# Pattle Delamore Partners Limited

## TECHNICAL MEMORANDUM

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|---|---|---|---|
| **INVESTIGATION** | Solids Characterisation | **PROJECT** | Disposal of Solids to Land |
| **CLIENT** | **The Alliance Group Limited – Lorneville Plant** | **PROJECT NO** | A01856202 |
| **CLIENT CONTACT** | Frances Wise | **PREPARED BY** | Daryl Irvine |
| **CLIENT WORK ORDER NO/ PURCHASE ORDER** | | **SIGNATURE** |  |
| | | **DATE** | 14 March 2016 |

### Introduction

The Alliance Group Limited plant at Lorneville (Alliance Lorneville) has applied for new discharge to surface water consents to replace the existing discharge consent, which expires in 2016. As part of the consent application, Alliance Lorneville has also applied for consent to spread biosolids (dewatered waste activated sludge) to company owned land in the vicinity of the processing plant. As part of a request for further information, made under Section 92 to the Resource Management Act (MfE 1991), Southland Regional Council has queried: *"Are there likely to be any sources of mercury or organics in the biosolids? Are there any pathogens specific to the waste stream which may affect human health? Are there any risks of Salmonella as a result of the discharge of biosolids?"*

Alliance Lorneville has subsequently collected a representative biosolids sample for further heavy metal, organics and microbiological testing to address these queries. In addition, Alliance Lorneville has sampled the stockyards solids for the same testing regime for completeness. This technical memorandum has been prepared by Pattle Delamore Partners to summarise the findings of the further biosolids and stockyards solids testing.

### Sampling Methodology

The consent application for disposal of biosolids to land incorporated dewatered waste activated sludge (WAS), from a proposed upgraded wastewater treatment system at the Lorneville plant. Because WAS is not currently produced from the Lorneville plant, a sample was collected from the Alliance Pukeuri plant wastewater treatment system. The Alliance Pukeuri plant incorporates similar processing systems as the Alliance Lorneville plant, with the exception of beef processing facilities and wet-blue tanning (both of which are not present at the Alliance Lorneville plant). Notwithstanding this, the WAS produced from the Alliance Pukeuri plant is considered to be representative of what would be produced from the Alliance Lorneville plant, except for chromium which could be expected to be higher for the Alliance Pukeuri WAS due to potential contribution from the wet-blue tanning process.

The following methodology was utilised for collection of the solids samples:

**Alliance Lorneville Stockyards Solids:**

A composite sample of stockyards solids was collected on 18 February 2016 by Alliance staff, from a pile of stockyards solids that had recently been scraped from below the stockyards and left to stand prior to disposal. Samples were collected from several locations within the pile and mixed to form a composite sample. The sample was then sent to Hill Laboratories Limited in Christchurch for analysis. The sample was assessed as a solid sample at a Screen Level.

# TECHNICAL MEMORANDUM

**Alliance Pukeuri Waste Activated Sludge:**

A liquid WAS sample was collected from the WAS tank at Alliance Pukeuri on 17 February 2016, by Alliance staff. The sample was then sent to Hill Laboratories Limited in Christchurch for analysis and was assessed as a liquid sample at a Screen Level.

## Results

The laboratory results from the stockyards and waste activated sludge analyses have been collated and attached in Appendix A. The WAS results were initially reported in units of $g/m^3$ as received, due to the sample being liquid form. For the purpose of comparing the results from the two solids samples and for assessment against guideline limits, the WAS results were converted to mg/kg dry weight, based on the measured solids content of the WAS sample (approximately 1.11% solids content). Where applicable, the results have been compared with the Guidelines for Safe Application of Biosolids to Land in New Zealand (Biosolids Guidelines) (NZWWA 2003)[1].

For the assessment of microorganisms, both the stockyards and WAS samples contained elevated levels of *E. coli* and *Campylobacter* species (above Grade 'A' guideline limits) but contained less than detection levels for *Salmonella*. Due to the elevated microorganism count for *E. coli* and *Campylobacter* both waste streams can be considered to fall into Grade 'B' categorisation under the Biosolids Guidelines.

The heavy metal results for both samples were less than the Biosolids Guidelines limits for the Grade 'a' biosolids limits, with the exception of the zinc concentration in the stockyards solids, which was less than the Grade 'b' limit. The higher zinc content in the stockyards solids may be as a result of zinc related veterinary products utilised on farms. The mercury content of both solids samples were below the Screen detection limit, and less than the Biosolids Guidelines Grade 'a' limit.

Both samples were assessed against a large organic compounds suite (refer to Appendix A), with all organic compounds with Biosolids Guideline limits returning below method detection limit results. While some individual parameters had detection limits greater than the Grade 'a' limit, the detection limits were below the Grade 'b' limit of the Biosolids Guidelines. The Total PCB (sum of 35 congeners) detection limit was greater than both the Grade 'a' and 'b' limits, however, the detection limit is as a result of the sum of all 35 congeners detection limits. The individual PCB congeners were all below detection limits and below the Total PCB Grade 'a' limit.

The organic compounds testing did register above detection limit results for 3 & 4-Methylphenol (m- + p-cresol) for both solids samples. There is no limit for 3 & 4-Methylphenol (m- + p-cresol) in the Biosolids Guidelines. P-Cresol naturally occurs in sheep urine (Martin 1982) and is the likely source measured in both samples.

## Conclusions

In response to the request by Southland Regional Council under Section 92 of the RMA, for further information for the consent application from Alliance Lorneville for disposal of biosolids to land, specifically: "*Are there likely to be any sources of mercury or organics in the biosolids? Are there any pathogens specific to the waste stream which may affect human health? Are there any risks of Salmonella as a result of the discharge of biosolids?",* the following conclusions have been drawn:

[1] Note: The Biosolids Guidelines (NZWWA 2003) Grade 'A' and 'B' limits relate to microorganism levels where as Grade 'a' and 'b' limits relate to other contaminants.

- There are no likely sources of mercury in the biosolids;
- There are potentially organics present in the biosolids, however, the organics present are likely to be naturally occurring organics and do not have an associated Biosolids Guideline limit;
- There are *E.coli* and *Campylobacter* micro-organism species present in the biosolids, but *Salmonella* was reported as being <30 MPN/L (adjusted to <675 MPN/25g dry wt). The dry weight value is based on the calculation of 30 MPN/L, however, it is likely that this is an over representation. Proposed controls will be in place for disposal of the biosolids to minimise risks to human health.

## Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Alliance Group Limited and Hill Laboratories Limited. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Alliance Group Limited for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

## References

Martin AK (1982) *The origin of urinary aromatic compounds excreted by ruminants. 3. The metabolism of phenolic compounds to simple phenols.* Br J Nutr. 1982 Nov;48(3):497-507.

MfE (1991) *Resource Management Act,* Ministry for the Environment, New Zealand.

NZWWA (2003), *Guidelines for the Safe Application of Biosolids to Land in New Zealand*, New Zealand Water and Waste Association and Ministry for the Environment.

# APPENDIX A:

# ALLIANCE LORNEVILLE SOLIDS ANALYSIS

**Data Set:** **Alliance Lorneville Solids Analysis**

Recorded by: D. Irvine, Pattle Delamore Partners Limited

Job Number A01856202

| Sample Name: | | Lorneville Stock Yards | Pukeuri WAS | NZWWA Biosolids Guidelines Limits | |
|---|---|---|---|---|---|
| Sample Date: | | 18-Feb-16 | 17-Feb-16 | | |
| Laboratory Number: | | 1540028 | 1539459 | | |
| Parameter: | Units | | | Grade A or a | Grade B or b |
| Dry Matter | g/100g as rcvd | 14.7 | 1.11 | | |
| Escherichia coli | MPN / g | > 16000 | > 14414 | 100 | Not applicable |
| Salmonella | MPN /25g dry wt | < 75 | < 676 | 1 | Not applicable |
| Campylobacter species | MPN / 25g dry wt | > 27500 | < 676 | 1 | Not applicable |
| Metals extensive suite, screen level (33 metals) | | | | | |
| Total Recoverable Aluminium | mg/kg dry wt | 5200 | 1559 | | |
| Total Recoverable Antimony | mg/kg dry wt | < 0.8 | < 0.378 | | |
| Total Recoverable Arsenic | mg/kg dry wt | < 4 | < 1.892 | 20 | 30 |
| Total Recoverable Barium | mg/kg dry wt | 60 | 27.027 | | |
| Total Recoverable Bismuth | mg/kg dry wt | < 0.8 | < 0.189 | | |
| Total Recoverable Boron | mg/kg dry wt | < 40 | 106.306 | | |
| Total Recoverable Cadmium | mg/kg dry wt | 0.3 | 0.180 | 1 | 10 |
| Total Recoverable Caesium | mg/kg dry wt | < 0.4 | 0.234 | | |
| Total Recoverable Calcium | mg/kg dry wt | 17800 | 19820 | | |
| Total Recoverable Chromium | mg/kg dry wt | 12 | 23.4 | 600 | 1500 |
| Total Recoverable Cobalt | mg/kg dry wt | 2.7 | 0.856 | | |
| Total Recoverable Copper | mg/kg dry wt | 20 | 36.0 | 100 | 1250 |
| Total Recoverable Iron | mg/kg dry wt | 10700 | 2342 | | |
| Total Recoverable Lanthanum | mg/kg dry wt | 2.6 | 1.12 | | |
| Total Recoverable Lead | mg/kg dry wt | 6.4 | 3.60 | 300 | 300 |
| Total Recoverable Lithium | mg/kg dry wt | 4.5 | 1.57 | | |
| Total Recoverable Magnesium | mg/kg dry wt | 4300 | 1982 | | |
| Total Recoverable Manganese | mg/kg dry wt | 580 | 168 | | |
| Total Recoverable Mercury | mg/kg dry wt | < 0.2 | < 0.189 | 1 | 7.5 |
| Total Recoverable Molybdenum | mg/kg dry wt | 2.5 | 1.98 | | |
| Total Recoverable Nickel | mg/kg dry wt | 7 | 3.87 | 60 | 135 |
| Total Recoverable Phosphorus | mg/kg dry wt | 5800 | | | |
| Total Recoverable Potassium | mg/kg dry wt | 6800 | 9279 | | |
| Total Recoverable Rubidium | mg/kg dry wt | 22 | 17.7 | | |
| Total Recoverable Selenium | mg/kg dry wt | < 40 | < 1.89 | | |
| Total Recoverable Silver | mg/kg dry wt | < 0.8 | < 0.198 | | |
| Total Recoverable Sodium | mg/kg dry wt | 1550 | 48649 | | |
| Total Recoverable Strontium | mg/kg dry wt | 140 | 44.1 | | |
| Total Recoverable Thallium | mg/kg dry wt | < 0.4 | < 0.099 | | |
| Total Recoverable Tin | mg/kg dry wt | < 2 | < 0.991 | | |
| Total Recoverable Uranium | mg/kg dry wt | < 0.2 | 0.216 | | |
| Total Recoverable Vanadium | mg/kg dry wt | < 200 | 6.31 | | |
| Total Recoverable Zinc | mg/kg dry wt | 480 | 243 | 300 | 1500 |
| Organochlorine Pesticides Screening in Soil | | | | | |
| Aldrin | mg/kg dry wt | < 0.1 | < 0.009 | 0.02 | 0.2 |
| alpha-BHC | mg/kg dry wt | < 0.1 | < 0.018 | | |
| beta-BHC | mg/kg dry wt | < 0.1 | < 0.018 | | |
| delta-BHC | mg/kg dry wt | < 0.1 | < 0.018 | | |
| gamma-BHC (Lindane) | mg/kg dry wt | < 0.1 | < 0.018 | | |
| cis-Chlordane | mg/kg dry wt | < 0.1 | < 0.009 | | |
| trans-Chlordane | mg/kg dry wt | < 0.1 | < 0.009 | | |
| Total Chlordane [(cis+trans)*100/42] | mg/kg dry wt | < 0.2 | < 0.018 | 0.02 | 0.2 |
| 2,4'-DDD | mg/kg dry wt | < 0.1 | < 0.018 | | |
| 4,4'-DDD | mg/kg dry wt | < 0.1 | < 0.018 | | |
| 2,4'-DDE | mg/kg dry wt | < 0.1 | < 0.018 | | |
| 4,4'-DDE | mg/kg dry wt | < 0.1 | < 0.018 | | |
| 2,4'-DDT | mg/kg dry wt | < 0.1 | < 0.018 | | |
| 4,4'-DDT | mg/kg dry wt | < 0.1 | < 0.009 | | |
| Total DDT Isomers | mg/kg dry wt | < 0.6 | | | |
| Dieldrin | mg/kg dry wt | < 0.1 | < 0.009 | 0.02 | 0.2 |
| Endosulfan I | mg/kg dry wt | < 0.1 | < 0.018 | | |
| Endosulfan II | mg/kg dry wt | < 0.1 | < 0.018 | | |
| Endosulfan sulphate | mg/kg dry wt | < 0.1 | < 0.018 | | |
| Endrin | mg/kg dry wt | < 0.1 | < 0.009 | | |
| Endrin aldehyde | mg/kg dry wt | < 0.1 | < 0.009 | | |
| Endrin ketone | mg/kg dry wt | < 0.1 | < 0.018 | | |
| Heptachlor | mg/kg dry wt | < 0.1 | < 0.009 | 0.02 | 0.2 |
| Heptachlor epoxide | mg/kg dry wt | < 0.1 | < 0.009 | 0.02 | 0.2 |
| Hexachlorobenzene | mg/kg dry wt | < 0.1 | < 0.072 | 0.02 | 0.2 |
| Methoxychlor | mg/kg dry wt | < 0.1 | < 0.009 | | |
| Organonitro&phosphorus Pesticides Screen in Soil by GCMS | | | | | |
| Acetochlor | mg/kg | < 0.4 | < 0.180 | | |
| Alachlor | mg/kg | < 0.18 | < 0.090 | | |
| Atrazine | mg/kg | < 0.4 | < 0.180 | | |
| Atrazine-desethyl | mg/kg | < 0.4 | < 0.180 | | |
| Atrazine-desisopropyl | mg/kg | < 0.7 | < 0.360 | | |

| | | | | | |
|---|---|---|---|---|---|
| Azaconazole | mg/kg | < 0.18 | < 0.090 | | |
| Azinphos-methyl | mg/kg | < 1.8 | < 0.360 | | |
| Benalaxyl | mg/kg | < 0.18 | < 0.090 | | |
| Bitertanol | mg/kg | < 0.7 | < 0.360 | | |
| Bromacil | mg/kg | < 0.4 | < 0.180 | | |
| Bromopropylate | mg/kg | < 0.4 | < 0.180 | | |
| Butachlor | mg/kg | < 0.4 | < 0.180 | | |
| Captan | mg/kg | < 0.7 | < 0.360 | | |
| Carbaryl | mg/kg | < 0.4 | < 0.180 | | |
| Carbofuran | mg/kg | < 0.4 | < 0.180 | | |
| Chlorfluazuron | mg/kg | < 0.4 | < 0.180 | | |
| Chlorothalonil | mg/kg | < 0.4 | < 0.180 | | |
| Chlorpyrifos | mg/kg | < 0.4 | < 0.180 | | |
| Chlorpyrifos-methyl | mg/kg | < 0.4 | < 0.180 | | |
| Chlortoluron | mg/kg | < 0.7 | < 0.360 | | |
| Cyanazine | mg/kg | < 0.4 | < 0.180 | | |
| Cyfluthrin | mg/kg | < 0.5 | < 0.270 | | |
| Cyhalothrin | mg/kg | < 0.4 | < 0.180 | | |
| Cypermethrin | mg/kg | < 0.9 | < 0.450 | | |
| Deltamethrin (including Tralomethrin) | mg/kg | < 0.7 | < 0.180 | | |
| Diazinon | mg/kg | < 0.18 | < 0.090 | | |
| Dichlofluanid | mg/kg | < 0.4 | < 0.180 | | |
| Dichloran | mg/kg | < 0.9 | < 0.450 | | |
| Dichlorvos | mg/kg | < 0.4 | < 0.180 | | |
| Difenoconazole | mg/kg | < 0.5 | < 0.270 | | |
| Dimethoate | mg/kg | < 0.7 | < 0.360 | | |
| Diphenylamine | mg/kg | < 0.7 | < 0.360 | | |
| Diuron | mg/kg | < 0.4 | < 0.180 | | |
| Fenpropimorph | mg/kg | < 0.4 | < 0.180 | | |
| Fluazifop-butyl | mg/kg | < 0.4 | < 0.180 | | |
| Fluometuron | mg/kg | < 0.4 | < 0.180 | | |
| Flusilazole | mg/kg | < 0.4 | < 0.180 | | |
| Fluvalinate | mg/kg | < 0.3 | < 0.135 | | |
| Furalaxyl | mg/kg | < 0.18 | < 0.090 | | |
| Haloxyfop-methyl | mg/kg | < 0.4 | < 0.180 | | |
| Hexaconazole | mg/kg | < 0.4 | < 0.180 | | |
| Hexazinone | mg/kg | < 0.18 | < 0.090 | | |
| IPBC (3-Iodo-2-propynyl-n-butylcarbamate) | mg/kg dry wt | < 1.8 | < 0.901 | | |
| Kresoxim-methyl | mg/kg | < 0.18 | < 0.090 | | |
| Linuron | mg/kg | < 0.7 | < 0.180 | | |
| Malathion | mg/kg | < 0.4 | < 0.180 | | |
| Metalaxyl (Mefenoxam) | mg/kg | < 0.4 | < 0.180 | | |
| Methamidophos | mg/kg | < 1.8 | | | |
| Metolachlor | mg/kg | < 0.18 | < 0.090 | | |
| Metribuzin | mg/kg | < 0.4 | < 0.180 | | |
| Molinate | mg/kg | < 0.7 | < 0.360 | | |
| Myclobutanil | mg/kg | < 0.4 | < 0.180 | | |
| Naled | mg/kg | < 1.8 | < 0.901 | | |
| Norflurazon | mg/kg | < 0.7 | < 0.360 | | |
| Oxadiazon | mg/kg | < 0.4 | < 0.180 | | |
| Oxyfluorfen | mg/kg | < 0.18 | < 0.090 | | |
| Paclobutrazol | mg/kg | < 0.4 | < 0.180 | | |
| Parathion-ethyl | mg/kg | < 0.4 | < 0.180 | | |
| Parathion-methyl | mg/kg | < 0.4 | < 0.180 | | |
| Pendimethalin | mg/kg | < 0.4 | < 0.180 | | |
| Permethrin | mg/kg | < 0.1 | < 0.054 | | |
| Pirimicarb | mg/kg | < 0.4 | < 0.180 | | |
| Pirimiphos-methyl | mg/kg | < 0.4 | < 0.180 | | |
| Prochloraz | mg/kg | < 1.8 | < 0.901 | | |
| Procymidone | mg/kg | < 0.4 | < 0.180 | | |
| Prometryn | mg/kg | < 0.18 | < 0.090 | | |
| Propachlor | mg/kg | < 0.4 | < 0.180 | | |
| Propanil | mg/kg | < 0.7 | < 0.360 | | |
| Propazine | mg/kg | < 0.18 | < 0.090 | | |
| Propiconazole | mg/kg | < 0.3 | < 0.135 | | |
| Pyriproxyfen | mg/kg | < 0.4 | < 0.180 | | |
| Quizalofop-ethyl | mg/kg | < 0.4 | < 0.180 | | |
| Simazine | mg/kg | < 0.4 | < 0.180 | | |
| Simetryn | mg/kg | < 0.4 | < 0.180 | | |
| Sulfentrazone | mg/kg | < 1.8 | < 0.901 | | |
| TCMTB [2-(thiocyanomethylthio)benzothiazole,Busan] | mg/kg dry wt | < 1.8 | < 0.360 | | |
| Tebuconazole | mg/kg | < 0.4 | < 0.180 | | |
| Terbacil | mg/kg | < 0.4 | < 0.180 | | |
| Terbufos | mg/kg | < 0.4 | < 0.180 | | |
| Terbumeton | mg/kg | < 0.4 | < 0.180 | | |
| Terbuthylazine | mg/kg | < 0.18 | < 0.090 | | |
| Terbuthylazine-desethyl | mg/kg | < 0.4 | < 0.180 | | |
| Terbutryn | mg/kg | < 0.4 | < 0.180 | | |
| Thiabendazole | mg/kg | < 1.8 | < 0.901 | | |
| Thiobencarb | mg/kg | < 0.4 | < 0.180 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tolylfluanid | mg/kg | < | 0.18 | < | 0.090 | | |
| Triazophos | mg/kg | < | 0.4 | < | 0.180 | | |
| Trifluralin | mg/kg | < | 0.4 | < | 0.180 | | |
| Vinclozolin | mg/kg | < | 0.4 | < | 0.180 | | |
| Polychlorinated Biphenyls Screening in Soil | | | | | | | |
| PCB-18 | mg/kg dry wt | < | 0.01 | | | | |
| PCB-28 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-31 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-44 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-49 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-52 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-60 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-77 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-81 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-86 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-101 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-105 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-110 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-114 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-118 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-121 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-123 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-126 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-128 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-138 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-141 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-149 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-151 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-153 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-156 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-157 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-159 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-167 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-169 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-170 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-180 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-189 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-194 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-206 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| PCB-209 | mg/kg dry wt | < | 0.01 | < | 0.036 | | |
| Total PCB (Sum of 35 congeners) | mg/kg dry wt | < | 0.4 | < | 1.261 | 0.02 | 0.2 |
| Pentachlorophenol Screening in Soil by LCMSMS | | | | | | | |
| Pentachlorophenol (PCP) | mg/kg dry wt | < | 0.1 | < | 0.027 | | |
| 2,3,4,6-Tetrachlorophenol (TCP) | mg/kg dry wt | < | 0.1 | < | 0.027 | | |
| Haloethers in SVOC Soil Samples by GC-MS | | | | | | | |
| Bis(2-chloroethoxy) methane | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Bis(2-chloroethyl)ether | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Bis(2-chloroisopropyl)ether | mg/kg dry wt | < | 2 | < | 0.450 | | |
| 4-Bromophenyl phenyl ether | mg/kg dry wt | < | 2 | < | 0.450 | | |
| 4-Chlorophenyl phenyl ether | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Nitrogen containing compounds in SVOC Soil Samples by GC-MS | | | | | | | |
| 2,4-Dinitrotoluene | mg/kg dry wt | < | 4 | < | 0.901 | | |
| 2,6-Dinitrotoluene | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Nitrobenzene | mg/kg dry wt | < | 2 | < | 0.450 | | |
| N-Nitrosodi-n-propylamine | mg/kg dry wt | < | 4 | < | 0.901 | | |
| N-Nitrosodiphenylamine + Diphenylamine | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Organochlorine Pesticides in SVOC Soil Samples by GC-MS | | | | | | | |
| Aldrin | mg/kg dry wt | < | 2 | < | 0.450 | | |
| alpha-BHC | mg/kg dry wt | < | 2 | < | 0.450 | | |
| beta-BHC | mg/kg dry wt | < | 2 | < | 0.450 | | |
| delta-BHC | mg/kg dry wt | < | 2 | < | 0.450 | | |
| gamma-BHC (Lindane) | mg/kg dry wt | < | 2 | < | 0.450 | | |
| 4,4'-DDD | mg/kg dry wt | < | 2 | < | 0.450 | | |
| 4,4'-DDE | mg/kg dry wt | < | 2 | < | 0.450 | | |
| 4,4'-DDT | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Dieldrin | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Endosulfan I | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Endosulfan II | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Endosulfan sulphate | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Endrin | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Endrin ketone | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Heptachlor | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Heptachlor epoxide | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Hexachlorobenzene | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS | | | | | | | |
| Acenaphthene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Acenaphthylene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Anthracene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Benzo[a]anthracene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Benzo[a]pyrene (BAP) | mg/kg dry wt | < | 2 | < | 0.270 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Benzo[b]fluoranthene + Benzo[j]fluoranthene | mg/kg dry wt | < | 2 | < | 0.270 | | |
| Benzo[g,h,i]perylene | mg/kg dry wt | < | 2 | < | 0.270 | | |
| Benzo[k]fluoranthene | mg/kg dry wt | < | 2 | < | 0.270 | | |
| 1&2-Chloronaphthalene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Chrysene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Dibenzo[a,h]anthracene | mg/kg dry wt | < | 2 | < | 0.270 | | |
| Fluoranthene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Fluorene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Indeno(1,2,3-c,d)pyrene | mg/kg dry wt | < | 2 | < | 0.270 | | |
| 2-Methylnaphthalene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Naphthalene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Phenanthrene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Pyrene | mg/kg dry wt | < | 1 | < | 0.270 | | |
| Phenols in SVOC Soil Samples by GC-MS | | | | | | | |
| 4-Chloro-3-methylphenol | mg/kg dry wt | < | 5 | < | 0.901 | | |
| 2-Chlorophenol | mg/kg dry wt | < | 2 | < | 0.450 | | |
| 2,4-Dichlorophenol | mg/kg dry wt | < | 2 | < | 0.450 | | |
| 2,4-Dimethylphenol | mg/kg dry wt | < | 3 | < | 0.450 | | |
| 3 & 4-Methylphenol (m- + p-cresol) | mg/kg dry wt | | 131 | | 2.342 | | |
| 2-Methylphenol (o-Cresol) | mg/kg dry wt | < | 2 | < | 0.450 | | |
| 2-Nitrophenol | mg/kg dry wt | < | 5 | < | 0.901 | | |
| Pentachlorophenol (PCP) | mg/kg dry wt | < | 40 | < | 9.009 | | |
| Phenol | mg/kg dry wt | < | 4 | | 9.730 | | |
| 2,4,5-Trichlorophenol | mg/kg dry wt | < | 4 | < | 0.901 | | |
| 2,4,6-Trichlorophenol | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Plasticisers in SVOC Soil Samples by GC-MS | | | | | | | |
| Bis(2-ethylhexyl)phthalate | mg/kg dry wt | < | 8 | < | 2.703 | | |
| Butylbenzylphthalate | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Di(2-ethylhexyl)adipate | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Diethylphthalate | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Dimethylphthalate | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Di-n-butylphthalate | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Di-n-octylphthalate | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Other Halogenated compounds in SVOC Soil Samples by GC-MS | | | | | | | |
| 1,2-Dichlorobenzene | mg/kg dry wt | < | 4 | < | 0.901 | | |
| 1,3-Dichlorobenzene | mg/kg dry wt | < | 4 | < | 0.901 | | |
| 1,4-Dichlorobenzene | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Hexachlorobutadiene | mg/kg dry wt | < | 4 | < | 0.901 | | |
| Hexachloroethane | mg/kg dry wt | < | 4 | < | 0.901 | | |
| 1,2,4-Trichlorobenzene | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Other compounds in SVOC Soil Samples by GC-MS | | | | | | | |
| Benzyl alcohol | mg/kg dry wt | < | 20 | < | 4.505 | | |
| Carbazole | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Dibenzofuran | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Isophorone | mg/kg dry wt | < | 2 | < | 0.450 | | |
| Tributyl Tin Trace in Soil samples by GCMS | | | | | | | |
| Dibutyltin (as Sn) | mg/kg dry wt | < | 0.03 | < | 0.054 | | |
| Monobutyltin (as Sn) | mg/kg dry wt | < | 0.03 | | | | |
| Tributyltin (as Sn) | mg/kg dry wt | < | 0.017 | < | 0.045 | | |
| Triphenyltin (as Sn) | mg/kg dry wt | < | 0.014 | < | 0.036 | | |