acceptance Criteria(±10%)	√		
Recalibration Within Acceptance Criteria(±15%)	√		

Other QA/QC

Holding time conforming With Method Specification	√		
Chain of Custody Attached	√		

N/A = Not Applicable

Comments

1. Laboratory QA/QC including Duplicates, Matrix Spike Duplicates, and check/reference samples are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results available on request. (Where applicable)
3. Surrogate description and recoveries are recorded in the Report. (Where applicable)
4. Acceptance criteria for specific analytes are listed on each QA/QC page.
5. Practical Quantitation Limit (PQL is typically 2-10 x method detection limit (MDL)).
6. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted.
7. Results are uncorrected for matrix spike or surrogate recoveries.

per G.W. ANDERSON
Manager Environmental Sydney

amdel

ob Number : 8E00625

AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1010 BTEX (P&T) in Soil							
Benzene	10	10	10	100%	100%	100%	0%
Toluene	10	11	11	110%	110%	110%	0%
Ethylbenzene	10	10	9	100%	90%	95%	11%
Total Xylenes	30	28	27	93%	90%	92%	4%
E1220 TPH in Soil							
Total C6-C36	950	823	803	87%	85%	86%	2%
C6-C9 Fraction	400	465	450	116%	113%	114%	3%
C15-C28 Fraction	550	540	535	98%	97%	98%	1%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

amdel

ob Number : 8E00625

AQC : Laboratory Duplicates

Analyte	PQL	Dupl 1	Dupl 2	Average	RPD (%)
E1010 BTEX (P&T) in Soil					
Benzene	0.5	nd	nd		
Toluene	1	nd	nd		
Ethylbenzene	1	nd	nd		
Total Xylenes	3	nd	nd		
E1220 TPH in Soil					
Total C6-C36	-	4429	3243	3836	30%
C6-C9 Fraction	10	nd	nd		
C10-C14 Fraction	20	300	288	294	4%
C15-C28 Fraction	100	1705	1227	1466	32%
C29-C36 Fraction	100	2424	1727	2075	33%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

ANALYTE	SAMPLE ID PQL	Blank				
E1010 BTEX (P&T) in Soil						
Benzene	0.5	nd				
Toluene	1	nd				
Ethylbenzene	1	nd				
Total Xylenes	3	nd				
E1220 TPH in Soil						
Total C6-C36	-	nd				
C6-C9 Fraction	10	nd				
C10-C14 Fraction	20	nd				
C15-C28 Fraction	100	nd				
C29-C36 Fraction	100	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

amdel

ob Number : 8E00625

)AQC : Spike Recoveries

Analyte	Spike Level (ppm)	Level Spike 1 (ppm)	Detected Spike 2 (ppm)	Recovery Details Rec 1 (%)	Rec 2 (%)	Average (%)	RPD (%)
E1110 PAH's in Soil							
Naphthalene	5	4.8	4.7	96%	95%	95%	1%
Acenaphthylene	5	4.5	4.5	90%	89%	90%	1%
Acenaphthene	5	4.8	4.6	97%	92%	94%	5%
Fluorene	5	4.7	4.5	93%	90%	92%	3%
Phenanthrene	5	4.6	4.2	91%	85%	88%	7%
Anthracene	5	4.6	4.3	92%	85%	89%	7%
Fluoranthene	5	4.7	4.3	93%	86%	90%	8%
Pyrene	5	4.7	4.4	94%	88%	91%	7%
Benz(a)anthracene	5	4.6	4.2	92%	84%	88%	8%
Chrysene	5	4.8	4.7	96%	94%	95%	2%
Benzo(b) & (k)fluoranthene	10	9	9	93%	92%	93%	1%
Benzo(a)pyrene	5	4.7	4.6	93%	92%	93%	2%
Indeno(1.2.3-cd)pyrene	5	4.7	4.6	94%	92%	93%	3%
Dibenz(a.h)anthracene	5	4.6	4.5	92%	91%	92%	2%
Benzo(g.h.i)perylene	5	4.6	4.6	92%	91%	92%	1%

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

amdel

ob Number : 8E00625

AQC : Laboratory Duplicates

Analyte	PQL	Dupl 1	Dupl 2	Average	RPD (%)
E1110 PAH's in Soil					
Naphthalene	0.5	nd	nd		
Acenaphthylene	0.5	nd	nd		
Acenaphthene	0.5	nd	nd		
Fluorene	0.5	nd	nd		
Phenanthrene	0.5	0.9	nd	0.9	
Anthracene	0.5	nd	nd		
Fluoranthene	0.5	0.5	nd	0.5	
Pyrene	0.5	nd	nd		
Benz(a)anthracene	0.5	nd	nd		
Chrysene	0.5	nd	nd		
Benzo(b) & (k)fluoranthene	1	nd	nd		
Benzo(a)pyrene	0.5	nd	nd		
Indeno(1.2.3-cd)pyrene	0.5	nd	nd		
Dibenz(a.h)anthracene	0.5	nd	nd		
Benzo(g.h.i)perylene	0.5	nd	nd		

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm)

nd = Not Detected
-- = Not Applicable

All results are within the acceptance criteria:

Refer to Amdel-Sydney Quality Control Manual SPM-01 4th Edition 1/7/97

AQC : Method Blank

	SAMPLE ID	Blank				
ANALYTE	PQL					
E1110 PAH's in Soil						
Naphthalene	0.5	nd				
Acenaphthylene	0.5	nd				
Acenaphthene	0.5	nd				
Fluorene	0.5	nd				
Phenanthrene	0.5	nd				
Anthracene	0.5	nd				
Fluoranthene	0.5	nd				
Pyrene	0.5	nd				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	nd				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1.2.3-cd)pyrene	0.5	nd				
Dibenz(a.h)anthracene	0.5	nd				
Benzo(g.h.i)perylene	0.5	nd				

PQL = Practical Quantitation Limit

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm)

nd = Not Detected
-- = Not Applicable

ADI
PO Box A221 Sydney South NSW 1235
Telephone: (02) 9916 4900 Fax: (02) 9368 0975

Major Projects Group
Environment Division
Cnr Links & Forrester Roads St Marys NSW 2760
Telephone: (02) 9833 8033 Fax: (02) 9833 8022
ACN 008 642 751

direct (02) 9673 8110
mobile 0417266908

CHAIN OF CUSTODY FORM

02158

1/2

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: HUGH MADDEN | CONTACT NUMBER: 0417266908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	PAH	ANALYTE	MATRIX	CONTAINER	PRESERVATION
167	WQ13	--	HM	E4564	20.4.98	SOIL	2 ✓	✓	✓✓	✓	TPH	M1	C2	P2-P3
168	WQ13	--	"		"	"	1	PLEASE HOLD			BTEX	M1	C2	P2-P3
169	--	--	"		"	"	1	PLEASE HOLD			BTEX	M1	C2	P2-P3
170	WQ13	--	"		"	"	1	PLEASE HOLD			PAH	M1	C2	P2-P3
171	WQ13	--	"	42	"	"	1	✓	✓✓	✓				
172	WQ13	--	"		"	"	1	PLEASE HOLD						
173	WQ12	--	"		"	"	2 ✓	PLEASE HOLD						
174	WQ12	--	"	43	"	"	2 ✓	✓	✓✓	✓				
175	WQ12	--	"		"	"	1	PLEASE HOLD						
176	WQ12	--	"	44	"	"	1	✓	✓✓	✓				
177	WQ12	--	"		"	"	1	PLEASE HOLD						
178	WQ12	--	"		"	"	1	PLEASE HOLD						
179	WQ16	--	"	45	"	"	2 ✓	✓	✓✓	✓				
180	--	--	"	46	"	"	2 ✓	✓	✓✓	✓				
181	WQ16	--	"		"	"	2 ✓	PLEASE HOLD						

RECEIVED 21 APR 1998 8E00625

EH COMMENTS: WHERE A VOCIAL IS PROVIDED USE IT. OTHERWISE TAKE SAMPLE FOR BTEX TEST FROM 250 mL JAR.
TPH METHOD - E1220, BTEX METHOD -- E1010, PAH METHOD - E1110.
HOLD ALL SAMPLES IN REFRIGERATION - DO NOT DISPOSE
4 DAY TURNAROUND REQUESTED -- fax results to H. MADDEN (02) 9 833 5022.

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? (YES) NO Please Notify ADI Limited if Integrity Seal is found broken
(please circle)

DESPATCH METHOD: AMDEL PICK UP FROM ADI OFFICE	DATE/TIME: 21/4/98 6:30AM	PREPARED BY: (signature) Hugh Madden
RECEIVED BY: (signature) R Adam	DATE/TIME: 21/4 1:30	CHECKED BY: (signature) Hugh Madden.

Matrix Codes
M1 soil
M2 rock
M3 concrete
M4 surface water
M5 ground water
M6 waste water
M7 oil
M8 liquid
M9 solid
M10 asbestos
M11 other (see comments)

Container Codes
C1 250ml glass jar, polypropylene cap
C2 250ml glass jar, teflon lined polypropylene cap
C3 20ml glass vial, teflon lined septum
C4 40ml glass vial, teflon lined septum
C5 500ml amber glass bottle, teflon lined polypropylene cap
C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
P1 filtered <0.45um
P2 zero headspace
P3 chilled to 4°C, away from light
P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original to lab/laboratory with NATA report 2nd Pink Project File (home) 3rd Green Book Copy

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ADI

Major Projects Group
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Cnr Links & Forrester Roads St Marys NSW 2760
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mobile 0417266908

CHAIN OF CUSTODY FORM

02159

2/2

PROJECT: PIONEER | TO: AMDEL | CONTACT PERSON: HUGH MADDEN | CONTACT NUMBER: 0417266908

SAMPLE No.	POINT No.	COMP. No.	SAMPLER ID	LAB ID (optional)	SAMPLE DATE	SAMPLE TYPE	QTY	TPH	BTEX	PAH	ANALYTE	MATRIX	CONTAINER	PRESERVATION
182	WQ16	--	HM		20.4.98	SOIL	2✓	PLEASE HOLD.			TPH	M1	C2	P2-P3
183	WQ16	--	HM	E4647	20.4.98	SOIL	1	✓	✓	✓	BTEX	M1	C2	P2-P3
184	WQ16	-	"	48	"	"	1	✓	✓	✓	BTEX	M1	C4	P2-P3
185	WQ16	-	"		"	"	1	PLEASE HOLD			PAH	M1	C2	P2-P3
186	WQ17	-	"		"	"	2✓	PLEASE HOLD						
187	WQ17	-	"		"	"	1	PLEASE HOLD						
188	WQ17	-	"		"	"	1	PLEASE HOLD						
189	WQ17	-	"	49	"	"	1	✓	✓	✓				
190	WQ17	-	"	50	"	"	1	✓	✓	✓				
191	WQ11	--	"		"	"	1	PLEASE HOLD						
192	WQ11	--	"	51	"	"	1	✓	✓	✓				
193	WQ11	--	"		"	"	1	PLEASE HOLD						

EH

RECEIVED
21 APR 1998
SE00625

COMMENTS: WHERE AVOC VIAL IS PROVIDED, USE IT FOR BTEX TEST. OTHERWISE TAKE SAMPLE FROM 250ml JAR.
TPH METHOD - E1220, BTEX METHOD - E1010, PAH METHOD - E1110.
HOLD ALL SAMPLES IN REFRIGERATION - DO NOT DISPOSE.
1 DAY TURNAROUND REQUESTED - Jacc results to H. MADDEN (02) 9833 8022

Signed Chain of Custody Form to be returned with NATA Report to ADI Limited, Major Projects Group, PO Box A221 Sydney South NSW 1235

Was ADI Limited Integrity Seal Intact? (YES) NO Please Notify ADI Limited if Integrity Seal is found broken
(please circle)

DESPATCH METHOD: AMDEL PICK UP FROM ADI OFFICE	DATE/TIME: 21/4/98 6.30AM	PREPARED BY: (signature) Hugh Madden
RECEIVED BY: (signature) [illegible]	DATE/TIME: 21/4 1:30pm	CHECKED BY: (signature) Hugh Madden

Matrix Codes
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M2 rock
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M5 ground water
M6 waste water
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M8 liquid
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C6 1L amber bottle, teflon lined polypropylene cap
C7 150ml polycarbonate bottle, polypropylene cap
C8 250ml polyethylene bottle, polypropylene cap
C9 1L polyethylene bottle, polypropylene cap
C10 other (see comments)

Preservation Codes
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P4 HNO_3 pH<2
P5 H_2SO_4 pH<2
P6 HCl pH<2
P7 NaOH pH>12
P8 other (see comments)

1st White original: to lab/return with NATA report | 2nd Pink Project File (temp) | 3rd Green Book Copy