PATTLE DELAMORE PARTNERS LTD
40 Hammersmith Drive, Wigram, Christchurch
PO Box 389, Christchurch, New Zealand

Tel: +3 **363 3100** Fax: +3 **363 3101**
Web Site **http://www.pdp.co.nz**
Auckland Wellington **Christchurch**

10 October 2011

Liz White
Resource Management Group Limited
PO Box 9053
Tower Junction
CHRISTCHURCH 8149

Dear Liz

SOIL SAMPLING INVESTIGATION – STONEBROOK PLAN CHANGE, ODP AREA 1 ROLLESTON (CDL LAND NZ LIMITED OWNED LAND)

1.0 Introduction and Background

Resource Management Group Limited on behalf of CDL Land NZ Limited (CDL) has engaged Pattle Delamore Partners Limited (PDP) to conduct a soil sampling environmental investigation on part of a site known as Outline Development Plan (ODP) Area 1, located on the south-eastern side of Main South Road, Rolleston. It is understood the environmental investigation is required as part of the proposed residential subdivision consenting process under Selwyn District Council's (SDC) proposed Plan Change 7. A desktop site history report prepared for the property was conducted by Tonkin & Taylor in 2011. The report indicated the past and present land use activities for the property included general cropping and dry stock grazing. The purpose of the surface soil sampling investigation was to determine the contamination status of the site associated with the historic and current agricultural activities at the site.

The assessment has comprised a surface soil sampling exercise, analysis of the main contaminants of concern associated with the former and current the agricultural activities, a review of the laboratory results and subsequent comparison with relevant environmental acceptance criteria.

A site location map and an aerial photograph showing the existing site layout are attached as Figures 1 and 2.

2.0 Site Location and Description

The overall ODP Area 1 is located on the south western side of the Rolleston township approximately 24 km west south-west from central Christchurch and covers a total area of approximately 63 ha. The ODP Area 1 is comprised of numerous land parcels with different land owners. The current investigation was limited to the CDL land parcels which cover a total area of approximately 42 ha and are legally described by the following land parcels:-

- Part Section 2 Survey Office Plan 18584 (19.865 ha);

- Part Lot 1 Deposited Plan 75811 (13.330 ha);
- Part Section 3 Survey Office Plan 18584 (6.430 ha);
- Part Section 1 Survey Office Plan 19540 (1.147 ha); and
- Part Section 1 Survey Office Plan 19340 (1.434 ha).

A plan showing the CDL land parcel layout and total ODP Area 1 boundary is presented as Figure 3.

The CDL site is currently used for general grazing while a portion of the property fronting Burnham School Road in the south western corner of the site is used for cropping. A sheep holding pen was noted near the western portion of the site while an open drain extended through the centre of the site. Photographs of the site taken during the sampling exercise are appended.

The approximate grid reference for the centre of the CDL site is NZMS 260 M36:5837-3368. The site is zoned Living 1 and Living 1B as per the SDC District Plan.

3.0 Soil Sampling Investigation

The soil sampling exercise was conducted by PDP on 26 September 2011. Details of the soil sampling exercise, soil guideline criteria and results are described below.

3.1 Soil Sampling

A total of 17 soil samples were collected during the investigation. The samples were collected in a general grid based pattern across the site as shown on Figure 4. The surface samples were collected using a soil corer and a fresh pair of nitrile gloves for each sample. The manual soil corer was cleaned between the each sample using standard PDP decontamination procedures. All samples were placed into glass jars with food-grade plastic sealed lids provided by the analytical laboratory. The samples were placed immediately into a chilly bin containing frozen ice pads before being shipped to RJ Hill Laboratories Limited in Hamilton for analysis of heavy metals and organochlorine pesticides (OCP). The samples were received by the laboratory on the following day after shipment. A copy of the chain of custody documentation is appended. The analytes selected are expected to provide a suitable assessment with regard to potential contaminants of concern associated with the reported historical and current use of the site.

3.2 Soil Guideline Criteria

The guideline values used for heavy metal and OCP compounds were selected by following the hierarchy specified in MfE (2003). Following this hierarchy, New Zealand guidelines (NZ Government cabinet paper, amended in May 2011) (NZ Government, 2011) have been selected for comparison of the tested analytes. Where no applicable New Zealand guideline criteria exist for some of the tested metals (i.e. nickel and zinc) the Australian *Guidelines on the Investigation Levels for Soil and Groundwater* (National Environmental Protection Council (NEPC) 1999) have been used. The guidelines take into account the protection of human health in a residential land use setting based on the intended future use of the site and accounting for the consumption of 10% home-grown produce.

In addition, Environment Canterbury (ECan) has established background soil concentrations of selected trace elements in the major Canterbury soil groups. For comparative purposes only, the total recoverable metals analytical results have also been compared with ECan Level Two background soil concentrations for the 'YBST' soil group. Concentrations above background levels do not necessarily indicate that a risk exists to human health, more so that land practices/chemical use has resulted in an accumulation of trace elements in the soil in that area, or that the concentrations detected are actually the localised background soil concentrations for this area.

3.3 Laboratory Results and Comparison to Guideline Criteria

The laboratory results for heavy metals and OCP compounds are summarised below while the laboratory report is appended. The soil results tables are also appended as Table 1.

Heavy Metals

All tested soil samples have heavy metal concentrations that are below the National Environmental Standard (NES) criteria for residential land use 10% produce and, where no New Zealand criteria exist, below the NEPC criteria for standard residential land use.

OCP Compounds

All 17 surface soil samples did not contain individual OCP concentrations above the laboratory limit of detection (up to 0.04 mg/kg for Total Chlordane). As such, all results with applicable soil guidelines (i.e. DDT and Dieldrin[1]) were reported below NES (2011) criteria for residential land use (taking into account of up to 10% home-grown produce consumption).

3.4 Comparison to ECan Background Soil Concentrations

The results of the soil samples have been compared with ECan background soil concentrations for metals (as shown in Table 1). A slightly elevated zinc concentration above the ECan background concentrations was reported from one sample (sample Area 1/2). As mentioned previously the presence of metal concentrations above background levels do not necessarily indicate that a risk exists to human health, more so that land practices/chemical use has resulted in an accumulation of trace elements in the soil in that area, or that the concentrations detected are actually the localised background soil concentrations for this area.

3.5 Quality Assurance Programme

A quality assurance and quality control (QA/QC) programme was implemented during the soil sampling exercise to ensure that field and laboratory data collected during the investigation provided reliable information for the characterisation of site conditions.

A blind field duplicate soil sample (QA1) was collected from sample location Area 1/11. In addition, an equipment blank sample (QA2) was also collected from the manual sampling equipment during the soil sampling programme to confirm the quality of the decontamination practises and to ensure there was no potential cross-contamination between sample locations. The two QA/QC samples (QA1 and QA2) were analysed for heavy metals and OCP compounds.

With regard to the blind duplicate sample (sample QA1, duplicate of sample Area 1/11), the Relative Percent Difference (%RPD) calculations were within acceptable limits for all parameters with detectable concentrations. In addition, the equipment blank sample (QA2) did not contain heavy metals or OCP compound concentrations above the laboratory limits of detection.

The results of the QA/QC soil analysis are presented in Table 1 while the equipment blank results are presented in Table 2.

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[1] Results for Aldrin and Dieldrin summed and compared to the guideline value for Dieldrin and results for DDT, DDD and DDE summed (i.e. ∑DDT) and compared to the guidelines value for DDT.

4.0 Summary and Conclusions

A soil sampling investigation has been undertaken on part of a site known as ODP Area 1 located on Main South Road, Rolleston. The investigation site is an agricultural property which was historically used for general grazing and cropping. The environmental investigation was undertaken as part of the subdivision consenting process under Selwyn District Council's proposed Plan Change 7 whereby the property is being considered for future residential land use. The purpose of the surface soil sampling investigation was to determine the contamination status of the site associated with the historic cropping and grazing activities at the site.

The assessment has comprised a surface soil sampling exercise, analysis of the main contaminants of concern associated with former the agricultural activities, a review of the laboratory results and subsequent comparison with relevant environmental acceptance criteria.

A total of 17 surface soil samples were collected on 26 September 2011 in a general grid based pattern across the CDL owned part of the overall ODP Area 1 site and analysed for heavy metals and OCP. All heavy metal and OCP compound concentrations were reported below adopted human health guidelines for residential land use.

5.0 Limitations

1) This assessment is limited to the collection and analysis of 17 soil samples across the site, and the comparison of laboratory test results with environmental and health guidelines. Subsurface conditions, including contaminant concentrations, can vary in time and distance so that conditions found at any specific point of sampling might not be representative of subsurface conditions that could occur away from the specific point of sampling.

2) If contaminants have been found at the site, it is possible that the contaminants could extend off-site, or that any contaminants existing on neighbouring sites might have contributed to the contamination that exists at the site. The presence or absence of contaminants off-site, and risks associated with any off-site contaminants, are not considered by this report.

3) This report has been prepared by PDP on the specific instructions of Resource Management Group Limited for the limited purposes described in the report. PDP accepts no liability to any other person for their use of or reliance on this report, and any such use or reliance will be solely at their own risk.

6.0 References

Environment Canterbury, 2007b. *Background concentrations of selected trace elements in Canterbury soils. Addendum 1: Additional samples and Timaru specific background levels*. Environment Canterbury Report R07/1/2.

Ministry for the Environment (MfE, 2003; updated 2007). *Contaminated Land Management Guidelines No. 2 - Hierarchy and Application in New Zealand of Environmental Guideline Values*. Wellington, New Zealand.

National Environment Protection Council, 1999. *Guidelines on the Investigation Levels for Soil and Groundwater*, National Environment Protection Council of Australia.

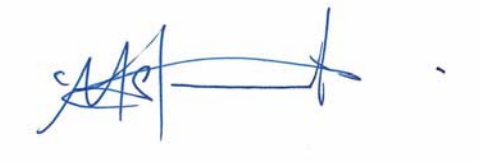
NZ Government, 2011. *Proposed National Environmental Standard for Assessing and Managing Contaminants in Soil*. Ministry for the Environment, Wellington, New Zealand, including amendments in cabinet paper (May 2011).

Tonkin & Taylor Limited, 2011. *Desk-based Ground Contamination Assessment Plan Change 7 Area*. Tonkin & Taylor Limited, Christchurch (Ref: 51778).

Yours sincerely

PATTLE DELAMORE PARTNERS LIMITED

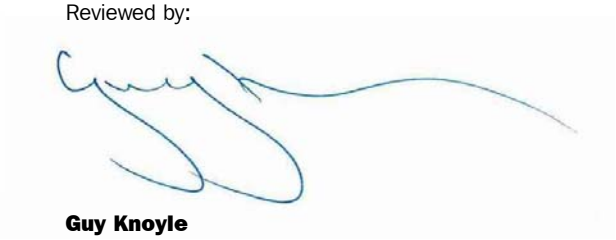
Prepared by:



Gerard Stark

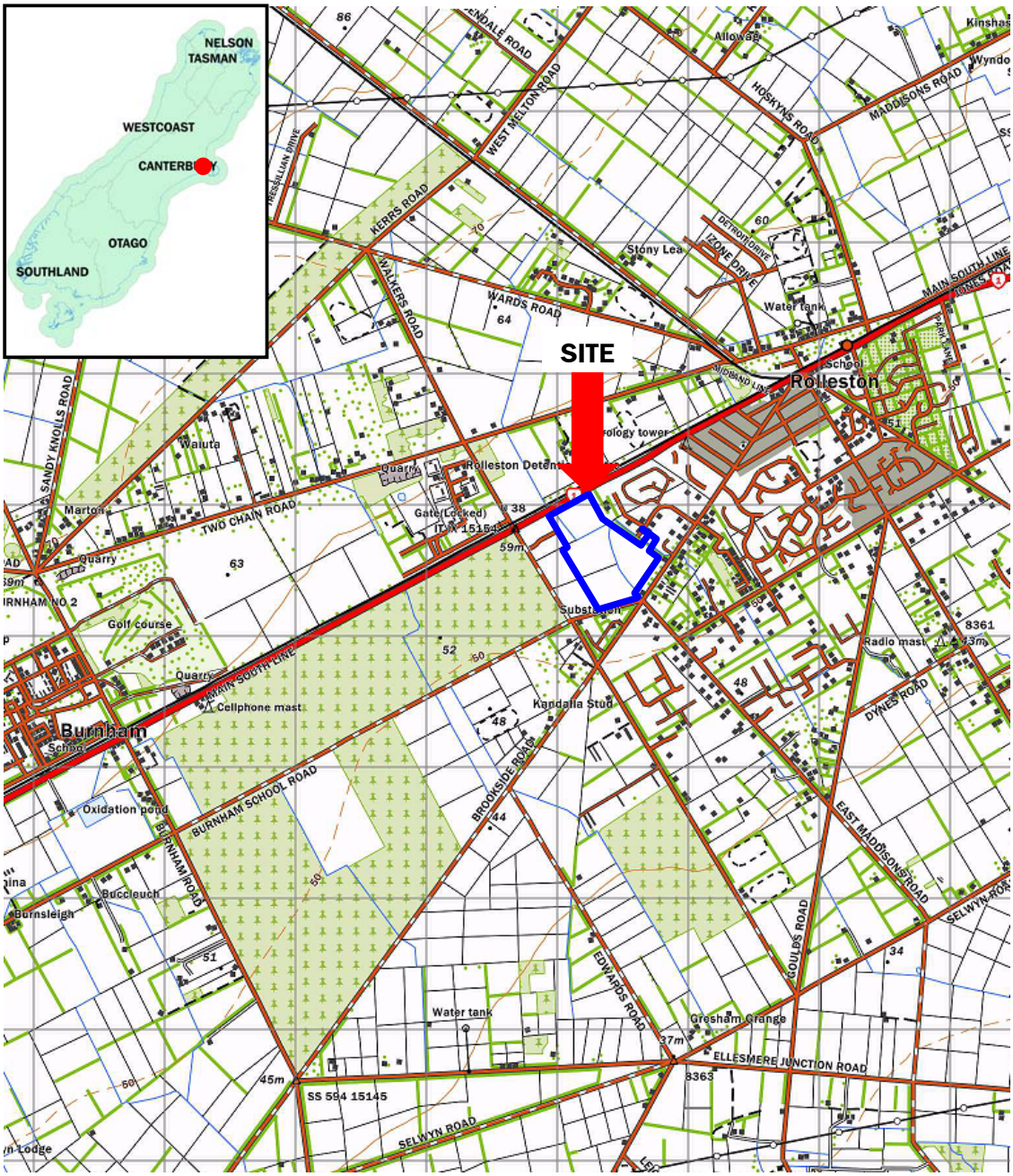
Environmental Scientist

Reviewed by:



Guy Knoyle

Environmental Scientist



NZMS 260 Map 36.

SCALE 1 : 50,000 (A4)

Figure 1: Site Location

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Figure 2: Site Layout

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Figure 3 : Layout of Land Parcels

Figure 4: Surface Soil Sample Locations

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Photograph 1: View looking south from corner by farm house

Photograph 2: View looking south west across the site

Photograph 3: View looking north west from southern end of site

Photograph 4: View looking east at the sheep holding pen near the western boundary (soil sample Area 1/2 collected within the pen)

Table 1: Soil Sample Results - Rolleston ODP Area 1 - CDL Land (Heavy Metals and OCP)

Sample Name	Area 1/1	Area 1/2	Area 1/3	Area 1/4	Area 1/5	Area 1/6	Area 1/7	Area 1/8	Area 1/9	Area 1/10	Proposed National Environmental Standard (Residential Land Use with 10% Produce Consumption)[1]	Environment Canterbury Background Soil Concentrations - 'YBST' Soils[3]
Sample Depth (m)	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1		
Laboratory Reference	937488.3	937488.4	937488.5	937488.6	937488.7	937488.8	937488.9	937488.10	937488.11	937488.12		
Date	26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011		
Heavy Metals												
Arsenic	3	3	3	3	3	3	3	3	3	2	20[1]	6.35
Cadmium	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	3[1,4]	0.14
Chromium	14	12	12	11	11	12	12	11	12	12	460[1,5]	19.89[9]
Copper	4	5	6	6	3	4	4	4	4	3	NL[1]	11.68
Lead	12.4	12.3	14.6	12.7	13.0	13.8	12.2	12.6	13.6	14.1	210[1]	19.75
Nickel	9	7	7	7	7	7	7	6	7	7	600[2]	13.91
Zinc	46	**127**	46	47	47	50	48	46	50	50	7,000[2]	69.58
Organochlorine Pesticides (OCP)												
ΣDDT	<0.060	<0.060	<0.060	<0.060	<0.066	<0.066	<0.066	<0.066	<0.060	<0.066	70[1,6]	-
Dieldrin	<0.020	<0.020	<0.020	<0.020	<0.022	<0.022	<0.022	<0.022	<0.020	<0.022	2.6[1,7]	-

Sample Name	Area 1/11	QA1 (dup of Area 1/11)	%RPD	Area 1/12	Area 1/13	Area 1/14	Area 1/15	Area 1/16	Area 1/17	Area 1/10	Proposed National Environmental Standard (Residential Land Use with 10% Produce Consumption)[1]	Environment Canterbury Background Soil Concentrations - 'YBST' Soils[3]
Sample Depth (m)	0 - 0.1	0 - 0.1		0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1		
Laboratory Reference	937488.13	937488.1		937488.14	937488.15	937488.16	937488.17	937488.18	937488.19	937488.12		
Date	26 September 2011	26 September 2011		26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011	26 September 2011		
Heavy Metals												
Arsenic	3	3	0.0%	3	3	2	3	3	3	2	20[1]	6.35
Cadmium	0.10	< 0.10	-	< 0.10	< 0.10	0.13	0.13	< 0.10	< 0.10	< 0.10	3[1,4]	0.14
Chromium	12	11	8.7%	13	12	12	13	12	12	12	460[1,5]	19.89[9]
Copper	4	4	0.0%	4	4	4	5	4	4	3	NL[1]	11.68
Lead	13.5	14.3	5.8%	14.3	13.4	12.7	16.4	12.7	14.2	14.1	210[1]	19.75
Nickel	7	7	0.0%	9	7	7	7	7	8	7	600[2]	13.91
Zinc	46	48	4.3%	51	48	48	65	49	50	50	7,000[2]	69.58
Organochlorine Pesticides (OCP)												
ΣDDT	<0.060	<0.060	-	<0.060	<0.066	<0.066	<0.060	<0.066	<0.060	<0.060	70[1,6]	-
Dieldrin	<0.020	<0.020	-	<0.020	<0.022	<0.022	<0.020	<0.022	<0.020	<0.020	2.6[1,7]	-

Notes:

1. Proposed 'National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health' - MfE May 2011 (cabinet paper) - Residential 10% produce.
2. Guideline on Health Based Investigation Levels for Soil and Groundwater (NEPC, 1999) - Commercial/industrial.
3. Background concentrations of selected trace elements in Canterbury soils - Addendum 1. (ECan 2007, Report no. R07/1/2). Based on 'YBST' soil type - background concentration value based on maximum plus half inter-quartile range.
4. Based on a default pH of 5.
5. Guideline criteria for Cr VI used as a conservative approach.
6. Results for DDT, DDD and DDE summed and compared to Guideline value for DDT.
7. Results for Aldrin and Dieldrin summed and compared to Guideline value for Dieldrin.
8. Where one or more of the compounds was below the detection limit, a value of half the detection limit was used in the sum. Where all compounds in the sum are non-detects, the overall detection limit is the sum of the detection limits.
9. Based on Total Chromium.

All results in mg/kg.

NL No Limit.

127 Concentration above reported ECan Background soil concentration.

Table 2: Equipment Blank Sample Results - Rolleston ODP Area 1 - CDL Land (Heavy Metals and OCP)

Sample Name	**QA2**
Sample Location	Equipment Blank
Laboratory Reference	937488.2
Date	26 September 2011
Heavy Metals	
Arsenic	< 0.0011
Cadmium	< 0.000053
Chromium	< 0.00053
Copper	< 0.00053
Lead	< 0.00011
Nickel	< 0.00053
Zinc	< 0.0011
Organochlorine Pesticides (OCP)	
Σ_{DDT}	<0.00006
Dieldrin	<0.00001

1. Results for DDT, DDD and DDE summed to represent the DDT concentration.

2. Results for Aldrin and Dieldrin summed to represent the Dieldrin concentration.

All results in mg/L.

Hill Laboratories
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R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

ANALYSIS REPORT

Client:	Pattle Delamore Partners Ltd	**Lab No:**	937488	SPv1
Contact:	Mr G Knoyle	**Date Registered:**	27-Sep-2011	
	C/- Pattle Delamore Partners Ltd	**Date Reported:**	06-Oct-2011	
	PO Box 389	**Quote No:**		
	CHRISTCHURCH 8140	**Order No:**		
		Client Reference:	C02531100	
		Submitted By:	I Cooper	

Sample Type: Soil

	Sample Name:	QA1 26-Sep-2011	Area 1/1 26-Sep-2011	Area 1/2 26-Sep-2011	Area 1/3 26-Sep-2011	Area 1/4 26-Sep-2011
	Lab Number:	937488.1	937488.3	937488.4	937488.5	937488.6
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	3	3	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.11	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	14	12	12	11
Total Recoverable Copper	mg/kg dry wt	4	4	5	6	6
Total Recoverable Lead	mg/kg dry wt	14.3	12.4	12.3	14.6	12.7
Total Recoverable Nickel	mg/kg dry wt	7	9	7	7	7
Total Recoverable Zinc	mg/kg dry wt	48	46	127	46	47
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
alpha-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
beta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
delta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
2,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Dieldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan I	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan II	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin Aldehyde	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin ketone	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Heptachlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Methoxychlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

	Sample Name:	Area 1/5 26-Sep-2011	Area 1/6 26-Sep-2011	Area 1/7 26-Sep-2011	Area 1/8 26-Sep-2011	Area 1/9 26-Sep-2011
	Lab Number:	937488.7	937488.8	937488.9	937488.10	937488.11
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						

Sample Type: Soil						
Sample Name:		Area 1/5 26-Sep-2011	Area 1/6 26-Sep-2011	Area 1/7 26-Sep-2011	Area 1/8 26-Sep-2011	Area 1/9 26-Sep-2011
Lab Number:		937488.7	937488.8	937488.9	937488.10	937488.11
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	3	3	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.11	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	12	12	11	12
Total Recoverable Copper	mg/kg dry wt	3	4	4	4	4
Total Recoverable Lead	mg/kg dry wt	13.0	13.8	12.2	12.6	13.6
Total Recoverable Nickel	mg/kg dry wt	7	7	7	6	7
Total Recoverable Zinc	mg/kg dry wt	47	50	48	46	50
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
alpha-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
beta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
delta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
cis-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
trans-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
4,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
2,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
4,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
4,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Dieldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Endosulfan I	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Endosulfan II	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Endosulfan sulphate	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Endrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Endrin Aldehyde	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Endrin ketone	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Heptachlor	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Heptachlor epoxide	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Hexachlorobenzene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010
Methoxychlor	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.010

Sample Name:		Area 1/10 26-Sep-2011	Area 1/11 26-Sep-2011	Area 1/12 26-Sep-2011	Area 1/13 26-Sep-2011	Area 1/14 26-Sep-2011
Lab Number:		937488.12	937488.13	937488.14	937488.15	937488.16
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	2	3	3	3	2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.10	< 0.10	< 0.10	0.13
Total Recoverable Chromium	mg/kg dry wt	12	12	13	12	12
Total Recoverable Copper	mg/kg dry wt	3	4	4	4	4
Total Recoverable Lead	mg/kg dry wt	14.1	13.5	14.3	13.4	12.7
Total Recoverable Nickel	mg/kg dry wt	7	7	9	7	7
Total Recoverable Zinc	mg/kg dry wt	50	46	51	48	48
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
alpha-BHC	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
beta-BHC	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
delta-BHC	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
cis-Chlordane	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
trans-Chlordane	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04

Sample Type: Soil						
Sample Name:		Area 1/10 26-Sep-2011	Area 1/11 26-Sep-2011	Area 1/12 26-Sep-2011	Area 1/13 26-Sep-2011	Area 1/14 26-Sep-2011
Lab Number:		937488.12	937488.13	937488.14	937488.15	937488.16
Organochlorine Pesticides Screening in Soil						
2,4'-DDD	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
4,4'-DDD	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
2,4'-DDE	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
4,4'-DDE	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
4,4'-DDT	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Dieldrin	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Endosulfan I	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Endosulfan II	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Endosulfan sulphate	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Endrin	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Endrin Aldehyde	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Endrin ketone	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Heptachlor	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Heptachlor epoxide	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Hexachlorobenzene	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011
Methoxychlor	mg/kg dry wt	< 0.011	< 0.010	< 0.010	< 0.011	< 0.011

Sample Name:		Area 1/15 26-Sep-2011	Area 1/16 26-Sep-2011	Area 1/17 26-Sep-2011		
Lab Number:		937488.17	937488.18	937488.19		
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	3	3	3	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.13	< 0.10	< 0.10	-	-
Total Recoverable Chromium	mg/kg dry wt	13	12	12	-	-
Total Recoverable Copper	mg/kg dry wt	5	4	4	-	-
Total Recoverable Lead	mg/kg dry wt	16.4	12.7	14.2	-	-
Total Recoverable Nickel	mg/kg dry wt	7	7	8	-	-
Total Recoverable Zinc	mg/kg dry wt	65	49	50	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
alpha-BHC	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
beta-BHC	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
delta-BHC	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
4,4'-DDD	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
4,4'-DDE	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
2,4'-DDT	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
4,4'-DDT	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Dieldrin	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Endosulfan I	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Endosulfan II	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Endrin	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Endrin Aldehyde	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Endrin ketone	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Heptachlor	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-
Methoxychlor	mg/kg dry wt	< 0.010	< 0.011	< 0.010	-	-

Sample Type: Aqueous						
Sample Name:		QA2 26-Sep-2011				
Lab Number:		937488.2				
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	-	-	-	-
Total Cadmium	g/m³	< 0.000053	-	-	-	-
Total Chromium	g/m³	< 0.00053	-	-	-	-
Total Copper	g/m³	< 0.00053	-	-	-	-
Total Lead	g/m³	< 0.00011	-	-	-	-
Total Nickel	g/m³	< 0.00053	-	-	-	-
Total Zinc	g/m³	< 0.0011	-	-	-	-
Organochlorine Pesticides Trace in water, By Liq/Liq						
Aldrin	g/m³	< 0.000005	-	-	-	-
alpha-BHC	g/m³	< 0.000010	-	-	-	-
beta-BHC	g/m³	< 0.000010	-	-	-	-
delta-BHC	g/m³	< 0.000010	-	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.000010	-	-	-	-
cis-Chlordane	g/m³	< 0.000005	-	-	-	-
trans-Chlordane	g/m³	< 0.000005	-	-	-	-
2,4'-DDD	g/m³	< 0.000010	-	-	-	-
4,4'-DDD	g/m³	< 0.000010	-	-	-	-
2,4'-DDE	g/m³	< 0.000010	-	-	-	-
4,4'-DDE	g/m³	< 0.000010	-	-	-	-
2,4'-DDT	g/m³	< 0.000010	-	-	-	-
4,4'-DDT	g/m³	< 0.000010	-	-	-	-
Dieldrin	g/m³	< 0.000005	-	-	-	-
Endosulfan I	g/m³	< 0.000010	-	-	-	-
Endosulfan II	g/m³	< 0.000010	-	-	-	-
Endosulfan sulfate	g/m³	< 0.000010	-	-	-	-
Endrin	g/m³	< 0.000005	-	-	-	-
Endrin aldehyde	g/m³	< 0.000005	-	-	-	-
Endrin ketone	g/m³	< 0.000010	-	-	-	-
Heptachlor	g/m³	< 0.000005	-	-	-	-
Heptachlor epoxide	g/m³	< 0.000005	-	-	-	-
Hexachlorobenzene	g/m³	< 0.00004	-	-	-	-
Methoxychlor	g/m³	< 0.000005	-	-	-	-
Total Chlordane [(cis+trans)*100/42]	g/m³	< 0.00002	-	-	-	-

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Samples**
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3-19
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	-	1, 3-19
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082).. Tested on dried sample	-	1, 3-19
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 3-19

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Samples**
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level	-	2
Organochlorine Pesticides Trace in water, By Liq/Liq	Liquid / liquid extraction, SPE (if required), dual column GC-ECD analysis	-	2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 21st ed. 2005.	-	2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental Division

PATTLE DELAMORE PARTNERS LTD

solutions for your environment

Time Received 27-Sep-2011 10:38:19 am

Job No **937488**

No of Samples **19** No of Fractions **93**

r Analyses

NOTE: Please acknowledge receipt of these samples by signing this form and emailing to submitter.

From: Pattle Delamore Partners Ltd

Address (Refer to base of sheet): C

0319374883

Submitted by: Ingrid Cooper Ph No.: 03 363 3100

☑ PDP Christchurch

To: Hill Laboratories

Quote No.: —

PDP Job No.: CO2531100

Chain of Custody Record

Sent:

Name: Ingrid Cooper

Signature: ICooper

Date and time: 26/9/11

Received: ☐ Room temp. ☐ Chilled. Temp.:____°C

Name: Kathryn H

Signature: Kathryn H

Date and time:

Notes:

SEP 27 AM 6:47

Results by: ☑ Email submitter: ingrid.cooper @pdp.co.nz ☐ Mail (address below)

☐ Email other: _____ @pdp.co.nz ☐ Fax (number below)

Priority: ☑ Normal ☐ High ☐ Urgent

Results required by: ____ / ____ / ____

Invoice to: ☑ PDP ☐ Other:

Sample ID	Sample type	No. bottles	Analyses requested	Notes
QA1	S	1	Heavy Metals (x 7), OCP	
QA2	FW	2		
Area1/1	S	1		
Area1/2				
Area1/3				
Area1/4				
Area1/5				
Area1/6				
Area1/7				
Area1/8				
Area1/9				
Area1/10				
Area1/11				
Area1/12				
Area1/13				
Area1/14				
Area1/15				
Area1/16				
Area1/17	↓	↓	↓	

Temperature On Arrival

10.5 °C

Temperature was measured on one or more arbitrarily chosen samples in this batch.

Sample type: S Soil | GW Groundwater | SAL Seawater/saline | FW Freshwater | LEACH Leachate | GEO Geothermal | SED Sediment | BIO Biota | TW Tradewaste | WW Wastewater | P Potable | Other: _____

Note: Samples may contain dangerous or hazardous substances

DP Auckland
DP House, 235 Broadway, Newmarket, Auckland
O Box 9528, Newmarket, Auckland 1149

PDP Wellington
iSOFT House, Level 1, 111 Customhouse Quay, Wellington
PO Box 6136, Wellington 6141

PDP Christchurch
Radio NZ House, 51 Chester St West, Christchurch
PO Box 389, Christchurch 8140

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R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

Job Information Summary

Client:	Pattle Delamore Partners Ltd	**Lab No:**	937488
Contact:	I Cooper	**Date Registered:**	27-Sep-2011 10:42:52 am
	C/- Pattle Delamore Partners Ltd	**Priority:**	Normal
	PO Box 389	**Quote No:**	
	CHRISTCHURCH 8140	**Order No:**	
		Client Reference:	C02531100
		Add. Client Ref:	
		Submitted By:	I Cooper
		Charge To:	Pattle Delamore Partners Ltd

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	QA1 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
2	QA2 26-Sep-2011	Surface Water	Org500, N100	Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Trace in water, By Liq/Liq
3	Area 1/1 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
4	Area 1/2 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
5	Area 1/3 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
6	Area 1/4 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
7	Area 1/5 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
8	Area 1/6 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
9	Area 1/7 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
10	Area 1/8 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
11	Area 1/9 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
12	Area 1/10 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
13	Area 1/11 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
14	Area 1/12 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
15	Area 1/13 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
16	Area 1/14 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
17	Area 1/15 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
18	Area 1/16 26-Sep-2011	Soil	GSoil125	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil
19	Area 1/17 26-Sep-2011	Soil	cGSoil	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn; Organochlorine Pesticides Screening in Soil

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Samples
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3-19
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	-	1, 3-19
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082).. Tested on dried sample	-	1, 3-19
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 3-19

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Samples
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level	-	2
Organochlorine Pesticides Trace in water, By Liq/Liq	Liquid / liquid extraction, SPE (if required), dual column GC-ECD analysis	-	2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 21st ed. 2005.	-	2