

PRELIMINARY ASSESSMENT OF MULDOONS QUARRY  
KELSO NEW SOUTH WALES  
FOR CONTAMINATION  
MARCH 2005  
CENTRAL WEST ENVIROTECH  
LABORATORY REPORT

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## 1. SUMMARY

A preliminary soil contamination study was conducted at Muldoon's Quarry (Kelso Gravel Quarry) Sydney Road, Kelso, New South Wales, on 24<sup>th</sup> -29<sup>th</sup> March 2005. The site comprised a former granite quarry, former slaughterhouse and grazing land totalling 19.7 hectares of land.

The study was initiated at the request of Gary Sloan on behalf of Slobobax, to obtain a preliminary estimation of contamination prior to potential re-development of the site for a commercial bulky goods store and rail/road transit hub.

The quarry was established in 1974 to supply Bathurst Municipal Council with gravel coincident with the development of the Kelso industrial area. The quarry was subsequently leased to Contractors Fengore Plant Hire P/L and later to Mitchell Plant P/L. The dwelling by Raglan Creek is very likely to have been the site of Ingersoles abattoir which operated from about 1910 to 1960.

A plan for the "continued management and operation of the quarry" was developed by R. W, Corkery and Co. P/L in 1995. This plan recommended maintenance of a 1:2 batter. Aerial photographs of the site indicated that more than 25% (>5 ha) of the land (DP 755781) surface has at some stage been cut and/or filled.

Thirty two soil pits were excavated from 24<sup>th</sup> to 29<sup>th</sup> March 2005. Most soil pits encountered native soil terminating in weathered granite at less than 1 m depth.

Six test pits situated in the immediate vicinity of the quarry were found to contain soil and fill that was different from soils native to the site. The presence of multiple soil/fill layers containing demolition debris such as bricks, and concrete rubble at five of these pits indicated that significant quantities of fill were deposited on site, presumably to restore the required 1:2 batter. Fragments of asbestos sheet and pipe were also present in fill from a number of these test pits.

Hydrocarbons were detected at only one location (Pit 1) to 2.6 m depth. The analytical data for two deep soil samples that were selected, based on the presence of hydrocarbons and a dense green sludge, respectively, are summarized in the following tables:

**Table 1a Summary of Analytical Results (Heavy Metals)**

2 Samples	mg/kg							
	As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
HHBIL	100	20	100●	1000	300	600	7000	15
Mean	<1	<0.1	7	5	21	10	21	<0.05
% Threshold	<1%	<1%	7%	<1%	7%	<1%	<1%	<1%

HHBIL = Human Health-Based Investigation A Level for Residential with Garden/Accessible Soil (Imray and Langley 1996)  
As = Arsenic; Cd = Cadmium, Cr = Chromium● VI, Cu = Copper, Hg = Mercury, Pb = Lead, Ni = Nickel, Zn = Zinc]

**Table 1b Summary of Analytical Results (Hydrocarbons)**

2 Samples	mg/kg						
	Benzene	Toluene	Ethylbenz.	Xylene(s)	C6-C9	C10-C14	C15-36
HHBIL	1	1.4	3.1	14	65	1000	1000
Mean	<0.2	<0.5	<0.5	<1.5	<50	<100	<100
% Threshold	<20%	<36%	<16%	<21%	<77%	<10%	<10%

HHBIL = Human Health-Based Investigation A Level for Residential with Garden/Accessible Soil (Imray and Langley 1996)

Neither sample had appreciable heavy metals or hydrocarbon content.

Simple physicochemical parameters such as pH and electrical conductivity (EC), texture and colour, were used to screen soil samples for potential contamination. A saline or alkaline sample, was more likely to have excessive nutrients, dissolved salts and possibly heavy metals content than samples resembling native soil.

Approximately 13% of the 76 soil samples assessed for colour, texture, pH and dissolved salts, had pH and/or electrical conductivity (EC) that was two standard deviations above the mean. Half of these samples were collected from shallow depth (0.1 m).

Recommendations for the next stage of investigation have been made on the basis of these results and the physical characteristics of the test pits excavated.

Recommendations for Non-quarry, Non-abattoir areas are:

- 1) Analysis of 4 samples (08/0.2 and 15/0.1, 15/0.6 and 31/0.1) with elevated salts/pH from areas other than the quarry proper or abattoir for nutrients cations and heavy metals.
- 2) Analysis of 3 samples from undisturbed 'native, soils (e.g. 17/0.1, 21/01 and 30/0.1) for nutrients, cations and heavy metals
- 3) Results of the analysis of all 7 samples below respective guideline thresholds will trigger the assigning of a low risk category to soils other than those of the quarry or abattoir (within 50 m).
- 4) Results of the analysis of one or more samples above respective guideline thresholds will trigger the implementation of a Specific Sub-site Sampling and Analysis Plan (SSSAP), which will define the extent and type of contamination and recommend a Cleanup Procedure (CP).

Recommendations for Abattoir areas are:

- 5) Analysis of 2 soil samples (27/0.1 and 28/0.1) with elevated salts/pH from the area immediately north west of the former abattoir for nutrients cations and heavy metals.



- 6) Results of the analysis of both samples below respective guideline thresholds will trigger the assigning of a low risk category to soils in proximity of the former Ingersole abattoir.
- 7) Results of the analysis of one or both samples above respective guideline thresholds will trigger the implementation of a Specific Sub-site Sampling and Analysis Plan (SSSAP), which will define the extent and type of contamination and recommend a Cleanup Procedure (CP) for the soils in the vicinity of the Former Ingersole Abattoir.
- 8) Representative sampling water from the well south east of the former abattoir building involving purging of the source and analysis of the groundwater for nutrients, cations, anions and heavy metals.
- 9) Results of the analysis of purged well water below respective guideline thresholds will trigger the assigning of a low risk category to groundwater.
- 10) Results of the analysis of purged well water above respective guideline thresholds will trigger the implementation of a Groundwater Sampling and Analysis Plan (GSAP), which will define the extent and type of contamination and recommend a Cleanup Procedure (CP) for groundwater in the vicinity of the former Ingersole abattoir. This GSAP may include sampling of neighbouring registered bores

Recommendations for Quarry areas (particularly batter fill) are:

- 11) Analysis of 6 batter soil/fill samples (05/0.8, 05/1.7 06/0.1, 06/0.7, 14/0.6 and 12/1.2) for nutrients, cations and heavy metals.
- 12) Results of the chemical analysis of all 6 samples below respective guideline thresholds will result in the assigning of a low chemical risk category to soil/fill of the quarry batter
- 13) Results of the analysis of one or more samples above respective guideline thresholds will result in the implementation of a Batter Fill Sampling and Analysis Plan (Chemical) (BFSAPc), which will define the extent and type of contamination and recommend a Chemical Cleanup Procedure (CPC).
- 14) Representative sampling, sieving and quantitative sample reduction of soil/fill from test pits 5, 6, 7 12 and 14 for analysis of asbestos fibres.
- 15) Results of the asbestos analysis of all 5 test pit samples below respective guideline thresholds will result in the assigning of a moderately low asbestos risk category to soil/fill of the quarry batter for asbestos fibres

- 16) Results of yielding one or more samples above respective guideline thresholds for asbestos type, fibre size and shape analyses may result in the implementation of a Batter Fill Sampling and Analysis Plan (Asbestos) (BFSAPa) which will define the extent and type of contamination and recommend an Asbestos Cleanup Procedure (CPa).
- 17) Absence of both chemical contaminants and asbestos fibres of inhalable shape and size in all submitted samples would result in the implementation of a Segregation and Isolation Plan (SIP). The SIP would provide a strategy for the removal of larger fragments of concrete fill, asbestos sheet and pipe, plastic and copper pipe, timber and coarse roots, and similar non-compactable separable material by processes such as:
  - a) Sieving
  - b) Spreading
  - c) Raking/harrowing
- 18) Presence of Chemical contaminants or asbestos fibres at hazardous concentration and/or dimensions will result in implementation of an Isolation and Containment Plan (ICP) involving: processes such as:
  - a) Determination of the volume of asbestos-containing soil/fill
  - b) Preparation of an appropriate containment cell (buried)
  - c) Implementaion of a low risk transfer procedure
  - d) Capping of the cell
  - e) Documentation and identification of cell location and dimensions

Apart from the introduced fill the site appears to have minor contamination consistent with past landuse. Conduct of these analyses strategies will enable adequate management of the environmental and OH&S risks described

## 2. INTRODUCTION

A preliminary soil contamination study of the 19.7 ha owned by JK and CM Muldoon, which incorporated the former Kelso Gravel Quarry and former Ingersole's Abattoir was conducted in on 24-29<sup>th</sup> March 2005, to estimate the distribution and magnitude of contamination, potentially deriving from three decades of granite extraction and five decades of small scale slaughter works.

Thirty two test pits were excavated to reveal and quantify soil characteristics. Pits intercepting natural soil were invariably shallow (<1 m depth) due to proximity of granite bedrock. Deeper pits (>2 m) indicated the presence of imported fill, which included asbestos - containing materials. One pit had detectable residues of hydrocarbons, a second pit had a silty sludge indicating a former sedimentation pond. Analysis of these samples yielded acceptable levels of hydrocarbons and heavy metals, respectively. Some fill samples were alkaline and high in dissolved salts. Further analyses of these samples will form the basis of decision making processes for validation of the site. The key issues arising from the preliminary investigation are:

- 1) Asbestos content and particle size in existing introduced fill
- 2) Volume of introduced fill
- 3) Heavy metals content of fill, soil near abattoir and natural soil
- 4) Quality of groundwater at former abattoir well

**Figure 1** Kelso Gravel Quarry SE corner. View NW toward Kelso



### 3. BACKGROUND

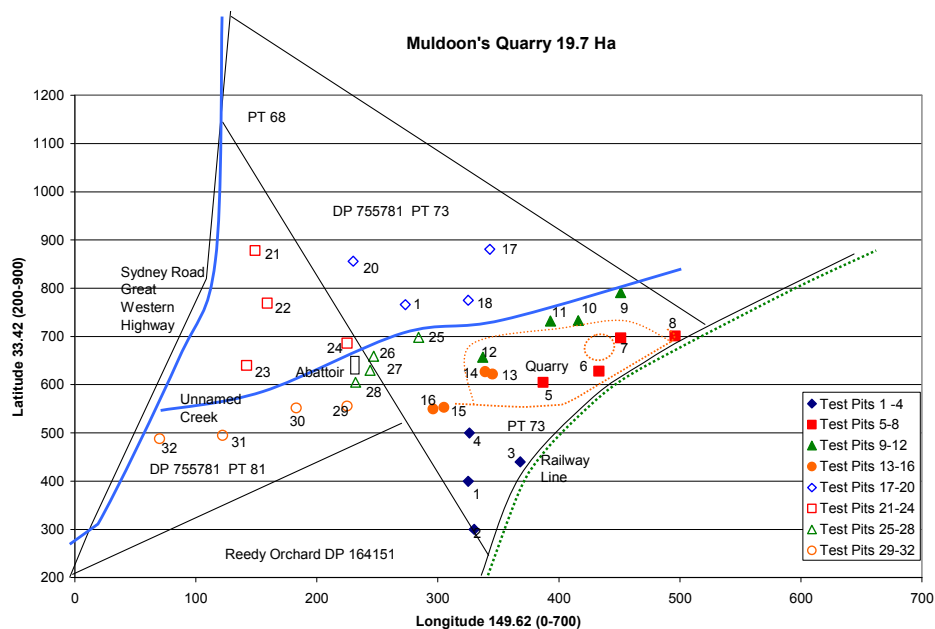
The study was initiated by Gary Sloane, to estimate contamination potentially deriving from past landuse. The site would be considered for commercial development as a bulky goods terminal.

A preliminary site visit confirmed that past land use included a small slaughter house, granite quarry and grazing of stock. Site history details indicated that landuse prior to 1910 was essentially agrarian, from 1910 – 1950 included small scale slaughter of sheep and cattle and from 1974 – 2004 was essentially extraction of gravel. The size of the quarry and topography indicated that excavation was associated with the importation of significant quantities of fill

#### 3.1 Location

A single preliminary contaminated site assessment was conducted on the former Muldoon’s Quarry (19.7 ha), D.P. 755781; parts 60, 68, 73, and 80, County of Roxburgh, Shire and Municipality of Bathurst. The site can be located at 744000 E and 6298500 N on the Bathurst 8831-3-S 1:25,000 topographical map. The street address of the Quarry is Sydney Road, Kelso, New South Wales.

**Figure 1 Sampling Points in D. P. 755781 – Muldoon’s Quarry**



#### 3.2 Vegetation

At the time of conduct of the study, the land of DP 755781, other than the area defined by the quarry was vacant agrarian land, predominantly vegetated with introduced broad leaf weeds and perennial grasses.

**Figure 2** View of south boundary showing vegetation on disturbed soil



The most frequently encountered broad leaf weeds were wild turnip (*Brassica tournefortii*), curled dock (*Rumex crispus*) and Patterson's Curse (*Echium plantagineum*).

Waterlogging indicator plants such as rush (*Juncus* ssp) and sedge (*Cyperus* ssp) were found at 5 test pit locations ( test pits 1, 2, 13 18 and 19) at the western edge of the quarry and on the east side of the unnamed creek toward the south east.

A broad range of introduced perennial grasses and native grasses were present on site, particularly the Poacea. The most frequently encountered grass was Prairie grass (*Bromus unioloides*), which was common south east of the abattoir. Panic grass (*Panicum effusum*) and Lovegrass (*Eragrostis* ssp), Windmill grass (*Chloris truncata*), Phalaris (*Phalaris aquatica*) and *Danthonia* ssp were also present in two or more locations.

### 3.3 Site Description

A small dwelling was centrally located (adjacent to Test Pits 26 and 27) close to the Raglan Creek. The dwelling was clad with corrugated iron. The bottom half of walls and floor (about 36 m<sup>2</sup>) was concrete. The top half of the walls incorporated mild steel flyscreen. Sturdy hardwood beams were set into the roof

space, from which hooks could be hung. The remains of a race and holding yards were present on the south side of the building. These features support the premise of past use as a small abattoir.

The quarry was situated at the south east end of the property, on the west side of the creek which divides DP 755781 parts 73 and 81. A central mound of stockpiled gravel was situated near the south east corner. The extent of the quarried land was defined by excavated topography, the lack of topsoil and predominance of broad leaf weeds.

The batter of the quarry containing introduced fill extended from the south east to the north west side of the quarry. Fill comprised native sandy loam topsoil and clay from the site, and introduced sandy and silt loam soil with fragments of building materials such as brick, concrete, copper pipe, plastic and asbestos sheet and pipe.

Smaller mounds of sandy soil were piled at the north west side of the main central mound. A filled-in former sedimentation dam was situated at the west side of the quarry (test pit 14). A second filled-in depression demarked by mild steel debris was situated west of the quarry (test pit 01) adjacent to the former orchard.

Some timber and scrap metal debris was located near a covered well approximately 30 m south of the former abattoir building. A number of abandoned car bodies (pre-1970) were partly buried in the sediment of the Unnamed Creek bed. The Unnamed Creek extending through the middle of the property was dry at the time of the assessment.

### 3.4 Site History

Three past landuses have been identified for the land of DP 755781, owned by J.K. and C.M. Muldoon at the time of this assessment. They include, gravel quarry, slaughterhouse and grazing.

The current dwelling (near test pit 26) is likely to have been the Ingersole abattoir. An Ingersole butchery operated in the Kelso-Bathurst region from 1873. The slaughterhouse “bounded by the southern side of the railway” was operational around 1910 and continued for approximately 50 years through to Mr. Muldoon’s ownership. Mr Muldoon recalls a throughput of 5-10 bullocks and 20-40 sheep a week toward the end of the abattoir operations in the late 1950s – early 1960s.

The granite gravel quarry, also referred to as the Kelso Gravel Quarry, initially occupying an area of about 3.9 ha was approved for development in 1974 to coincide with development of the Kelso Industrial Estate. Contractors accessing the quarry include Fengore Plant Hire P/L and Mitchell Plant Hire P/L.



**Figure 3** Former Ingersole's Abattoir (circa 1910) view from south



A "Site Management Plan for the Continued Operation and Rehabilitation of the Kelso Gravel Quarry", was prepared by R.W Corkery and Co. P/L in August 1995. The plan recommended maintenance of a 1:2 V:H batter contingent with removal of weathered granite, the stockpiling of removed topsoil and establishment of tree buffer zones at the east and northern extents of the quarry.

Grazing of sheep and cattle was conducted during the operations of the abattoir. Mr. Muldoon has kept horses on the land during his ownership.

### 3.5 Hydrology

The site lies 2.5 km east of the Macquarie River, and incorporates two seasonal tributaries of Raglan Creek, which continues west to join the Macquarie River at about 20 m lower altitude (670 m), relative to the orchard. The Unnamed Creek bisecting the property was dry at the time of assessment. The creek adjacent to the Highway had a low but constant flow.

### 3.6 Geology

Parent geology derives from the Bathurst Batholith which is described as coarse grained porphyritic biotite granite, with a quartz content of approximately 20%. Decomposed granite was encountered throughout the site at depths of 0.1-0.7 m.

The site has characteristics of both the Bathurst and Raglan soilscapes, which are part of the Bathurst Batholith. In these soilscapes granodiorite frequently overlays biotite granite. The dominant soil types for Bathurst and Raglan soilscapes are non calcic brown, red solodic, and yellow solodic soils. The latter predominate in drainage depressions. Table 2 summarizes the geology of the Kelso locality.

**Table 2 Geology and Soil Types of the Bathurst Region**

Map	Bathurst 1:100 000 series
Geological Unit	Bathurst Granite
Parent Rock	Medium to coarse grained and massive granodiorites and adamellites
Parent material	Alluvial-colluvial deriving from above parent rock
Formation	Bathurst batholith (Cbg) coarse grained porphyritic biotite granite with orthoclase megacrysts and hornblend biotite granodiorite
Adj. formation	(Qa) alluvium gravel, sand silt clay
Dominant Soil Non Calcic Brown	Topsoil: A1 Dark Brown Sandy Loam pH 6.0 Topsoil: A2 Reddish Brown Medium Clay pH 6.5 Subsoil: Dull Yellowish Brown Heavy Clay pH 6.5
Common Soil Yellow Solodic	Topsoil: A1 Brown to Brown Black Loamy Sand to sandy loam pH 5.7 Topsoil: A2 Bleached Yellow Brown to light grey sandy loam pH 7.0 Subsoil: Dull Yellow Brown mottled sandy clay loam to heavy clay pH 8.0-8.5.
Minor Soil Red Solodic	Topsoil: A1 Reddish or Dark Brown Sandy Loam, pH 6.0 Subsoil: A2 Bleached Sandy Loam pH 6.5 Subsoil: B1 Reddish Brown Light to Heavy Clay pH 6.5 Subsoil: B2 Yellowish brown Heavy clay pH 8.3

Soil samples collected on site were generally sandy, due to the proximity of granodiorite/granite bedrock. Test pits along the western edge of the central Unnamed Creek generally intercepted greyish brown sandy loam to sandy clay loam soil, which became heavier and more alkaline nearer to the confluence of the two creeks.

Soil at the south west in the vicinity of the quarry was generally a yellowish brown sandy loam becoming a sandy clay with depth. This yellow brown sandy clay was limited to the west of the creek in an area that defined the extent of the quarry.

A reddish brown sandy clay loam was located centrally from the east side of the creek across to the west of the site at a point between Reedy's orchard and the railway line. Reddish clay was generally encountered on the higher ground proximal to Reedy's orchard. An additional 6 test pits were excavated along the western side adjacent to Reedy's orchard. These soils were also reddish brown sandy loam to sandy clays.



Soil on lower ground at the east side of the creek toward the highway was a brown sandy loam to sandy clay. Virtually all soils were underlain by decomposed granite at shallow depth around 0.5 m

The greyish brown, brown and yellowish brown soils encountered were indicative of yellow solodic and non-calcic brown soils typical of the Bathurst and neighbouring Raglan soilscapes. The reddish brown soil on higher ground to the west was typical of red solodic soils, also present in these soilscapes.

**Figure 4** Test pit from east side of the central Unnamed Creek upslope showing shallow sandy profile above weathered granite (Test pit 20)



### 3.7 Hydrogeology

One well was identified on site, approximately 30 m south of the former Ingersole's abattoir building on the west bank of the Unnamed Creek. The SWL was approximately 4 m.

Four registered bores were located within one kilometre of the quarry. Two bores yielded water at depths of 18 and 31 meters at a pumping rate of approximately 2.5 L/s. The nearer bore, 500 m north west had a standing water level of 4.6 m. The distal bore, 1000 m north had an SWL of 30.5 m.

## 4. METHODS

### 4.1 Location and Number of Samples

Seventy six samples from various depth intervals were collected from 32 test pits. These samples were tested for physicochemical properties including pH, dissolved salts (electrical conductivity), Munsell colour and field texture. Samples were screened for hydrocarbon residues by olfaction and by photo-ionization.

Two samples from a depth of about 2.6 m at test pits 1 and 14 were analysed for hydrocarbons and eight heavy metals. The soil pits were excavated in a loose grid formation. The location of each test pit is shown in Figure 1, and the composite sample locations ( 1:25 000 topographic map) summarized in Table 3.

**Table 3 Location of sampling areas**

Test Pits	Location with respect to D.P. 755781	Latitude	Longitude
		33.42	149.62
1-4	South west between Reedy's Orchard and railway line	325-368	300-500
5-8	South side of Quarry Pit adjacent to railway line	387-496	605-701
9-12	North side of Quarry Pit immediately west of Creek	337-451	657-791
13-16	Central - west side of Quarry	296-345	550-627
17-20	South east side of Creek	230-343	775-881
21-24	North east side of Creek	142-225	640-878
25-28	Central west side of Creek adjacent to Abattoir	232-284	605-698
29-32	North west side of Creek	70-225	488-56

### 4.2 Excavation of Test Pits

Soil Pits were excavated using a 22 tonne CATERPILLAR® excavator with 1.3 m wide bucket.

### 4.3 Sample Screening and Collection

Soil samples were collected from test pit side walls at prescribed depths, using a Jarrat-Dormer 75 mm hand auger and/or trowel. Individual soil samples were collected in polythene bags for air-drying and physicochemical characterization. Specific samples were stored in Teflon lined 250 ml glass jars in the freezer at -20°C until dispatched for analysis. The location, soil texture and colour of topsoil and subsoil samples from each of the test pits was recorded during excavation.

### 4.4 Decontamination

The auger head, trowel and stainless steel bowls were cleaned between collection of each sub sample, primarily by scraping and brushing adherent soil from the auger head, and secondarily by rinsing with tap water, where required.

The full decontamination procedure was invoked when moist soil adhered to the auger. This comprised 4 steps:

1. Brushing away excess dirt with a stiff brush
2. Washing with 2% v/v liquid organic detergent
3. Sequential rinsing with municipal tap water (two rinses)
4. Air-drying before commencement of subsequent sampling

#### 4.5 Dispatch

The soil samples stored in glass jars with Teflon lined lids, were wrapped in insulation and transported to an accredited analytical laboratory with sufficient coolant to maintain a <4°C temperature for the duration of transit (24 hours). The dispatched samples were accompanied by appropriate chain of custody documentation. The remaining jar samples were frozen until completion of the analyses for follow-up purposes.

#### 4.6 Analysis

A 1:5 soil: distilled water mixture of the 76 air-dried samples was prepared and analysed for electrical conductivity (EC<sub>1:5</sub>) and pH<sub>H<sub>2</sub>O</sub> using a TPS 90-FLMV electrochemical meter. The K10 electrical conductivity probe was calibrated against a 276 mS/cm standard. The Ionode IJ44 intermediate junction pH electrode was standardized against pH 6.88 phosphate and pH 4.0 phthalate standards.

Two samples, implicated by a hydrocarbon odour and abnormal texture were dispatched for analysis by an external NATA accredited laboratory. These samples were stored in glass jars with teflon®-lid linings and frozen at -20 °C before being dispatched for analysis of hydrocarbons and eight metals including arsenic (As), copper (Cu), lead (Pb), Cadmium (Cd), Chromium (Cr), nickel (Ni) zinc (Zn) and mercury (Hg) by LabMark laboratories Asquith, New South Wales.

Metals were determined after acid digest by inductively coupled plasma absorption/emission spectrometry (ICPAES) and inductively coupled plasma mass spectrometry (ICP-MS). Certificate of Analysis Sheets for Organochlorines and Metals are shown in Appendix 7.1.

#### 4.7 Reporting

The results of analyses were assessed in relation to Commonwealth Environment Protection Agency and Department of Health and Family Services contaminated site guideline criteria.

## 5. RESULTS AND DISCUSSION

### 5.1 Field Data

Soil samples were visually and olfactorily assessed during test pit excavation. The full data recorded during sampling is shown in Appendix 7.2 and summarised in Table 4 below:

**Table 4 Field Texture and Colour**

Texture	Wet Colour	Topsoil 0-0.4 m	Midsoil 0.5-0.9 m	Subsoil >0.9 m
Loamy or clayey sand	Brown/Dark Brown	2, 3, 8, 21, 31	5,	
	Reddish Brown	11, 6	5, 6	7
	Yellowish Brown	11, 6	5, 6	7
	Greyish Brown	9	6	
	Strong Brown	6	6	
Silty sand	Pink Grey-Grey brown			6
Sandy Loam to Sandy	Dark Brown/Brown	8, 10, 15, 18, 19, 21, 27, 30	10	
Clay Loam	Dark Greyish Brown	9, 28, 32, 15	14	
	Reddish Brown/grey	2, 17, 20, 26	12	12
	Yellowish Brown	10	8	
Sandy to Heavy Clay	Dark Brown	16, 23, 24, 29		1, 14, 25
	Greyish Brown-Grey	30, 32, 26	9, 31	
	Olive		32	14
	Reddish Brown-Grey	16	2	12
	Strong Brown		7	6
	Yellowish Brown	27, 29,	25, 29, 13, 11	1, 5, 14

From Table 4, it is evident that clayey or loam sand was confined to the topsoil layer, except at test pits 5, 6 and 7. These 3 test pits were excavated to more than 2 m depth. The sandy fill encountered was associated with building debris such as bricks, concrete, copper and plastic pipe and some asbestos sheet/pipe.

Sandy loam generally occurred at shallow depth in the topsoil layer, except in the vicinity of the quarry, where depth of colluvium was greatest. Test pits 8, 10, 12 and 14 had sandy loam soils at depths greater than 5 m.

Clays were encountered at shallow depth in proximity to the central unnamed creek. Centrally, the sandy clays were dark brown. Along the north west bank of the creek the sandy clay was greyish brown, and near the south east corner of the neighbouring former orchard reddish clays were encountered.

### 5.2 Laboratory Data

#### 5.2.1 Hydrocarbons and Heavy Metals

Hydrocarbons were detected using photoionization detection at only on of the thirty two test pits. Pit logs show that the highest signature of 158 – 190

isobutylene equivalents was obtained for blue-grey (stained) heavy clay at a depth of 2 – 2.5 m in test pit 1. A sample from this test pit (01/2.6) was submitted for hydrocarbons and heavy metals analysis.

A second sample from test pit 14 (14/2.6) at comparable depth was also analysed for these parameters. These test pits represent two of a total of 6 pits (1,5, 6, 7, 12, 14) which were excavated to greater than 1.5 m depth and which were associated with rubble and introduced fill.

**Table 5 Analysis of Hydrocarbons in Two Deep Soil Samples**

2 Samples	mg/kg						
	Benzene	Toluene	Ethylbenz.	Xylene(s)	TPH C <sub>6-9</sub>	TPH C <sub>10-14</sub>	TPH C <sub>15-36</sub>
HHBIL	1	1.4	3.1	14	65	1000	1000
01/2.6	<0.2	<0.5	<0.5	<1.5	<50	<100	<100
14/2.6	<0.2	<0.5	<0.5	<1.5	<50	<100	<100
Result	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

HHBIL = Human Health-Based Investigation A Level for Residential with Garden/Accessible Soil (Imray and Langley 1996)  
n.d. = not detected

**Table 6 Analysis of Heavy Metals in Two Deep Soil Samples**

2 Samples	mg/kg							
	As	Cd	Cr	Cu	Hg	Pb	Ni	Zn
HHBIL	100	20	100●	1000	15	300	600	7000
01/2.6	1	<0.1	6	5	<0.05	8	7	7
14/2.6	<1	<0.1	8	5	<0.05	11	10	35
% of HHBIL	1%	n.d.	7%	<1%	<1%	<1%	<1%	<1%

HHBIL = Human Health-Based Investigation A Level for Residential with Garden/Accessible Soil (Imray and Langley 1996)

● Chromium VI threshold

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

The data show that residues of hydrocarbons and heavy metals in both samples were acceptably low, even for residential development. Test pit 14 was associated with introduced fill overlying a dense greenish sludge, of a former sedimentation dam. Sediment was tested but the fill was not.

Since at least a further four pits were associated with multiple fill layers, a screening method was used to implicate the samples that were most different from the native soil on site.

### 5.2.2 Electrical Conductivity and pH

A total of 76 individual soil samples were tested for physicochemical properties by C W Envirotech Orange N.S.W. The data for texture, colour, EC<sub>1:5</sub>, texture-dependent electrical conductivity (ECe) and pH (water) of the 76 samples is shown in Appendix 7.2. The data are summarized in Table 7.

**Table 7 Soil Electrical Conductivity and pH**

Depth (m)	Median Texture	Median Colour	pH <sup>①</sup> water	ECe <sup>②</sup> dS/m
0.2-0.8	Sand (clayey and loamy)	Dark Brown	6.0 ± 0.9	0.8 ± 0.7
0.1-1.5		Yellow Brown	6.9 ± 1.2	0.7 ± 0.3
0.1-1.7		Other	6.8 ± 1.2	1.3 ± 0.9
Mean			6.8 ± 1.1	1.1 ± 0.8
0.1-0.7	Loam (sandy-sandy clay)	Brown	6.1 ± 0.7	0.5 ± 0.4
0.1-0.6		Greyish Brown	6.8 ± 0.8	0.9 ± 0.5
0.1-0.6		Reddish Brown	6.6 ± 0.8	0.4 ± 0.2
0.1-0.6		Other	5.6 ± 0.2	0.6 ± 0.5
Mean			6.3 ± 0.8	0.6 ± 0.4
0.2-1.5	Clay (sandy to heavy)	Brown	6.6 ± 0.7	0.4 ± 0.2
0.2-0.6		Dark Greyish Brown	7.2 ± 0.8	0.3 ± 0.1
0.3-2.6		Yellowish Brown	6.9 ± 0.6	0.4 ± 0.2
0.4-2.7		Other	7.0 ± 0.7	0.4 ± 0.3
Mean			6.9 ± 0.7	0.4 ± 0.2
Overall			6.6 ± 0.9	0.6 ± 0.5

① pH of a 1:5 soil to water extract

② ECe = Electrical conductivity equivalent to the electrical conductivity of the saturation extract – determined as the product of the appropriate soil texture factor and EC<sub>1:5</sub>.

③ Outlier has an ECe and a pH which is 2 standard deviations above the mean

From Table 7, It is evident that soil type was quite variable. Loam dominated soils were more acidic than sand or clay dominated soils. Sands were saltier than loams and clays.

A feature of the data is the relatively high deviation of the means of pH and ECe. Soils of similar texture and colour were frequently dissimilar in pH and dissolved salts content. This could indicate a high level of disturbance, or site-specific impacts. Individual data was inspected to determine if site-specific effects and physicochemical characteristics were linked. Samples with pH or ECe values that were two standard deviations outside the mean were considered to be abnormal. Hence samples with a pH above 8.3, below 4.9 or an ECe above 1.7 dS/m were considered worthy of further investigation.

Samples 05/1.7 and 15/0.6 were alkaline (pH 8.4 and 8.9). Samples 05/0.8, 05/1.7, 6/0.9, 8/0.2 were abnormally high in dissolved salts (ECe 1.8 -2.8 dS/m). Samples 14/0.6, 15/0.1, 27/0.1 and 28/0.1 were also relatively high in dissolved salts content, with ECe values more than one standard deviation above the mean (ECe 1.2-1.4 dS/m). This meant that test pits 05, 06, 08 and 15 were strongly implicated and test pits 14, 27 and 28 were moderately implicated, as being potentially abnormal.

Of all the pits implicated by salinity, pH and physical composition to be 'abnormal', four (pits 08, 15, 27 and 28) could be explained by site history and situation:

Pits 27 and 28 were proximal to the former abattoir. Elevated dissolved salts content was limited to topsoil and was associated with high organic matter - manure deriving from livestock and or the paunch material post-slaughter.

**Recommendation: Test 27/0.1 and 28/0.1 and groundwater from the adjacent well for nitrogen nitrate, phosphate, cations and heavy metals**



Pits 8 and 15 were situated at the south east and north west corners of the quarry proper, respectively. Both sub-sites were poorly vegetated. Topsoil from Pit 8 was the most saline encountered (2 dS/m), but salinity was confined only to the first 0.2 m. Pit 15 had no rubble and was non-saline below 0.3 m. Both pit localities appear to be superficially saline.

**Recommendation: Test 08/0.2 and 15/0.1 for nitrates, CEC, heavy metals.**

Test Pit 1, as mentioned earlier was found to have a hydrocarbon signature, but analysis for benzene, ethylbenzene, toluene and xylene (BTEX), total petroleum hydrocarbons (TPH) and heavy metals showed no significant residues at 2.6 m depth. This pit was associated with concrete and brick rubble, but fill soil samples were not excessively saline or alkaline. A check pit excavated 5 m further east did not reveal further hydrocarbon contamination.

**Recommendation: Mechanical turning of soil from Pit 1 during soil works to increase aeration facilitating further reduction in hydrocarbon residues.**

**Figure 5** Test Pit 1 – Concrete and brick rubble underlain by fuel-stained soil



The remaining three 'implicated pits' (5, 6, and 14) were deep (>2 m) and were associated with 'introduced fill/soil'. Soil from Pit 14 soil - a silty sludge at 2.6 m, was analysed for hydrocarbons and metals and found to have negligible residues of hydrocarbons or heavy metals at base depth.

Six pits (1, 5, 6, 7, 12 and 14 ) were associated with significant amounts of introduced fill that contained building materials that were remnants of demolition: bricks, concrete, asbestos sheet and pipe, copper and plastic pipe, plastic bags and strapping. Specific details are listed in the Test Pit logs in Appendix 7.4.

Five of the six 'debris' containing pits (5, 6, 7, 12 and 14) were situated from the north west to the south east of the quarry batter and on the quarry floor, west side. Some samples of soil/fill had fractions with elevated dissolved salts and/or pH , indicative of lime/concrete addition.

**Recommendation: Test Pit 5, 6, 7, 12 and 14 soil for heavy metals.**

**Figure 6** Test Pit 5 had multiple fill layers. Debris included asbestos pipe



A contaminant of concern is asbestos, as pipe and sheet fragments were detected in Pits 5 and 6. If the area circumscribed by the five pits is uniformly contaminated with asbestos, the issues of inhalable fibres becomes more significant. Since the fill is heterogeneous, poorly compacted and mixed with formwork, wood and roots, excavation is likely to increase the risk of fibre generation if coarse sources are pulverized.

**Recommendation: Collect representative soil samples of profiles with evidence of asbestos. Analyse the sub-samples for asbestos fibres.**

The risk of asbestos fibre generation is low, since asbestos is a dense mineral, and the proportion of asbestos to fill is low. Should asbestos fibres of critical size,



and shape be detected in one or more samples, a segregation and containment plan can be implemented to minimise risk of inhalation during excavation.

**Recommendation Assess volume of fill; quantify compaction; design removal or remediation strategies**

**Figure 7** Test Pit 7 showing multiple soil and fill layers



## 6. CONCLUSION

Preliminary assessment of the Muldoon land incorporating the former Kelso Gravel Quarry, and former Ingersole Abattoir for contamination potentially deriving from past landuse revealed:

- Low risk of contamination in soils of adjacent grazing land
- Moderately low risk of contamination risk associated with Ingersole's abattoir
- Moderate contamination risk associated with the former Kelso gravel quarry

The risk associated with former grazing land will be reduced to very low with favourable results from analysis of two topsoil samples (08/0.2; 15/0.1) for nutrients, cations and heavy metals

The risk associated with the former abattoir will be reduced to a low level with favourable results from analysis of two topsoil (27/0.1, 28/0.1) and one groundwater (well) sample for nutrients, cations and heavy metals.

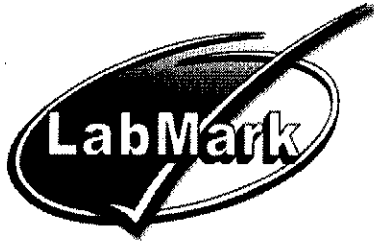
The risk associated with the former gravel quarry will be reduced to a moderately low level with favourable results from the analysis of six soil samples (05/0.8, 05/1.7, 06/0.2, 06/0.9, 12/ 1.1 and 14/0.6) for nutrients, cations, and heavy metals and further reduced to a low risk level with favourable analysis of soil from test pits 5, 6, 7, 12 and 14 for asbestos.

In the event that a non-favourable result is returned for these samples, depending on the parameter, the location, the concentration and the frequency of 'failure' various mitigation plans can be implement to isolate, segregate, neutralize and/or immobilize the contaminants of concern such that development may proceed in an acceptably safe manner with an acceptable legacy for future landuse options.

## 7. APPENDICES

### 7.1 Certificates of Analysis

**LabMark Laboratories Asquith NSW**



**AQIS**

AUSTRALIAN QUARANTINE  
AND INSPECTION SERVICE

No. 13542.

SYDNEY License No. N0356.

Accredited for compliance with ISO/IEC 17025. The results of tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Quarantine Approved premises criteria 5.1 for quarantine containment level 1 (QC1) facilities. Class five criteria cover premises utilised for research, analysis, and/or testing of biological material, soil, animal, plant and human products.

**CUSTOMER CENTRIC - ANALYTICAL CHEMISTS**

**FINAL CERTIFICATE OF ANALYSIS - ENVIRONMENTAL DIVISION**

**Laboratory Report No:** E022211  
**Client Name:** Central West Envirotech  
**Client Reference:** 0507DR - May assorted  
**Contact Name:** James Milson  
**Chain of Custody No:** na  
**Sample Matrix:** OTHER & SOIL & WATER

Cover Page 1 of 4  
plus Sample Results

**Date Received:** 15/06/2005  
**Date Reported:** 21/06/2005

This Final Certificate of Analysis consists of sample results, DQT's, method descriptions, laboratory definitions, and internationally recognised NATA accreditation and endorsement. The DQO compliance relates specifically to QA/QC results as performed as part of the sample analysis, and may provide an indication of sample result quality. Transfer of report ownership from Labmark to the client shall only occur once full & final payment has been settled and verified. All report copies may be retracted where full payment has not occurred within the agreed settlement period.

**QUALITY ASSURANCE CRITERIA**

**Accuracy:** matrix spike: 1 in first 5-20, then 1 every 20 samples  
lcs, crm, method: 1 per analytical batch  
surrogate spike: addition per target organic method

**Precision:** laboratory duplicate: 1 in first 5-10; then 1 every 10 samples  
laboratory triplicate: re-extracted & reported when duplicate RPD values exceed acceptance criteria

**Holding Times:** soils, waters: Refer to LabMark Preservation & THT table  
VOC's 14 days water / soil  
VAC's 7 days water or 14 days acidified  
VAC's 14 days soil  
SVOC's 7 days water, 14 days soil  
Pesticides 7 days water, 14 days soil  
Metals 6 months general elements  
Mercury 28 days

**Confirmation:** target organic analysis: GC/MS, or confirmatory column

**Sensitivity:** EQL: Typically 2-5 x Method Detection Limit (MDL)

**QUALITY CONTROL**

**GLOBAL ACCEPTANCE CRITERIA (GAC)**

**Accuracy:** spike, lcs, crm general analytes 70% - 130% recovery  
surrogate: phenol analytes 50% - 130% recovery  
organophosphorous pesticide analytes 60% - 130% recovery  
phenoxo acid herbicides 50% - 130% recovery

anion/cation bal: +/- 10% (0-3 meq/l),  
+/- 5% (>3 meq/l)

**Precision:** method blank: not detected >95% of the reported EQL  
duplicate lab 0-30% (>10xEQL), 0-75% (5-10xEQL)  
RPD (metals): 0-100% (<5xEQL)  
duplicate lab 0-50% (>10xEQL), 0-75% (5-10xEQL)  
RPD: 0-100% (<5xEQL)

**QUALITY CONTROL**

**ANALYTE SPECIFIC ACCEPTANCE CRITERIA (ASAC)**

**Accuracy:** spike, lcs, crm analyte specific recovery data  
surrogate: <3xsd of historical mean

**Uncertainty:** spike, lcs: measurement calculated from historical analyte specific control charts

**RESULT ANNOTATION**

DQO: Data Quality Objective s: matrix spike recovery p: pending  
DQI: Data Quality Indicator d: laboratory duplicate lcs: laboratory control sample  
EQL: Estimated Quantitation Limit t: laboratory triplicate crm: certified reference material  
--: not applicable r: RPD relative % difference mb: method blank

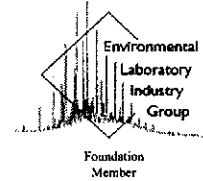
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CUSTOMER CENTRIC - ANALYTICAL CHEMISTS



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## NEPC GUIDELINE COMPLIANCE - DQO

### 1. GENERAL

- A. Results relate specifically to samples as received. Sample results are not corrected for matrix spike, lcs, or surrogate recovery data.
- B. EQL's are matrix dependant and may be increased due to sample dilution or matrix interference.
- C. Laboratory QA/QC samples are specific to this project.
- D. Inter-laboratory proficiency results are available upon request. NATA accreditation details available at [www.nata.asn.au](http://www.nata.asn.au).
- E. VOC spikes & surrogates added to samples during extraction, SVOC spikes & surrogates added prior to extraction.
- F. Recovery data outside GAC limits shall be investigated and compared to ASAC (historical mean +/- 3sd). If recovery data <20%, then the relevant results for that compound are considered not reliable.
- G. Recovery data (ms, surrogate, crm, lcs) outside ASAC limits shall initiate an investigative action. Anomalous QC data is examined in conjunction with other QC samples and a final decision whether to accept or reject results is provided by the professional judgement of the senior analyst. The USEPA-CLP National Functional Guidelines are referred to for specific recommendations.
- H. Extraction (preparation) date refers to the date that sample preparation was initiated. Note that certain methods not requiring sample preparation (eg. VOCs in water, etc) may report a common extraction and analysis date.
- I. LabMark shall maintain an official copy of this Certificate of Analysis for all tracable reference purposes.

### 2. CHAIN OF CUSTODY (COC) & SAMPLE RECEIPT NOTICE (SRN) REQUIREMENTS

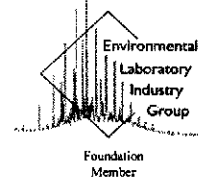
- A. SRN issued to client upon sample receipt & login verification.
- B. Preservation & sampling date details specified on COC and SRN, unless noted.
- C. Sample Integrity & Validated Time of Sample Receipt (VTSR) Holding Times verified (preservation may extend holding time, refer to preservation chart).

### 3. NATA ACCREDITED METHODS

- A. NATA accreditation held for each method and sample matrix type reported, unless noted below.
- B. NATA accredited in-house laboratory methods are referenced from NEPC, ASTM, modified USEPA / APHA documents. Corporate Accreditation No. 13542.
- C. Subcontracted analyses: Refer to Sample Receipt Notice and additional DQO comments.



CUSTOMER CENTRIC - ANALYTICAL CHEMISTS



**Laboratory Report: E022211**

Cover Page 3 of 4

**4. QA/QC FREQUENCY COMPLIANCE TABLE SPECIFIC TO THIS REPORT**

**Matrix: OTHER**

Page:	Method:	Totals:	#d	%d-ratio	#t	#s	%s-ratio
7	Acid extractable metals (M7)	12	2	17%	0	1	8%
10	Acid extractable mercury	12	2	17%	0	1	8%
17	Acid extractable metals	1	0	0%	0	0	0%
18	Moisture	12	--	--	--	--	--

**Matrix: SOIL**

Page:	Method:	Totals:	#d	%d-ratio	#t	#s	%s-ratio
1	BTEX by P&T	3	0	0%	0	0	0%
1	Volatile TPH by P&T (vTPH)	3	0	0%	0	0	0%
2	Petroleum Hydrocarbons (TPH)	3	0	0%	0	0	0%
3	Organochlorine Pesticides (OC)	8	1	13%	0	1	13%
5	Organophosphorus Pesticides	8	1	13%	0	1	13%
7	Acid extractable metals (M7)	12	2	17%	0	1	8%
10	Acid extractable mercury	12	2	17%	0	1	8%
18	Moisture	12	--	--	--	--	--

**Matrix: WATER**

Page:	Method:	Totals:	#d	%d-ratio	#t	#s	%s-ratio
12	Filtered mercury	14	2	14%	0	1	7%
14	Filtered metals	14	2	14%	0	1	7%

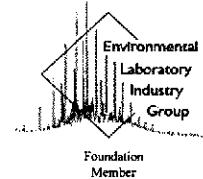
NEPC guideline for laboratory duplicates is 1 in 10 samples (10%).  
 USEPA guideline for laboratory matrix spikes is 1 in 20 samples (5%).



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CUSTOMER CENTRIC - ANALYTICAL CHEMISTS

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**Laboratory Report: E022211**

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**5. ADDITIONAL COMMENTS SPECIFIC TO THIS REPORT**

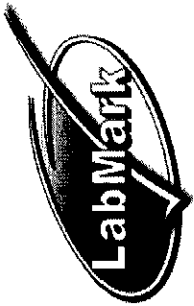
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A. Report re-issued with Lab #20336 analysed and reported for TPH, BTEX, metals as per client instructions, refer to reissued sample receipt notice. Lab #20336 was extracted outside THT for TPH, BTEX analysis, sample was kept refrigerated prior to analysis.

---

Laboratory QA/QC Self Assessment data shall relate specifically to this report, and may only provide an indication of sample result quality. Acceptance of this Self Assessment certificate does not preclude any requirement for a QA/QC review by a accredited contaminated site EPA auditor, when and wherever necessary. Laboratory QA/QC Self Assessment references available upon request.





Laboratory Report No: E022211

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Final

Client Name: Central West Envirotech

plus cover page

# Certificate of Analysis

Contact Name: James Milson

Date: 21/6/05

Client Reference: 0507DR - May assorted

This report supercedes reports issued on: 3/6/05

Laboratory Identification		20334	20335	20336	les	les	mb	mb
Sample Identification		0512GS-01	0512GS-14	0521DW-05	QC	QC	QC	QC
Depth (m)		2.6	2.6	1.8	--	--	--	--
Sampling Date recorded on COC		24/3/05	24/3/05	21/5/05	--	--	--	--
Laboratory Extraction (Preparation) Date		28/5/05	28/5/05	15/6/05	28/5/05	28/5/05	15/6/05	15/6/05
Laboratory Analysis Date		2/6/05	2/6/05	18/6/05	15/6/05	30/5/05	15/6/05	15/6/05
<b>Method</b>	<b>BTEX by P&amp;T</b>	<b>EQL</b>						
E002.2	Benzene	0.2	<0.2	<0.2	108%	<0.2	<0.2	<0.2
	Toluene	0.5	<0.5	<0.5	106%	<0.5	<0.5	<0.5
	Ethylbenzene	0.5	<0.5	0.9	106%	<0.5	<0.5	<0.5
	meta- and para-Xylene	1	<1	1	113%	<1	<1	<1
	ortho-Xylene	0.5	<0.5	<0.5	107%	<0.5	<0.5	<0.5
	Total Xylene	--	--	1	--	--	--	--
	<i>CDFB (Surr @ 10mg/kg)</i>	--	88%	92%	101%	99%	105%	105%
<b>Method</b>	<b>Volatile TPH by P&amp;T (vTPH)</b>	<b>EQL</b>						
E003.2	C6 - C9 Fraction	10	<10	10	100%	<10	<10	<10

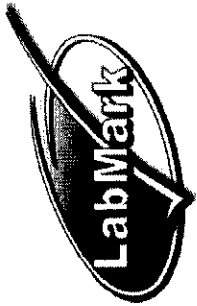
Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E002.2: 8-10g soil extracted with 20ml methanol. Analysis by P&T/GC/PID/MSD.

E003.2: 8-10g soil extracted with 20ml methanol. Analysis by P&T/GC/FID.





Laboratory Report No: E022211

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Final

Client Name: Central West Envirotech

plus cover page

# Certificate of Analysis

Contact Name: James Milson

Date: 21/6/05

Client Reference: 0507DR - May assorted

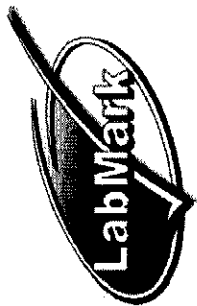
This report supercedes reports issued on: 3/6/05

Laboratory Identification		20334	20335	20336	ics	ics	mb	mb
Sample Identification		0512GS-01	0512GS-14	0521DW-05	QC	QC	QC	QC
Depth (m)		2.6	2.6	1.8	--	--	--	--
Sampling Date recorded on COC		24/3/05	24/3/05	21/5/05	--	--	--	--
Laboratory Extraction (Preparation) Date		28/5/05	28/5/05	15/6/05	15/6/05	28/5/05	15/6/05	15/6/05
Laboratory Analysis Date		1/6/05	1/6/05	16/6/05	15/6/05	30/5/05	15/6/05	15/6/05
<b>Method</b>	<b>Petroleum Hydrocarbons (TPH)</b>							
E006.2	C10 - C14 Fraction	<50	<50	60	86%	<50	<50	<50
	C15 - C28 Fraction	<100	<100	<100	--	<100	<100	<100
	C29 - C36 Fraction	<100	<100	<100	--	<100	<100	<100
	Sum of TPH C10 - C36	--	--	60	--	--	--	--

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E006.2: 8-10g soil extracted with 20ml DCM/Acetone (8:2). Analysis by GC/FID.



Laboratory Report No: E022211

Client Name: Central West Envirotech

Contact Name: James Milson

Client Reference: 0507DR - May assorted

Page: 3 of 18

plus cover page

Date: 21/6/05

This report supersedes reports issued on: 3/6/05

Final

# Certificate of Analysis

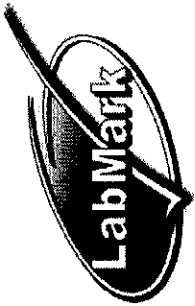


Laboratory Identification		20338	20339	20340	20341	20342	20343	20344	20345	20338d	20338r
Sample Identification		0513GSA	0513GSB	0513GSC	0513GSD	0513GSE	0513GSF	0513GSG	0513GSH	QC	QC
Depth (m)		0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	--	--
Sampling Date recorded on COC		31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	--	--
Laboratory Extraction (Preparation) Date		28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05
Laboratory Analysis Date		31/5/05	31/5/05	31/5/05	31/5/05	31/5/05	31/5/05	31/5/05	31/5/05	31/5/05	31/5/05
<b>Method</b>	<b>Organochlorine Pesticides (OC)</b>										
E013.2	<b>EQL</b>										
	a-BHC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	HCb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	b-BHC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	g-BHC (Lindane)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	d-BHC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Heptachlor	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Aldrin	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Heptachlor epoxide	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	trans-chlordane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Endosulfan I	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	cis-chlordane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Dieldrin	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	4,4-DDE	1.1	0.66	1.3	1.0	1.1	0.83	0.87	0.91	1.1	0.0%
	Endrin	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Endosulfan II	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	4,4-DDD	0.09	0.07	0.14	0.1	0.15	0.09	0.1	0.08	0.09	0.0%
	Endosulfan sulphate	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	4,4-DDT	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Methoxychlor	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	DBC (Surr @ 0.2mg/kg)	88%	84%	95%	93%	95%	93%	96%	93%	83%	6%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: # Percent recovery not available due to significant background levels of analyte in sample.

E013.2: 8-10g soil extracted with 20ml hexane/acetone (1:1). Analysis by GC/dual ECD.



Laboratory Report No: E022211

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Client Name:

Central West Envirotech

Certificate

Contact Name:

James Milson

of Analysis

Date: 21/6/05

Client Reference

0507DR - May assorted

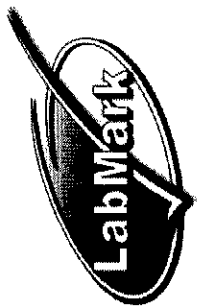
This report supersedes reports issued on: 3/6/05

Laboratory Identification		20339s	ics	mb				
Sample Identification		QC	QC	QC				
Depth (m)		--	--	--				
Sampling Date recorded on COC		--	--	--				
Laboratory Extraction (Preparation) Date		28/5/05	28/5/05	28/5/05				
Laboratory Analysis Date		31/5/05	30/5/05	30/5/05				
<b>Method</b>	<b>Organochlorine Pesticides (OC)</b>	<b>EQL</b>						
E013.2	a-BHC	0.05	107%	<0.05				
	HCB	0.05	118%	<0.05				
	b-BHC	0.05	102%	<0.05				
	g-BHC (Lindane)	0.05	105%	<0.05				
	d-BHC	0.05	98%	<0.05				
	Heptachlor	0.05	105%	<0.05				
	Aldrin	0.05	104%	<0.05				
	Heptachlor epoxide	0.05	106%	<0.05				
	trans-chlordane	0.05	107%	<0.05				
	Endosulfan I	0.05	107%	<0.05				
	cis-chlordane	0.05	105%	<0.05				
	Dieldrin	0.05	104%	<0.05				
	4,4-DDE	0.05	105%	<0.05				
	Endrin	0.05	113%	<0.05				
	Endosulfan II	0.05	108%	<0.05				
	4,4-DDD	0.05	100%	<0.05				
	Endosulfan sulphate	0.05	108%	<0.05				
	4,4-DDT	0.2	103%	<0.2				
	Methoxychlor	0.2	111%	<0.2				
	DBC (Surr @ 0.2mg/kg)	--	100%	113%				

Results expressed in mg/kg dry weight unless otherwise specified

Comments: # Percent recovery not available due to significant background levels of analyte in sample.

E013.2: 8-10g soil extracted with 20ml hexane/acetone (1:1). Analysis by GC/dual ECD.



Laboratory Report No: E022211

Client Name: Central West Envirotech

Contact Name: James Milson

Client Reference: 0507DR - May assorted

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Date: 21/6/05

This report supersedes reports issued on: 3/6/05

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# Certificate of Analysis

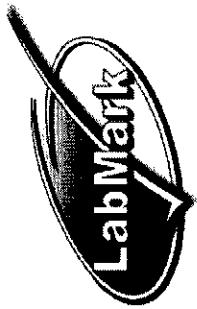


Laboratory Identification		20338	20339	20340	20341	20342	20343	20344	20345	20338d	20338r
Sample Identification		0513GSA	0513GSB	0513GSC	0513GSD	0513GSE	0513GSF	0513GSG	0513GSH	QC	QC
Depth (m)		0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	--	--
Sampling Date recorded on COC		31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	--	--
Laboratory Extraction (Preparation) Date		28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05
Laboratory Analysis Date		30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05
Method	Organophosphorus Pesticides	EQI									
E014.2	Dichlorvos	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Mevinphos (Phosdrin)	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Demeton (total)	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Ethoprop	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Monocrotophos	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Phorate	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Dimethoate	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Diazinon	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Disulfoton	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Methyl parathion	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Ronnel	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Fenitrothion	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Malathion	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Fenthion	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Chlorpyrifos	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Parathion	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Stirofos	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Prothiofos	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Azinophos methyl	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Coumaphos	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	TPP (Surr @ 2mg/kg)	--	103%	105%	114%	102%	104%	110%	107%	99%	4%

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E014.2: 8-10g soil extracted with 20ml hexane/acetone (1:1). Analysis by GC/FPD/MS.



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Client Name: Central West Envirotech

Contact Name: James Milson

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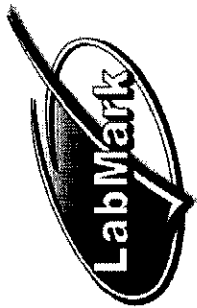
Laboratory Identification		20339s	ics	mb					
Sample Identification		QC	QC	QC					
Depth (m)		--	--	--					
Sampling Date recorded on COC		--	--	--					
Laboratory Extraction (Preparation) Date		28/5/05	28/5/05	28/5/05					
Laboratory Analysis Date		30/5/05	30/5/05	30/5/05					
Method	Organophosphorus Pesticides	EQL							
E014.2	Dichlorvos	0.5	104%	<0.5					
	Mevinphos (Phosdrin)	0.5	--	<0.5					
	Demeton (total)	1	--	<1					
	Ethoprop	0.5	98%	<0.5					
	Monocrotophos	0.5	102%	<0.5					
	Phorate	0.5	100%	<0.5					
	Dimethoate	0.5	109%	<0.5					
	Diazinon	0.5	102%	<0.5					
	Disulfoton	0.5	101%	<0.5					
	Methyl parathion	0.5	99%	<0.5					
	Ronnel	0.5	89%	<0.5					
	Fenitrothion	0.5	104%	<0.5					
	Malathion	0.5	86%	<0.5					
	Fenthion	0.5	106%	<0.5					
	Chlorpyrifos	0.5	101%	<0.5					
	Parathion	0.5	101%	<0.5					
	Stirofos	0.5	102%	<0.5					
	Prothiofos	0.5	107%	<0.5					
	Azinophos methyl	0.5	127%	<0.5					
	Coumaphos	0.5	111%	<0.5					
	TPP (Surr @ 2mg/kg)	--	102%	103%					

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E014.2: 8-10g soil extracted with 20ml hexane/acetone (1:1). Analysis by GC/FPD/MS.





Laboratory Report No: E022211

Client Name: Central West Envirotech

Contact Name: James Milson

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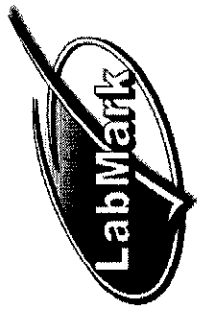


Laboratory Identification		20334	20335	20336	20337	20338	20339	20340	20341	20342	20343
Sample Identification		0512GS-01	0512GS-14	0521DW-05	052975-01	0513GSA	0513GSB	0513GSC	0513GSD	0513GSE	0513GSF
Depth (m)		2.6	2.6	1.8	--	0.15	0.15	0.15	0.15	0.15	0.15
Sampling Date recorded on COC		24/3/05	24/3/05	21/5/05	23/5/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05
Laboratory Extraction (Preparation) Date		1/6/05	1/6/05	16/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05
Laboratory Analysis Date		1/6/05	1/6/05	19/6/05	1/6/05	2/6/05	2/6/05	2/6/05	1/6/05	1/6/05	1/6/05
<b>Method</b>	<b>Acid extractable metals (M7)</b>										
E022.2	Arsenic	1	<1	2	5	1	<1	<1	2	<1	<1
	Cadmium	<0.1	<0.1	0.1	0.9	0.1	0.1	0.2	0.1	0.1	0.1
	Chromium	6	8	15	54200	13	7	8	11	16	16
	Copper	5	5	11	12000	88	66	99	88	.49	55
	Nickel	7	10	3	37	3	2	3	3	6	4
	Lead	8	11	15	64	10	9	10	12	9	8
	Zinc	7	35	49	2770	13	10	15	15	10	11
	<b>EQL</b>										

Results expressed in mg/kg dry weight unless otherwise specified

Comments: # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.



**Laboratory Report No:** E022211  
**Client Name:** Central West Envirotech  
**Contact Name:** James Milson  
**Client Reference:** 0507DR - May assorted

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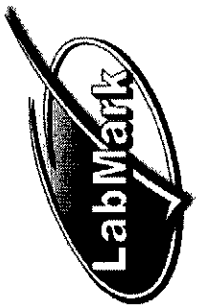
This report supercedes reports issued on: 3/6/05

Laboratory Identification		20344	20345	20338d	20338r	20345d	20345r	20339s	crm	crm	ics
Sample Identification		0513GSG	0513GSH	QC	QC	QC	QC	QC	QC	QC	QC
Depth (m)		0.15	0.15	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		31/3/05	31/3/05	--	--	--	--	--	--	--	--
Laboratory Extraction (Preparation) Date		1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05
Laboratory Analysis Date		1/6/05	1/6/05	2/6/05	2/6/05	1/6/05	2/6/05	1/6/05	1/6/05	1/6/05	1/6/05
<b>Method</b>	<b>Acid extractable metals (M7)</b>	<b>EQL</b>									
E022.2	Arsenic	1	<1	1	0%	<1	--	80%	109%	94%	107%
	Cadmium	0.1	<0.1	0.1	0.0%	<0.1	--	93%	91%	92%	93%
	Chromium	1	6	11	17%	5	18%	73%	91%	92%	101%
	Copper	2	43	91	3%	45	5%	#	96%	90%	103%
	Nickel	1	2	3	0%	1	67%	78%	92%	84%	104%
	Lead	2	7	10	0%	7	0%	95%	101%	93%	100%
	Zinc	5	9	13	0%	8	12%	80%	87%	83%	101%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.



**Laboratory Report No:** E022211  
**Client Name:** Central West Envirotech  
**Contact Name:** James Milson  
**Client Reference:** 0507DR - May assorted

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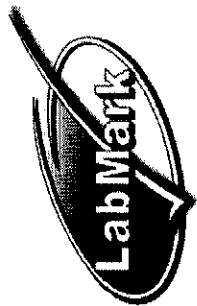
Laboratory Identification		ics	mb	mb					
Sample Identification		QC	QC	QC					
Depth (m)		--	--	--					
Sampling Date recorded on COC		--	--	--					
Laboratory Extraction (Preparation) Date		16/6/05	1/6/05	16/6/05					
Laboratory Analysis Date		17/6/05	1/6/05	17/6/05					
Method	Acid extractable metals (M7)	EQL							
E022.2	Arsenic	1	<1	<1					
	Cadmium	0.1	<0.1	<0.1					
	Chromium	1	<1	<1					
	Copper	2	<2	<2					
	Nickel	1	<1	<1					
	Lead	2	<2	<2					
	Zinc	5	<5	<5					

Results expressed in mg/kg dry weight unless otherwise specified

Comments: # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.





Laboratory Report No: E022211

Client Name: Central West Envirotech

Contact Name: James Milson

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Laboratory Identification		20334	20335	20336	20337	20338	20339	20340	20341	20342	20343
Sample Identification		0512GGS-01	0512GGS-14	0521DW-05	052975-01	0513GSA	0513GSB	0513GSC	0513GSD	0513GSE	0513GSF
Depth (m)		2.6	2.6	1.8	--	0.15	0.15	0.15	0.15	0.15	0.15
Sampling Date recorded on COC		24/3/05	24/3/05	21/5/05	23/5/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05
Laboratory Extraction (Preparation) Date		1/6/05	1/6/05	16/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05	1/6/05
Laboratory Analysis Date		1/6/05	1/6/05	17/6/05	2/6/05	2/6/05	2/6/05	2/6/05	1/6/05	1/6/05	1/6/05
<b>Method</b>	<b>Acid extractable mercury</b>	<b>EQL</b>									
E026.2	Mercury	0.05	<0.05	0.10	*<0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Results expressed in mg/kg dry weight unless otherwise specified

Comments: \*EQL increased due to matrix interference.

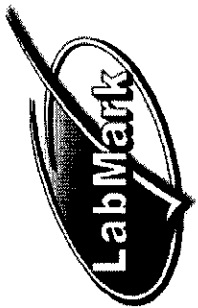
E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		20344	20345	20338d	20338r	20345d	20345r	20339s	crm	crm	ics
Sample Identification		0513GSG	0513GSH	QC	QC	QC	QC	QC	QC	QC	QC
Depth (m)		0.15	0.15	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		31/3/05	31/3/05	--	--	--	--	--	--	--	--
Laboratory Extraction (Preparation) Date		1/6/05	1/6/05	1/6/05	--	1/6/05	--	1/6/05	1/6/05	16/6/05	1/6/05
Laboratory Analysis Date		1/6/05	1/6/05	2/6/05	--	1/6/05	--	2/6/05	1/6/05	16/6/05	1/6/05
<b>Method</b>	<b>Acid extractable mercury</b>	<b>EQL</b>									
E026.2	Mercury	0.05	<0.05	<0.05	--	<0.05	--	98%	102%	121%	88%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: \*EQL increased due to matrix interference.

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.



**Laboratory Report No:** E022211

**Client Name:** Central West Envirotech

**Contact Name:** James Milson

**Client Reference:** 0507DR - May assorted

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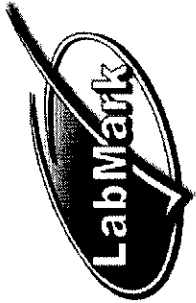


Laboratory Identification		les	mb	mb
Sample Identification		QC	QC	QC
Depth (m)		--	--	--
Sampling Date recorded on COC		--	--	--
Laboratory Extraction (Preparation) Date		16/6/05	1/6/05	16/6/05
Laboratory Analysis Date		16/6/05	1/6/05	16/6/05
<b>Method</b>	<b>Acid extractable mercury</b>	<b>EQL</b>		
E026.2	Mercury	99%	<0.05	<0.05

Results expressed in mg/kg dry weight unless otherwise specified

Comments: \*EQL increased due to matrix interference.

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.



Laboratory Report No: E022211

Client Name: Central West Envirotech

Contact Name: James Milson

Client Reference: 0507DR - May assorted

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Laboratory Identification		20320	20321	20322	20323	20324	20325	20326	20327	20328	20329
Sample Identification		0507RD01	0507RD02	0507RD03	0507RD04	0507RD05	0507RD06	0507RD07	0523RD01	0523RD02	0523RD03
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		31/1/05	31/1/05	31/1/05	31/1/05	31/1/05	31/1/05	31/1/05	4/5/05	4/5/05	4/5/05
Laboratory Extraction (Preparation) Date		27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05
Laboratory Analysis Date		30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	30/5/05
<b>Method</b>	<b>Filtered mercury</b>										
E026.1	Mercury										
<b>EQL</b>											
0.1		<0.1	1.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.5	1

Results expressed in ug/l unless otherwise specified

Comments:

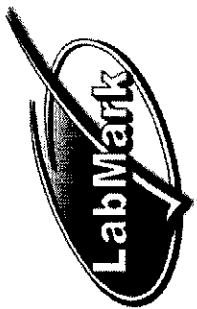
E026.1: Analysis by CV-ICP-MS or FIMS following BrCl pre-treatment.

Laboratory Identification		20330	20331	20332	20333	20320d	20320r	20330d	20330r	20321s	ics
Sample Identification		0523RD04	0523RD05	0523RD06	0523RD07	QC	QC	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		4/5/05	4/5/05	4/5/05	4/5/05	--	--	--	--	--	--
Laboratory Extraction (Preparation) Date		27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	--	27/5/05	--	27/5/05	27/5/05
Laboratory Analysis Date		30/5/05	30/5/05	30/5/05	30/5/05	30/5/05	--	30/5/05	--	30/5/05	30/5/05
<b>Method</b>	<b>Filtered mercury</b>										
E026.1	Mercury										
<b>EQL</b>											
0.1		<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	--	97%	89%

Results expressed in ug/l unless otherwise specified

Comments:

E026.1: Analysis by CV-ICP-MS or FIMS following BrCl pre-treatment.



**Laboratory Report No:** E022211

**Client Name:** Central West Envirotech

**Contact Name:** James Milson

**Client Reference:** 0507DR - May assorted

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# Certificate of Analysis

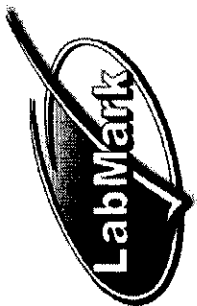


Laboratory Identification		mb							
Sample Identification		QC							
Depth (m)		--							
Sampling Date recorded on COC		--							
Laboratory Extraction (Preparation) Date		27/5/05							
Laboratory Analysis Date		30/5/05							
<b>Method</b>	<b>Filtered mercury</b>	<b>EQL</b>							
E026.1	Mercury	0.1							
		<0.1							

Results expressed in ug/l unless otherwise specified

Comments:

E026.1: Analysis by CV-ICP-MS or FIMS following BrCl pre-treatment.



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Client Name: Central West Envirotech

plus cover page

Certificate

Contact Name: James Milson

Date: 21/6/05

of Analysis

Client Reference: 0507DR - May assorted

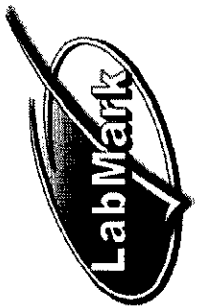
This report supersedes reports issued on: 3/6/05

Laboratory Identification		20320	20321	20322	20323	20324	20325	20326	20327	20328	20329
Sample Identification		0507RD01	0507RD02	0507RD03	0507RD04	0507RD05	0507RD06	0507RD07	0523RD01	0523RD02	0523RD03
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		31/1/05	31/1/05	31/1/05	31/1/05	31/1/05	31/1/05	31/1/05	4/5/05	4/5/05	4/5/05
Laboratory Extraction (Preparation) Date		27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	27/5/05
Laboratory Analysis Date		28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	2/6/05
<b>Method</b>	<b>Filtered metals</b>										
E022.1	Chromium	*<5	*<5	*<5	2	<1	2	1	*<5	*<5	1
	Copper	<1	<1	11	<1	3	<1	<1	<1	<1	1
	Lead	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Results expressed in ug/l unless otherwise specified

Comments: \*EQL increased due to matrix interference.

E022.1: Filtered sample directly analysed by ICP-MS.



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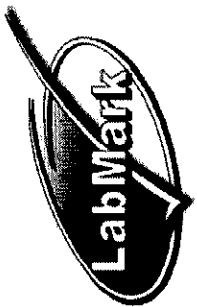
# Certificate of Analysis

Laboratory Identification		20330	20331	20332	20333	20320d	20320r	20330d	20330r	20321s	ics
Sample Identification		0523RD04	0523RD05	0523RD06	0523RD07	QC	QC	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		4/5/05	4/5/05	4/5/05	4/5/05	--	--	--	--	--	--
Laboratory Extraction (Preparation) Date		27/5/05	27/5/05	27/5/05	27/5/05	27/5/05	--	27/5/05	--	27/5/05	27/5/05
Laboratory Analysis Date		28/5/05	2/6/05	28/5/05	2/6/05	28/5/05	--	28/5/05	--	28/5/05	28/5/05
Method E022.1	Filtered metals	EQL									
	Chromium	*<5	<1	*<5	<1	*<5	--	*<5	--	99%	100%
	Copper	1	<1	<1	<1	<1	--	1	0%	96%	100%
	Lead	<1	<1	<1	<1	<1	--	<1	--	92%	100%

Results expressed in ug/l unless otherwise specified

Comments: \*EQL increased due to matrix interference.

E022.1: Filtered sample directly analysed by ICP-MS.



**Laboratory Report No:** E022211

**Client Name:** Central West Envirotech

**Contact Name:** James Milson

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# Certificate of Analysis



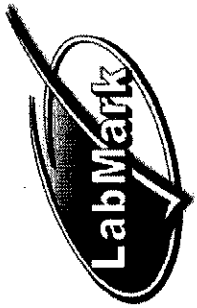
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Sample Identification		QC							
Depth (m)		--							
Sampling Date recorded on COC		--							
Laboratory Extraction (Preparation) Date		27/5/05							
Laboratory Analysis Date		28/5/05							
Method	Filtered metals	EQL							
E022.1	Chromium	1	<1						
	Copper	1	<1						
	Lead	1	<1						

Results expressed in ug/l unless otherwise specified

Comments: \*EQL increased due to matrix interference.

E022.1: Filtered sample directly analysed by ICP-MS.





**Laboratory Report No:** E022211  
**Client Name:** Central West Envirotech  
**Contact Name:** James Milson  
**Client Reference:** 0507DR - May assorted

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Final  
**Certificate**  
 of Analysis

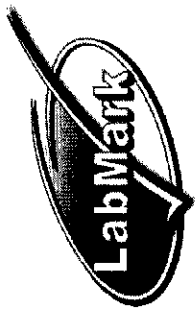
This report supercedes reports issued on: 3/6/05

Laboratory Identification		20337	les	mb				
Sample Identification		052975-01	QC	QC				
Depth (m)		--	--	--				
Sampling Date recorded on COC		23/5/05	--	--				
Laboratory Extraction (Preparation) Date		1/6/05	1/6/05	1/6/05				
Laboratory Analysis Date		2/6/05	2/6/05	2/6/05				
<b>Method</b>	<b>Acid extractable metals</b>	<b>EQL</b>						
E020.2/E	Calcium	10	95%	<10				
	Magnesium	10	91%	<10				

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E020.2/E030.2: 0.5g digested with nitric/hydrochloric acid . Analysis by AAS and/or ICP-OES.



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This report supercedes reports issued on: 3/6/05

Laboratory Identification		20334	20335	20336	20337	20338	20339	20340	20341	20342	20343
Sample Identification		0512GSG-01	0512GSG-14	0521DW-05	052975-01	0513GSA	0513GSB	0513GSC	0513GSD	0513GSE	0513GSF
Depth (m)		2.6	2.6	1.8	--	0.15	0.15	0.15	0.15	0.15	0.15
Sampling Date recorded on COC		24/3/05	24/3/05	21/5/05	23/5/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05	31/3/05
Laboratory Extraction (Preparation) Date		28/5/05	28/5/05	15/6/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05
Laboratory Analysis Date		28/5/05	28/5/05	16/6/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05	28/5/05
<b>Method</b>	<b>Moisture</b>	EQL									
E005.2	Moisture	14	33	23	44	2	2	2	2	3	2

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Identification		20344	20345	20338d	20338r	20345d	20345r
Sample Identification		0513GSG	0513GSH	QC	QC	QC	QC
Depth (m)		0.15	0.15	--	--	--	--
Sampling Date recorded on COC		31/3/05	31/3/05	--	--	--	--
Laboratory Extraction (Preparation) Date		28/5/05	28/5/05	28/5/05	--	28/5/05	--
Laboratory Analysis Date		28/5/05	28/5/05	28/5/05	--	28/5/05	--
<b>Method</b>	<b>Moisture</b>	EQL					
E005.2	Moisture	2	1	1	67%	1	0%

Results expressed in % w/w unless otherwise specified

Comments:

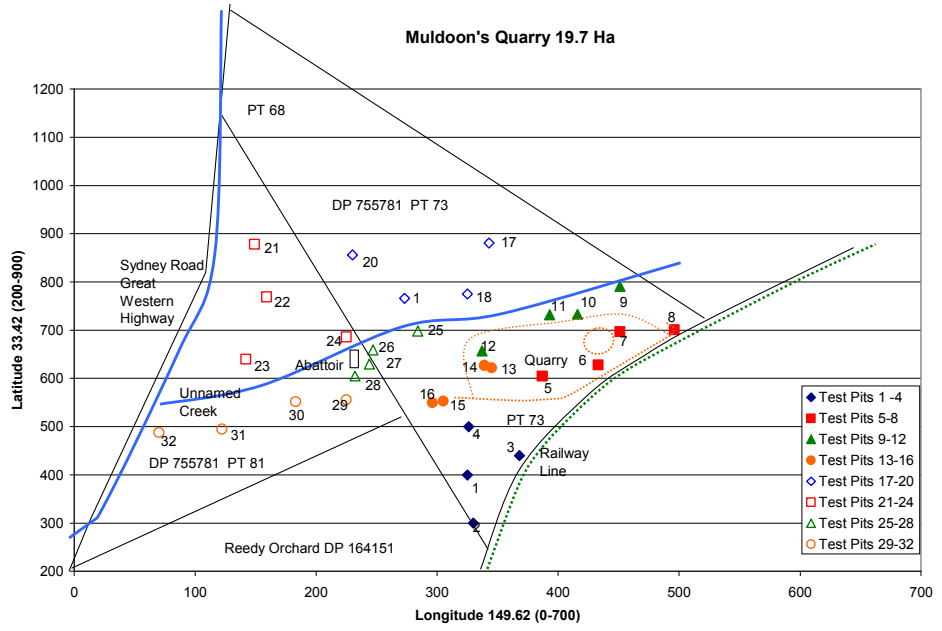
E005.2: Moisture by gravimetric analysis. Results are in % w/w.

## **7.2 Central West Envirotech Soil Physicochemical Data**

Pit	m	Munsell Colour	Description	Texture	Mottles	Notes	pH	mS/cm	TexFac	ECe
1	0.8	10 YR 5 4	Yellowish Brown	Sandy Clay	5 YR 4 6	Yellowish Red	6.46	0.0212	8.6	0.182
1	1.5	10 YR 3 3 Dark	Brown	Medium Clay Clay			6.23	0.055	7.5	0.413
1	2.6	10 YR 10 5	Yellowish Brown	Heavy Clay	3 YR 5 0	Grey	7.39	0.0482	5.8	0.280
2	0.2	7.5 YR 4 4 Dark	Brown	Loamy Sand			5.20	0.014	22	0.308
2	0.4	5 YR 4 4	Reddish Brown	Sandy Loam			5.50	0.0127	13.5	0.171
2	0.6	4 YR 4 4	Reddish Brown	Sandy Clay	5 YR 5 8	Yellowish Red	5.90	0.0105	9.5	0.100
3	0.2	7.5 YR 4 2 Dark	Brown	Loamy Sand			5.65	0.0235	22	0.517
3	0.5	7.5 YR 4 4	Brown	Sandy Loam			4.95	0.0127	13.5	0.171
4	0.1	5 YR 3 3 Dark	Reddish Brown	Loamy Sand			6.23	0.0151	22	0.332
5	0.8	7.5 YR 4 4	Brown	Loamy Sand			6.52	0.1007	22	2.215
5	1.7	7.5 YR 7 2	Pinkish Grey	Silty Sand		Rubble Fill	8.44	0.1293	22	2.845
5	2	10 YR 3 4 Dark	Yellowish Brown	Light Clay			6.48	0.1172	7.5	0.879
6	0.1	7.5 YR 4 6	Strong Brown	Coarse Loamy Sand			6.00	0.0539	22	1.186
6	0.2	10 YR 5 4	Yellowish Brown	Clayey Sand			6.51	0.0324	22	0.713
6	0.5	10 YR 6 4 Light	Yellowish Brown	Clayey Sand			6.51	0.0408	22	0.898
6	0.9	10 YR 3 2 V.Dark	Greyish Brown	Coarse Sand		Rubble Fill	8.10	0.0816	22	1.795
6	1.1	7.5 YR 4 6	Strong Brown	Loamy Sand			6.42	0.0477	22	1.049
6	1.5	7.5 YR 4 6	Strong Brown	Sandy Clay			7.35	0.0732	8.6	0.630
7	0.5	7.5 YR 4 6	Strong Brown	Sandy Clay			6.45	0.0241	8.6	0.207
7	1.5	10 YR 6 6	Brownish Yellow	Clayey Sand		weathered granite	7.56	0.036	22	0.792
8	0.2	10 YR 4 4	Dark brown	Clayey Sand			5.42	0.104	22	2.288
8	0.4	10 YR 5 3	Brown	Sandy Loam			5.32	0.0354	13.5	0.478
8	0.6	10 YR 6 4 Light	Yellowish Brown	F.Sandy Clay Loam		Ferromangenous nodules	5.36	0.1153	9.5	1.095
9	0.1	10 YR 3 2 V.Dark	Greyish Brown	Loamy Sand		Unnamed creek	5.63	0.0321	22	0.706
9	0.3	10 YR 5 2	Greyish Brown	Sandy Loam			5.86	0.0139	13.5	0.188
9	0.6	10 YR 4 1 Dark	Grey	Heavy Clay	10 YR 5 8	Yellowish Brown	7.64	0.0362	5.8	0.210
10	0.1	10 YR 3 3 Dark	Brown	Loamy Sand			6.22	0.0229	22	0.504
10	0.3	10 YR 4 4 Dark	Yellowish Brown	Sandy Loam			5.55	0.0169	13.5	0.228
10	0.7	10 YR 6 3 Pale	Brown	F.Sandy Clay Loam			5.39	0.0137	9.5	0.130
11	0.1	10 YR 5 4	Yellowish Brown	Loamy Sand		ferromangenous nodules ?	5.73	0.0213	22	0.469
11	0.4	10 YR 5 4	Yellowish Brown	Loamy Sand			6.15	0.0156	22	0.343
11	0.9	10 YR 5 8	Yellowish Brown	Sandy Clay	10 YR 6 2	Light Greyish Brown	7.63	0.0358	8.6	0.308
12	0.8	5 YR 3 3 Dark	Reddish Brown	Sandy Clay Loam			7.30	0.0232	8.6	0.200
12	1.1	5 YR 3 2	Reddish Brown	Sandy Loam		coarse sand, gravel	7.65	0.0393	13.8	0.542
12	1.2	5 YR 4 2 Dark	Reddish grey	Sandy Clay		shiny flecks pyrite	7.57	0.0240	8.6	0.206
13	0.7	10 YR 5 4	Yellowish Brown	Sandy Clay			7.60	0.0297	8.6	0.255
14	0.6	10 YR 3 2 V.Dark	Greyish Brown	Sandy Loam		coarse sand fine rubble	7.17	0.1025	13.8	1.415
14	1	10 YR 4 3	Brown	Sandy Clay		coarse sand/gravel	7.58	0.0951	8.6	0.818
14	2	10 YR 5 4	Yellowish Brown	Sandy Clay			7.51	0.0457	8.6	0.393
14	2.7	2.5 YR 5 4 Light	Olive Brown	Silty Clay		Dam sediment, pyrite	6.76	0.1009	9.5	0.959
15	0.1	10 YR 3 2 V.Dark	Greyish Brown	Sandy Loam			7.14	0.0914	13.8	1.261
15	0.3	10 YR 3 3 Dark	Brown	Sandy Clay Loam		coarse sand/gravel	6.72	0.0275	9.5	0.261
15	0.6	10 YR 6 6	Brownish Yellow	Clayey Sand			8.92	0.0477	22	1.049
16	0.1	10 YR 3 3 Dark	Brown	Medium Clay			7.15	0.0178	8.6	0.153
16	0.4	10 YR 3 3	Reddish Brown	Sandy Clay			6.97	0.0120	8.6	0.103

Pit	m	Munsell Colour	Description	Texture	Mottles	Notes	pH	mS/cm	TexFac	ECe
17	0.1	5 YR 3	2 Dark Reddish Brown	Sandy	Loam		6.55	0.0415	13.8	0.573
17	0.4	5 YR 3	3 Dark Reddish Brown	Sandy Clay	Loam		6.14	0.0291	9.5	0.276
18	0.1	7.5 YR 4	2 Brown	Sandy	Loam		6.86	0.0818	13.8	1.129
18	0.4	7.5 YR 3	2 Dark Brown	Sandy Clay	Loam		6.23	0.0197	9.5	0.187
19	0.2	7.5 YR 3	2 Dark Brown	Sandy	Loam		6.98	0.0581	13.8	0.802
20	0.1	5 YR 4	2 Dark Reddish grey	Sandy	Loam		5.75	0.0332	13.8	0.458
20	0.3	7.5 YR 4	4 Brown	Sandy	Loam		5.37	0.0208	13.8	0.287
21	0.1	7.5 YR 4	4 Brown	Sandy Clay	Loam		5.85	0.0149	9.5	0.142
21	0.3	7.5 YR 5	4 Brown	Clayey	Sand		5.27	0.0418	22	0.920
21	0.4	7.5 YR 4	4 Brown	Clayey	Sand		6.10	0.0155	22	0.341
23	0.4	7.5 YR 4	2 Brown	Sandy	Clay		7.25	0.0418	9.5	0.397
24	0.2	7.5 YR 3	2 Dark Brown	Sandy	Clay		5.75	0.0353	9.5	0.335
24	0.4	7.5 YR 3	2 Dark Brown	Sandy	Clay		5.60	0.0234	9.5	0.222
25	0.5	10 YR 4	4 Dark Yellowish Brown	Sandy	Clay		6.25	0.0666	9.5	0.633
25	1	10 YR 4	6 Dark Brown	Sandy	Clay		6.19	0.0761	9.5	0.723
26	0.2	5 YR 2.5	2 Dark Reddish Brown	Sandy Clay	Loam		6.70	0.0464	13.8	0.640
26	0.4	10 YR 4	2 Dark Greyish Brown	Sandy	Clay		6.87	0.0303	9.5	0.288
27	0.1	10 YR 2	2 V.Dark Brown	Sandy	Loam		6.60	0.0885	13.8	1.221
27	0.2	10 YR 3	6 Dark Yellowish Brown	Sandy	Clay		6.34	0.0349	9.5	0.332
28	0.1	10 YR 3	2 V.Dark Greyish Brown		Loam		6.34	0.0985	13.8	1.359
29	0.3	10 YR 4	4 Dark Yellowish Brown	Sandy	Clay		6.55	0.0279	9.5	0.265
29	0.4	7.5 YR 4	4 Brown	Sandy	Clay		6.72	0.0278	9.5	0.264
29	0.5	10 YR 5	4 Yellowish Brown	Sandy	Clay		7.04	0.0634	9.5	0.602
30	0.1	10 YR 3	3 Dark Brown	Sandy	Loam		6.43	0.0570	13.8	0.787
30	0.2	10 YR 4	2 Dark Greyish Brown	Sandy	Clay		6.34	0.0487	9.5	0.463
31	0.1	2.5 Y 4	2 Dark Greyish Brown	Sandy Clay	Loam		8.11	0.0556	13.8	0.767
31	0.3	10 YR 3	3 Dark Brown	Clayey	Sand		7.73	0.0297	22	0.653
31	0.6	10 YR 4	2 Dark Greyish Brown	Sandy	Clay		8.30	0.0370	9.5	0.352
32	0.2	10 YR 3	2 V.Dark Greyish Brown	Sandy Clay	Loam		6.41	0.0371	13.8	0.512
32	0.3	10 YR 3	1 V.Dark Grey	Sandy	Clay		6.70	0.0295	9.5	0.280
32	0.5	5 Y 5	3 Olive	Sandy	Clay		7.73	0.0363	9.5	0.345

### 7.3 Schematic Site Map





**Envirotech**  
central west

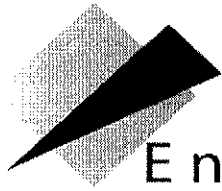
## Site Investigation Log

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	24-Feb-05	01	
Location Description			
South west side, drainage depression			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
	33.42325 (estimated)	149.62400 (estimated)	695
Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	Sample Code
0.5			0.5
1.0	Coarse orange sand a little brown clay	2.5	01/0.8
1.5	Sandy clay, orange brown	6.2-11.6	01/1.5
2.0	Blue grey heavy clay with weathered granite		
2.5	Granite bedrock - solid end of pit @ 2.6 m		01/2.6 (sent for analysis)
3.0			3.0
3.5			3.5
4.0			4.0
General Observations			
Introduced clay fill, no topsoil			
Waterlogging indicators - dirty dora and sedge			
Poor drainage, some mild steel debris at surface			
Sample 0512GS01/2.6 sent for analysis of hydrocarbons and metals			





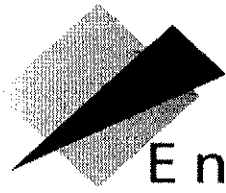
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		24-Feb-05		02	
Location Description					
Far south west corner of allotment between railway and former orchard					
GPS		Latitude or Northing		Longitude or Easting	
m		33.42330 (estimated)		149.62300 (estimated)	
		Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	
		Sample Code		m	
0.5		Brown sandy clay loam		0	
		Orange brown sandy clay		0	
		Red heavy clay with grey and ochre mottles		0	
1.0		Weathered Granite - end of pit @ 0.6 m			
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
General Observations					
groundcover - some native grasses, rush and Phalaris					
Clean natural soil					



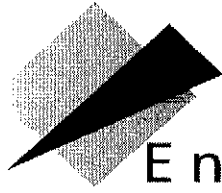
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		24-Feb-05		03	
Location Description					
South west corner of allotment					
GPS	Latitude or Northing		Longitude or Easting		Altitude (m)
	33.42368		149.62440		697.3
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)		Sample Code
	Brown sandy loam topsoil		0		03/0.2
	Yellow brown medium clay		0		03/0.5
0.5	Red heavy clay with grey and ochre mottles		0		
	Sand - weathered granite - end of pit at 0.7 m				
1.0					
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
General Observations					
Groundcover - native (poacea) and introduced perennial grasses; abundant skeleton weed					
Topsoil brown sandy loam to 0.2 m					
Subsoil from 0.2 m heavy yellow brown clay					
Broadleaf weeds					



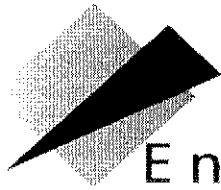
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	24-Feb-05	04	
Location Description			
Central south west near western extent of quarry			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
	33.42326	149.62500	700.4
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE) Sample Code
	Dark brown clay loam to light clay		0 04/0.1
0.5	Weathered gold and grey-white granite		
	Hole terminated in granite at 0.6 m		
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
General Observations			
Very dark brown clay topsoil to 0.15 m			
Coarse weathered granite thereafter			



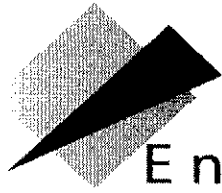
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID
0512GS	24-Feb-05	05
<b>Location Description</b>		
south west side of main quarry pit		
<b>GPS</b>	<b>Latitude or Northing</b>	<b>Longitude or Easting</b>
	33.42387	149.62605
		696.2
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)	PID (ppm IBE)
	Sample Code	m
0.5	Dark brown clay loam to medium clay topsoil	0
1.0	Ochre very coarse sand with dusty fines and very fine sand	05/0.8
1.5	Second topsoil layer, lot of organic material roots, brick fill, copper pipe, concrete fragments, asbestos pipe fill and soil mix, bricks, irrigation polypipe	05/1.6
2.0	Bronze coloured weathered granite	
2.5	Dark brown clay loam, lots of wood, roots and debris	
3.0	Heavy clay and weathered granite	0
3.5	End of pit at 2.6 m	
4.0		
<b>General Observations</b>		
Pit excavated into south west quarry batter at base level		
Lot of brick and concrete fill		
multiple layers of topsoil/fill/sand/clay		



**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		24-Feb-05		06	
Location Description					
South central side of main quarry pit uphill					
GPS		Latitude or Northing		Longitude or Easting	
m		33.42433		149.62628	
		Altitude (m)		698	
		Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	
		Sample Code		m	
0.5		Reddish clay loam topsoil to 0.15 m		0	
		Bleached yellow brown sandy coarse clay to 0.3 m		06/0.1	
		Grey silty alluvial soil with brick fill		06/0.2	
		Thin layer of ochre medium clay		06/0.5	
1.0		Grey silt loam and brick fill			
		Grey brown coarse sand little clay		06/1.1	
1.5		Brown loamy sand - Rubble fill with brick fragments			
		Brown sandy clay - weathered granite		06/1.5	
2.0		End of pit at weathered granite - 2.0 m			
2.5					
3.0					
3.5					
4.0					
General Observations					
asbestos sheet, bricks concrete, tiles, timber					
brass strips, plastic bags, concrete reo-chairs					
pallet ties, styrofoam, asbestos					



**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	24-Feb-05	07	
<b>Location Description</b>			
South east side of main quarry mound			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
	33.42451	149.62697	679.9
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)	PID (ppm IBE)	Sample Code
0.5	Red sandy clay loam colluvium		
	Reddish brown sandy clay loam, moist	0	
			07/0.5
1.0	Weathered granite with a little fine sand		
	very little clay		
1.5	Golden and white weathered granite	0	
			07/1.5
2.0	Pit terminated in weathered granite at 1.7 m		
2.5			
3.0			
3.5			
4.0			
<b>General Observations</b>			
Colluvium to 0.3 - 0.8 m - red with moderate clay and coarse sand			
Particles of pyrite , no odour			
granite tested at 1:5 : EC = 0.0245 mS/cm; pH = 7.81 - alkaline			



**Envirotech**  
central west

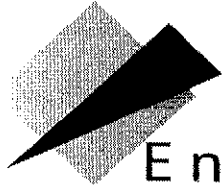
**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	24-Feb-05	08	
Location Description			
south east corner of quarry 25 m north of railway, 60 m west of east fence			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
m	33.42496	149.62701	700.4
	Texture, colour, aggregate (% & mm), moisture (d. m,w)	PID (ppm IBE)	Sample Code
0.5	Dark greyish brown fine sandy loam, lot organic matter	0	08/0.2
	Medium brownish grey fine sandy clay loam		08/0.4
	Ochre sandy clay		
1.0	Ochre and pale grey clay, bleached, with ferromanganous nodules at 0.8 - 1.2 m	0	08/0.8
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
General Observations			
dark brown sandy loam topsoil hardsetting to clay loam			
clay below 0.4 m with ferromanganous nodules - bleached			
some asbestos pipe nearby			
08/0.2 1:5 EC = 0.0314 mS/cm, pH 7.12 - non saline, neutral			





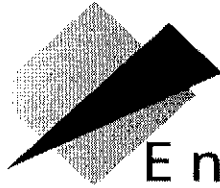
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date	Test Pit/Bore ID
0512GS		24-Feb-05	09
Location Description			
south side of Raglan Creek bank at east side of allotment			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
	33.42451	149.62791	696.3
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE) Sample Code
	Grey, little brown fine sandy clay loam topsoil		0 09/0.1
0.5	A2 a paler grey brown, hard setting fine sandy clay loam		09/0.3
	Dark grey and ochre medium to heavy clay		09/0.6
1.0	Very firm very hard setting clay		
	Pit terminated at very firm heavy clay		
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
General Observations			
topsoil hard setting			
vegetation - Panicum, Poacea, Lovegrass, Paterson's Curse			
Bleached A2 hard setting clay loam			
Subsoil very hard ochre and dark grey mottles			



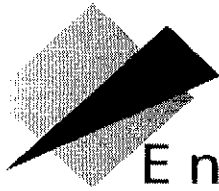
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	24-Feb-05	10	
Location Description			
North side of quarry perimeter bund, north of large central mound, 20 m west of west bank			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
	33.42416	149.62733	697.6
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)	PID (ppm IBE)	Sample Code
0.5	Dark Grey loam fine sandy topsoil to 0.15 m		10/0.1
	Bleached ochre hard setting fine sandy clay loam		10/0.3
1.0	Pale grey medium clay, hard setting with ochre mottles and ferromangenuous nodules		10/0.7
1.5	Pit terminated with very firm clay @ 1.4 m		
2.0			
2.5			
3.0			
3.5			
4.0			
General Observations			
Hardsetting grey fine sandy clay loam then heavy clay			
Well vegetated with broad leaf weeds- Pattersons curse and wild turnip			
also succulent creeper and Panicum and Fescue grasses			



**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID			
0512GS	25-Feb-05	11			
Location Description					
North of large central mound					
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)		
	33.42393	149.62732	694.2		
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	Sample Code	m
0.5	Deep yellow brown sandy loam topsoil		0	11/0.1	0.5
	Bleached yellow brown loamy sand, rounded 5 mm sand		0	11/0.4	
	Ochre and grey sandy/ heavy clay with Fe-Mn nodules				
1.0	Sandy clay-weathered granite intergrade		0	11/0.9	1.0
1.5	Weathered granite bedrock from 1.3 m				1.5
	End of test pit at 1.5 m in weathered granite				
2.0					2.0
2.5					2.5
3.0					3.0
3.5					3.5
4.0					4.0
General Observations					
Deep colluvium - fine sandy					
Ochre and grey heavy clay with ferromaganous nodules					
Ochre weathered granite from 1.3 m					



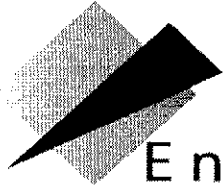
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	25-Feb-05	12	
<b>Location Description</b>			
Quarry, north east of large central mound, at western edge of small dam			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
m	33.42337	149.62657	706
	Texture, colour, aggregate (% & mm), moisture (d, m,w)	PID (ppm IBE)	Sample Code
0.5	Dark reddish brown clay loam to light clay		
1.0	Reddish brown silt fill with brick rubble, pipes etc.	0	12/0.8 12/1.1
1.5	Dark reddish brown clay Bronze coloured weathered granite End of test pit at 1.5 m in weathered granite		12/1.2
2.0			
2.5			
3.0			
3.5			
4.0			
<b>General Observations</b>			
Lot of rubble - plastic gas pipe (yellow), plastic electrical pipe (orange)			
ac pipe, tiles, plasterboard, concrete, brick			
Water from dam: EC 0.075 mS/cm, pH 7.62			



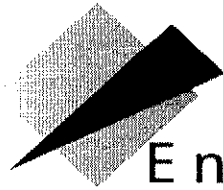
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date	Test Pit/Bore ID	
0512GS		25-Feb-05	13	
Location Description				
Quarry floor, depression north west of large central mound				
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)	
	33.42345	149.62622	691	
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	Sample Code
	Brown silty sandy soil with some brick fill			
0.5	Dark brown heavy clay, sandy			0.5
1.0	Ochre and bronze weathered granite			1.0
1.5				1.5
2.0				2.0
2.5				2.5
3.0				3.0
3.5				3.5
4.0				4.0
General Observations				
Hollow vegetated with dirty dora and Prairie grass and BL weeds				
Heavy compact clay				
weathered granite				

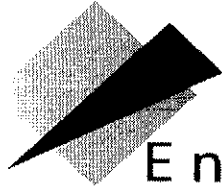


**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW  
Muldoon's Quarry

Job		Date	Test Pit/Bore ID
0512GS		25-Feb-05	14
Location Description			
Slight mound 120 m NW of big mound			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
	33.42339	149.62627	698.5
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)
			Sample Code
0.5	Weathered granite fill and dusty sand		
1.0	Brown sandy clay with weathered granite , fill		0
	Pipe fragments, bricks, concrete and plastic		14/1.0
1.5			
2.0	Brown sandy clay, weathered granite		0
			14/2.0
2.5			
3.0	Green grey silty clay with golden flecks Weathered granite		
	Pit terminated at 3.0m depth		0
			14/2.7
3.5			Sample sent for analysis
4.0			
General Observations			
large amount of fill			
fill layers extend to 2.7 m			
greeny blue silty sludge at 2.7 m indicative of sedimentation in dam			
Sedimnet sent for analysis of hydrocarbons and heavy metals			



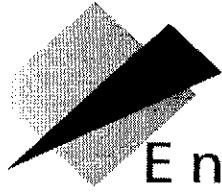
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID
0512GS	25-Feb-05	15
<b>Location Description</b>		
Western border with Reedy ex-orchard		
<b>GPS</b>	<b>Latitude or Northing</b>	<b>Longitude or Easting</b>
	33.42305	149.62553
		<b>Altitude (m)</b>
		689.9
m	<b>Texture, colour, aggregate (% &amp; mm), moisture (d, m,w)</b>	<b>PID (ppm IBE)</b>
		<b>Sample Code</b>
0.5	Dark brown sandy loam topsoil	0
	A2 bleached, brown coarse sandy loam	0
1.0	Brownish yellow sandy clay, ochre and pale grey	
	Fe-Mn nodules	
	Golden weathered granite mica flecks	
1.5		
2.0		
2.5		
3.0		
3.5		
4.0		
<b>General Observations</b>		
Clean, plenty of topsoil 0.2-0.3 m		
A2 0.1-0.2 m grey brown, granite/clay ~0.1-0.5m		
weathered granite from 0.7 m		
well vegetated with windmill grass, Brassica - wild turnip, Panicum		



**Envirotech**  
central west

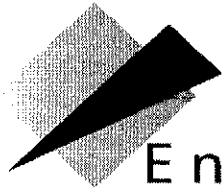
**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		25-Feb-05		16	
Location Description					
West side adjacent to Reedy ex-orchard on a rise, near underground cable box - conduit					
GPS		Latitude or Northing		Longitude or Easting	
m		33.42296		149.6255	
		Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	
		Sample Code		m	
0.5		Dark brown clay loam to heavy clay		0	
		Hard red-ochre coarse sandy weathered granite		0	
		Hard reddish weathered granite pit terminated at 0.6m		16/0.1	
1.0				16/0.4	
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
General Observations					
undisturbed, very heavy clay topsoil (indicated removal of original topsoil)					
weathered granite at shallow depth 0.3 m					





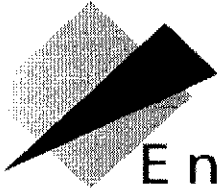
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		29/02/2005		17	
Location Description					
East side of central creek, south east corner, uphill toward sawmill					
GPS		Latitude or Northing		Longitude or Easting	
m		33.42343		149.62881	
		Altitude (m)		699.5	
		Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	
		Sample Code		m	
0.5		Dark Brown Clay Loam		0	
		Reddish sandy clay / weathered granite		17/0.1	
1.0		Pit terminated in weathered granite at 0.7 m		17/0.4	
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
General Observations					
Undisturbed soil, vegetated with Phlaris, Brome grass and dock					
High ground with granite close to surface					



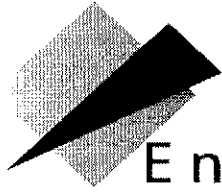
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	29/02/2005	18	
Location Description			
East side of central creek, near sewer south of telstra conduit			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
	33.42325	149.62775	693.3
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)
	Dark grey brown clay loam granite		0
0.5	Pit terminated at weathered granite @ 0.6 m		18/0.1 18/0.4
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
General Observations			
Broad lef weeds - Plantain and rushes, Drainage Hollow			
Compact Clay very hard			



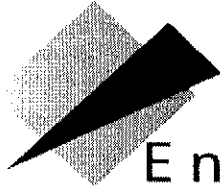
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date	Test Pit/Bore ID	
0512GS		29/02/2005	19	
Location Description				
East side of central creek lower ground, central west				
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)	
	33.42273	149.62766	695.3	
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	Sample Code
0.5	Dark grey brown light clay Dark brown grey heavy clay Dark brown and grey mottles very little granite		0	19/0.2
1.0				
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
General Observations				
dry dam poor drainage - rush at surface				
compacted clay, moist at 0.3 m				
very firm				



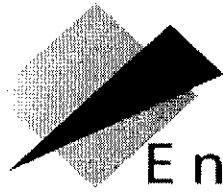
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central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date	Test Pit/Bore ID	
0512GS		29/02/2005	20	
Location Description				
East side of central creek, upper slope, central				
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)	
	33.42230	149.62856	698.5	
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	Sample Code
0.5	Dark brown fine sandy clay loam		0	20/0.1
	Reddish sandy clay intergrading to weathered granite			20/0.3
	Weathered granite @ 0.3 m red/Bronze			
1.0				
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
General Observations				
Vegetation included Panicum, Chloris truncata (windmill grass), love grass, pattersons curse				
Brome, wild oats				
Granite @ 0.3 m , sandy clay loam, Fe-Mn nodules				



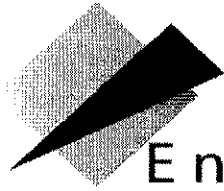
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central west

**Site Investigation Log**

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Muldoon's Quarry

Job		Date	Test Pit/Bore ID	
0512GS		29/02/2005	21	
Location Description				
East side of central creek, north east corner 20 m south of northern creek adjacent to Highway				
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)	
	33.42149	149.62878	699.4	
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	Sample Code
0.5	Brown fine sandy clay loam		0	21/0.1
	Brown clayey sand - Weathered granite, moist, soft		0	21/0.3
	Pit terminated in weathered granite at 0.7 m			21/0.4
1.0				
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
General Observations				
Soft weathered granitic soil				
50 m south of highway @ north east corner of east side of lot				
major vegetation - lovegrass				



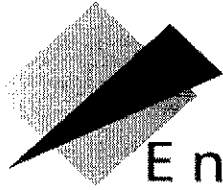
**Envirotech**  
central west

**Site Investigation Log**

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Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		29/02/2005		22	
Location Description					
East side of central creek, lower slopes east side near northern creek					
GPS	Latitude or Northing		Longitude or Easting		Altitude (m)
	33.42159		149.62769		700.3
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)		Sample Code
	Dark brown sandy clay loam - hard setting 0.6 m		0		
0.5	Pit ends at pale greyish brown weathered granite 0.6 m				0.5
1.0					1.0
1.5					1.5
2.0					2.0
2.5					2.5
3.0					3.0
3.5					3.5
4.0					4.0
General Observations					
Vegetation - wild turnip, Plantain, Patterson's Curse					
Hard bleached clay over weathered granite at 0.3 m					



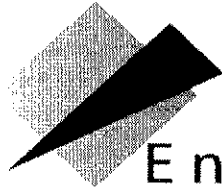
**Envirotech**  
central west

**Site Investigation Log**

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Muldoon's Quarry

Job		Date	Test Pit/Bore ID	
0512GS		29/02/2005	23	
Location Description				
East side of central creek low area 50 m south east of confluence with the north creek				
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)	
	33.42142	149.6264	692	
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	Sample Code
0.5	Brownish grey sandy clay loam - light clay Brown sandy clay with ochre and white mottles Brown heavy clay		0	23/0.1 23/0.4
1.0				
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
General Observations				
Vegetation - Lovegrass, Patterson's curse, Bottle washers, Brome, Danthonia, wild turnip				



**Envirotech**  
central west

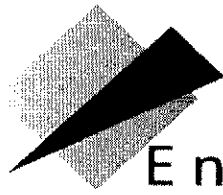
**Site Investigation Log**

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Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		29/02/2005		24	
Location Description					
East side of central creek opposite former abattoir					
GPS		Latitude or Northing		Longitude or Easting	
m		33.42225		149.62686	
		Altitude (m)		688.4	
		Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	
		Sample Code		m	
0.5	Dark brown fine sandy clay loam Bleached light brown sandy clay				0.5
1.0	Brown heavy clay intergarding with weathered granite Pit terminates in weatered granite at 0.8 m				1.0
1.5					1.5
2.0					2.0
2.5					2.5
3.0					3.0
3.5					3.5
4.0					4.0
General Observations					
Vegetation - Lovegrass, Patterson's curse, Bottle washers, Brome, Danthonia redleg, wild turnip					





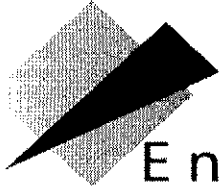
**Envirotech**  
central west

Site Investigation Log

KELSO NSW

Muldoon's Quarry

Job		Date	Test Pit/Bore ID	
0512GS		29/02/2005	25	
Location Description				
West side of creek 250 m south of former abattoir				
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)	
	33.42284	149.62698	688.3	
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	Sample Code
0.5	Red Brown Clay overburden			25/0.5
1.0	Dull brown sandy clay loam true topsoil?			
1.5	Ochre sandy clay Pit terminated in weathered granite at 1.3 m			25/1.0
2.0				
2.5				
3.0				
3.5				
4.0				
General Observations				
imported clay soil over in <b>mounds</b>				
sandy clay loam colluvium to 0.5 m				
ochre clay at 1.0 m				
Vegetation - Dock, Prairie grass, briar rose				



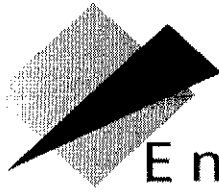
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	29/02/2005	26	
Location Description			
West side of central creek, 20 m south of ex-abattoir building			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
m	33.42247	149.62659	688.3
	Texture, colour, aggregate (% & mm), moisture (d, m,w)	PID (ppm IBE)	Sample Code
0.5	Dark brown sandy clay loam		26/0.2
	Red brown sandy clay		26/0.4
1.0	Dark brown (chocolate) heavier sandy clay		
1.5	Pit terminated in bronze weathered granite at 1.3 m		
2.0			
2.5			
3.0			
3.5			
4.0			
General Observations			
imported clay soil over in <b>mounds</b>			
sandy clay loam colluvium to 0.5 m			
ochre clay at 1.0 m			
Vegetation - Dock, Prairie grass, briar rose			



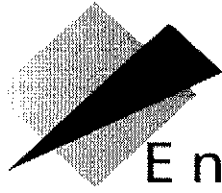
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	29/02/2005	27	
<b>Location Description</b>			
West side of central creek, 10 m west of ex-abattoir building			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
m	33.42244	149.62630	688.3
	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)
			Sample Code
0.5	Dark brown sandy loam topsoil		27/0.1
	Red/strong brown sandy clay loam, bleached hard setting		27/0.2
	Red weathered granite		
1.0	Golden weathered granite		
1.5	Pit terminated in golden weathered granite at 1.1 m		
2.0			
2.5			
3.0			
3.5			
4.0			
<b>General Observations</b>			
firm hard-setting soil, deep A2 layer to 0.4 m			
weathered granite, reddish from 0.4 m			
Vegetation - wild turnip, Patterson's Curse, kikuyu, couch, dock, wintergrass			



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central west

Site Investigation Log

KELSO NSW  
Muldoon's Quarry

Job		Date	Test Pit/Bore ID
0512GS		29/02/2005	28
Location Description			
West side of central creek, 50 m north west of abattoir toward highway			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
m	33.42232	149.62605	695.1
	Texture, colour, aggregate (% & mm), moisture (d, m,w)	PID (ppm IBE)	Sample Code
0.5	Dark brown loam, sheep manure and fine bluestone Yellowish brown sandy clay intergraded weathered granite Pit terminated in weathered granite @ 0.5 m		28/0.1
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
General Observations			
Sheep manure and small (5-10 mm) angular basalt (blue metal) gravel			
lot of organic matter - indicates former holding area or gut disposal area			



**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID	
0512GS	29/02/2005	29	
Location Description			
10 m west of central creek, 75 m north west of former abattoir toward highway			
GPS	Latitude or Northing	Longitude or Easting	Altitude (m)
	33.42225	149.62566	690.7
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)	PID (ppm IBE)	Sample Code
0.5	setting Dark brown sandy clay loam		29/0.5
1.0	Dark yellow brown and grey heavy clay intergrading to golden weathered granite		
1.5			1.5
2.0			2.0
2.5			2.5
3.0			3.0
3.5			3.5
4.0			4.0
General Observations			
Very heavy firm clay intergraded with weathered granite			
Vegetation - Prairie grass and dock			



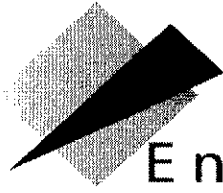
**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job	Date	Test Pit/Bore ID
0512GS	29/02/2005	30
<b>Location Description</b>		
200 m north of abattoir, 10 m west of Creek		
<b>GPS</b>	<b>Latitude or Northing</b>	<b>Longitude or Easting</b>
	33.42183	149.62552
		689.8
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)	
		PID (ppm IBE)
		Sample Code
0.5	Dark brown sandy loam	30/0.1
	Grey bleached sandy clay loam - hard setting with	30/0.2
1.0	Pit terminated in weathered granite at 0.6 m	
1.5		
2.0		
2.5		
3.0		
3.5		
4.0		
<b>General Observations</b>		
Very heavy firm clay intergraded with weathered granite		
Bleached grey A2 horizon		



**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		29/02/2005		31	
Location Description					
10 m west of creek, 400 m north of abattoir					
GPS	Latitude or Northing		Longitude or Easting		Altitude (m)
	33.42122		149.62495		687.9
m	Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)		Sample Code
	Grey brown sandy loam				31/0.1
0.5	Red brown clayey sand, coarse				31/0.3
	Bleached grey heavy clay intergraded granite				31/0.6
1.0	Pit terminated in weathered granite at 0.8 m				
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
General Observations					
Bleached grey sandy clay loam at 0.4-0.6 m					
Heavy grey clay below 0.6 m					
Sandy clay at 0.8 m = weathered granite					



**Envirotech**  
central west

**Site Investigation Log**

KELSO NSW

Muldoon's Quarry

Job		Date		Test Pit/Bore ID	
0512GS		29/02/2005		32	
Location Description					
West side of central creek, adjacent to north creek near highway					
GPS		Latitude or Northing		Longitude or Easting	
m		33.42070		149.62488	
		Altitude (m)		694.3	
		Texture, colour, aggregate (% & mm), moisture (d, m,w)		PID (ppm IBE)	
		Sample Code		m	
0.5		Dull brown coarse loamy sand-sandy loam		32/0.2	
		Medium grey sandy clay intergrades to weathered granite		32/0.3	
←		Bleached grey clay loam, soft powdery		32/0.5	
←		Dark brown (chocolate) heavy clay with yellow mottles			
1.0		Pit terminated at 1.0 m in weathered granite			
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
General Observations					
Vegetation - many broad leaf weeds - Plantain, wild turnip, thistle,					
Hard setting, poorly drained					
Bleached grey A2					