

Preliminary Site Investigation Report

683 Dalefield Road

Carterton

Prepared for Lauren Spicer

31 January, 2018



Abbreviations

| | |
|------|---|
| GWRC | Greater Wellington Regional Council |
| HAIL | Hazardous Activities and Industries List (October 2011) |
| MfE | Ministry for the Environment |
| NES | National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health |
| PSI | Preliminary Site Investigation Report |
| SLUR | Selected Land Use Register |

Certification

This report is certified by Dr. Esther F. Dijkstra of EcoAgriLogic Ltd. PO Box 190, Carterton 5743, who has not less than 15 years of experience as a soil and contaminated site professional, whose highest qualification is PhD Environmental Sciences, University of Amsterdam (1997).



Esther Dijkstra, 31 January 2018

Disclaimer

The information contained in this report by EcoAgriLogic Ltd (EAL) is based upon the best information available to EAL at the time it was drawn up and all due care was exercised in its preparation. The conclusions and recommendations conveyed in this document are based on information supplied by the Client and the analytical results of representative soil sampling at the time of investigation. While the soil sampling was carried out according to best scientific practice, no guarantee of public health risk due to contamination at the site is given. The analytical results are directly related to the soil cores taken, which are representations of the total area of the subject land. The results are an interpolation of ground conditions between the sampling points and it is possible that undetected contamination exists in locations not directly sampled.

EAL accepts no responsibility for site conditions that were not evident based on the analysis results of representative sampling performed during this investigation. This report was prepared for the single specific purpose of investigating the soil contamination status of the herein described land use change proposed by the Client. EAL is not responsible for the use of this document for any other purpose. This report is intended for the use of the Client only.

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Summary

EcoAgriLogic Ltd was commissioned by Lauren Spicer to prepare a Preliminary Site Investigation Report (PSI) to determine the potential soil contamination of part of 683 Dalefield Road, Carterton.

A woolshed and yards were located on a section of this property, along Dalefield Road ('the site'). The woolshed has since been removed, but the yards are still present (figure 1). The location of a dip bath or similar could not be confirmed.

A car parking area has been proposed for the site.

This PSI presents an assessment of contamination risk with respect to the proposed change of use by consideration of previous activities at the location, the intended land use scenario and the analysis results of soil sampling. This report will determine the National Environmental Standard (NES, 2011) soil contamination status at the site.

EcoAgriLogic Ltd collected representative soil samples from the site and tested them for a range of heavy metal contaminants.

Arsenic concentrations above the soil contaminant standard for rural residential use (MfE, 2011) is found in 1 of the 4 sampling transects and is linked to former use of the site. The arsenic concentrations are below the soil contaminant standard for high density residential use (MfE, 2011).

The arsenic concentrations detected pose a potential risk to future users of the site by contacting and ingesting the soil.

It is recommended that the site is being managed by means of fencing and planting and the playhouse removed from the site to eliminate the exposure pathway of soil contact. The site can be developed for car parking if a permanent cover is used to eliminate soil contact.

With these recommendations in place, the level of heavy metals, including arsenic, it will be highly unlikely to have an adverse effect on human health. The site can therefore be developed for car parking purposes.

1 Introduction

EcoAgriLogic Ltd was commissioned by Lauren Spicer to prepare a Preliminary Site Investigation Report (PSI) to determine the potential soil contamination of part of 683 Dalefield Road, Carterton.

A woolshed and yards were located on a section of this property, along Dalefield Road ('the site'). The woolshed has since been removed, but the yards are still present (figure 1).

It is the intention to develop the site for car parking for the proposed Early Childhood Centre in the buildings adjacent to the site.

1.1 Objective

This report has been prepared for the purposes of land use change and has been completed in accordance with the "Contaminated Land Management Guidelines No1: reporting on contaminated Sites in New Zealand" (MfE, 2011). This report includes all requirements for a Preliminary Site Investigation report (PSI).

This report presents an assessment of contamination risk with respect to the proposed change of use by consideration of previous activities at the location, the intended land use scenario and the analysis results of soil sampling. This report will determine the National Environmental Standard (NES, 2011) soil contamination status at the site.

1.2 Scope of work undertaken

To achieve the project objective, the scope of works outlined in Table 1 was undertaken.

Table 1. Scope of Works

| Work Activity | Description |
|--------------------------------|--|
| Preliminary site investigation | Completing a site walk over, reviewing selected historical aerial photographs from ca. 1943, reviewing GWRC and combined Wairarapa Councils' online geographic information systems records relating to the site and vicinity |
| Field work | The collection and analysis of selected soil samples from 4 transects within the site |
| Soil Results Analysis | A comparison of laboratory soil analytical results with applicable land use guideline values and Wellington regional background values. |
| Reporting | Preparation of this report summarising the findings of the PSI |

2 Site Description

2.1 Site Identification

The site is located at 683 Dalefield Road, west of Carterton (figure 1).

The client would like to redevelop the site as a carpark for the proposed Early Childhood Centre in the buildings adjacent to the site (figure 2).



Figure 1 Location of 683 Dalefield Road, Carterton. The blue line represent the property boundary, the orange shaded area is the location of the former woolshed and yards



Figure 2 Proposed outlay of the carpark for the Centre

Table 2. Site identification

| | |
|----------------------|--|
| Street Address | 683 Dalefield Road, Carterton |
| Legal Description | LOT 3 DP 478234 Certificate of title 664162 |
| Site Owner | Lauren and Matt Spicer |
| District Plan Zoning | Rural |

2.2 Site condition

The site was inspected on Wednesday the 6 of December 2017 by Esther Dijkstra of EcoAgriLogic Ltd., accompanied by Lauren Spicer.

The site was entered from Dalefield Road, west of Carterton. The site containing the former woolshed and yards is part of a larger property containing a dwelling, sheds and pasture for grazing.

The site is flat and completely fenced. It is located in the south eastern corner of the property, between the driveway and Dalefield Road. The site is approximately 930 m². The site contains mature trees, a playhouse, yards and a chicken coop.

North of the playhouse a concrete slab is visible. It is unclear if this was part of a sheep dip structure.

On the day of inspection, a pet lamb was grazing in the enclosure.

A new shed was built on the north eastern boundary, approximately on the location of the old wool shed.

There were no visible signs of contamination or plant stress at the time of inspection of the site.

The surrounding land is in agricultural use (pasture).

| | |
|--|--|
|  | <p>Sampling site “under trees located to the left of the trees and play house.</p> <p>It is unclear if the concrete slab in the foreground was part of a sheep dip</p> |
|  | <p>Sampling site ‘yard’ located inside the yards</p> |
|  | <p>Sampling site ‘along drive’</p> |
|  | <p>Sampling site ‘north of shed’</p> |

Figure 3 Photos of the sampling sites

3 Review of aerial photographs

Two aerial photographs (see appendix B) have been used to assess the historical use of the site as detailed below. The photographs were sourced from Greater Wellington Regional Council.

c. 1943 – The earliest photograph is from 1943. This aerial photograph clearly shows that there was no shearing shed or yards on the site

1963 – This aerial photograph shows the shed. Also visible in the photograph are a number of pens/yards. A dip bath was not visible.

2003 – This area photograph shows that a house north of the site, but no woolshed. Mature trees are in the yards.

The Google Earth photograph of 2004 shows no woolshed.
The Google Earth photograph of 2010 shows a shed on the north eastern boundary of the site.

4 Applicable Criteria

The site is not registered on Greater Wellington's Selected Land Use Register (SLUR). The SLUR records sites that fit the definitions in the Ministry for the Environment's Hazardous Activities and Industries List (HAIL).

Historical evidence (aerial photographs) and anecdotal information indicate that the site most likely contained a woolshed and yards. It is not clear if the site had a dip bath.

4.1 NES

The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES) came into effect on 1 January 2012.

The NES applies to land where an activity which is described in the MfE's HAIL is being or has been undertaken, or it is more than likely that such an activity or industry has been undertaken.

A former woolshed and yard is an activity on the HAIL and the piece of land might have contained a sheep-dip or sheep might have treated in the yards by other means. Hence the NES applies to this piece of land.

The NES is administered by territorial authorities; in respect of the site the relevant territorial authority is Carterton District Council (CDC).

Soil Contaminant Standards (SCSs) are given for 12 priority contaminants under the NES for five land-use scenarios. Methods for setting applicable numerical standards for contaminants in soil are also prescribed for the protection of human health. Laboratory analytical results from this assessment were compared against the soil contaminant standard for residential use.

4.2 GWRC Regional Plan

The GWRC Regional Plan for Discharges to Land defines “contaminated site”: a site at which hazardous substances occur at concentrations above background levels and where assessment indicates it poses or is likely to pose an immediate or long term hazard to human health or the environment. Therefore, the laboratory results were also compared to recognised regional background concentrations.

5 Sampling method

EcoAgriLogic conducted a soil investigation giving consideration to the following guidelines:

- Contaminated Land Management Guideline No. 5, Site Investigation and Analysis of Soils (MfE 2004, revised 2011).
- Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011).

The site was sampled on Friday the 19th of January 2018. The sampling transects can be found in figure 3.

Four transects were sampled, three across the former yards and one in the area north of the current shed. Each transect contains 4 samples taken 1-2 meters apart. The 4 samples on each transect were combined to one bulk sample.

The samples were taken with a stainless steel auger from 0 -15 cm.

All soil samples were collected in sample containers supplied by Hill Laboratories.

The samples were analysed for heavy metals. These are the hazardous substances that could be present given the use of the site as sheep yards (HAIL, MfE, 2011).

The most commonly used chemical to control sheep parasites in New Zealand was arsenic (MfE, 2006).

Arsenic was used to control parasites on sheep from 1840s until the 1980s. Arsenic is a semi-metallic element that does not break down in soil and may slowly leach down through the soil and contaminate ground and surface water.

Very high concentrations of arsenic have been measured in soil in the vicinity of former sheep-dips in New Zealand.

The chemicals used more recently (after 1960) to treat sheep parasites usually readily break down.

The samples were sent to Hill Laboratories for testing.

The full laboratory results can be found in Appendix A.

Details of the analytical methods used by Hill Laboratories and laboratory accreditation for analytical methods are in the attached Hill Laboratories report. All standard laboratory procedures were adhered to by Hill Laboratories who are accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported in this document have been performed in accordance with the terms of accreditation.



Figure 4 Approximate location of sampling transects at 683 Dalefield Road, Carterton

6 Results

6.1 Heavy Metal Screen

The full analysis report can be found in Appendix A.

Of the four the sample transects only site 'along drive' has arsenic concentrations above 17 mg/kg (Table 3); the soil contaminant standard for rural residential, 25% produce (MfE, 2011).

The concentration of arsenic in the sample of site 'along drive' is well below the soil contaminant standard for high density residential with permanently paved yards and driveways and no produce.

Sites 'under trees' and 'yards' are above the background values for arsenic, but below the applicable soil contaminant standard.

Site 'north of shed' has background levels of arsenic.

All other heavy metal concentrations analysed do not exceed the soil contaminant standard for rural residential use (MfE, 2011).

The concentrations of copper and nickel are all at or below the natural background concentrations for heavy metals in greywacke soils (GWRC, 2005).

Table 3 Heavy metal screen results

| | Yards | Along drive way | Under Trees | North of Shed | Soil Contaminant Standard ¹ | Soil Contaminant Standard ² | Background Concentrations ³ |
|------------------------------------|-------|-----------------|-------------|---------------|--|--|--|
| Total Recoverable Arsenic (mg/kg) | 11 | 22 | 11 | 6 | 17 | 45 | <2-7 |
| Total Recoverable Cadmium (mg/kg) | 0.23 | 0.18 | 0.23 | 0.27 | 0.8 | 230 | <0.1-0.2 |
| Total Recoverable Chromium (mg/kg) | 23 | 22 | 22 | 22 | 290 | 1500 | 11-21 |
| Total Recoverable Copper (mg/kg) | 18 | 13 | 15 | 11 | >10,000 | >10,000 | 7-19 |
| Total Recoverable Lead (mg/kg) | 44 | 16.6 | 20 | 17.5 | 160 | 500 | 9.4-34.0 |
| Total Recoverable Nickel (mg/kg) | 12 | 11 | 11 | 11 | 400 ⁴ | 1,200 ⁵ | 6-21 |
| Total Recoverable Zinc (mg/kg) | 119 | 71 | 141 | 74 | 7400 ⁴ | 60,000 ⁵ | 44-121 |

¹ Soil Contaminant Standard for rural residential / lifestyle use (based on scenario of 25% of all produce consumed is home-grown); MfE, 2011

² Soil Contaminant Standard for high density residential; MfE, 2011

³ Background soils concentration ranges in soils in the Wairarapa Region; Main soil Type 4 (Wairarapa Alluvium). GWRC (2005)

NL No Limit

⁴ NEPC, 1999 Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

⁵ NEPC, 1999 Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

7 Discussion

After a site inspection and considering the previous site activities and soil testing results, this investigation concludes that the topsoil of the former sheep-dip and yards site contains concentrations of arsenic at and just below the rural residential National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES, 2012).

The elevated arsenic concentration in the sample 'along driveway' most likely reflects the use of the site as woolshed and yards. The slightly elevated levels of lead and zinc above the background levels also point to that.

There is no clear evidence that there was a sheep dip with a dip bath on the site. Aerial photographs of 1963 (Appendix B) show a yard structure attached to a woolshed.

There is no visible indication of a sheep dip on the site today. If it had a dip, it would most likely have been filled in after it became redundant.

Arsenic is very toxic to humans and animals and is a known human carcinogen (MfE, 2006). Toxic effects associated with exposure to arsenic include irritation of the stomach and intestines, skin changes, reduced nerve function and damage to blood vessels. Repeated exposures to lower concentrations of arsenic can result in concentrations in the body that are fatal or can cause serious health effects. Concentrations of arsenic high enough to be fatal to a young child from a single exposure (e.g. eating soil) have been measured at sheep-dip sites in New Zealand. Direct skin contact with high concentrations of arsenic can irritate the skin.

The immediate risk from exposure to arsenic in soil is by ingesting soil and dust, in particular by children and young stock. The level of arsenic found in the sample of woolshed is well below the levels of arsenic found at old sheep-dip sites, occasionally exceeding 10,000mg/kg.

The level of arsenic found in the sample of the former sheep-dip and yards site is more likely to cause a chronic, long term risk (e.g. over 30 years) from lower exposure and hence do not apply to stock.

The main exposure pathway is by touching and breathing in contaminated soil or dust when gardening and eating vegetables grown on a contaminated area. This is a medium and longer term risk and only when developed for rural residential use.

The risk will be negligible if exposure to soil pathway is removed by permanently covering the soil and therefore restricting access to the contamination.

The risk to surface and groundwater is deemed to be low as arsenic is not very mobile. It binds strongly to soil particles. Surface runoff is considered a low risk. The area of the site is flat, and in permanent pasture. Surface runoff of contaminated sediment is considered minimal.

8 Recommendation

After a site inspection and considering the current and previous site activities, this investigation concludes that the topsoil of the site will need to be managed to

prevent people getting into contact with the elevated levels of arsenic, in particular along the drive way.

Currently the site is fenced and access to the soil will be further reduced by planting the site with shrubs and covering the soil for the proposed carpark with a permanent cover, such as base course, concrete or asphalt.

It is also strongly recommended to remove the playhouse from the site to eliminate children playing on the site.

With these recommendations in place, the level of heavy metals, including arsenic, it will be highly unlikely to have an adverse effect on human health. The site can therefore be developed for car parking purposes.

However, if the site in future is going to be developed for rural residential use, it is recommended that the site is further investigated to establish the extent (horizontal and vertical spread) of the contamination before land use changes occur.

References

Assessing and managing Risks associated with Former Sheep-dip Sites. A guide for local authorities. Ministry for the Environment, 2006.

Contaminated Land Management Guidelines No. 2. Hierarchy and Application in New Zealand of Environmental Guideline Values. Ministry for the Environment, 2003.

Contaminated Land Management Guidelines No. 5. Site Investigation and analysis of Soils. Ministry for the Environment, 2011.

Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Ministry for the Environment, 2011.

National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Ministry for the Environment, 2012.

NEPC, 1999. Schedule B(7a) Guideline on Health-Based Investigation Levels, National Environmental Protection Measure, National Environment Protection Council, Australia.

WRC, 1999. Regional Plan for Discharges to Land for the Wellington Region. Wellington Regional Council, December 1999

Appendix A – Laboratory Results



Hill Laboratories
TRIED, TESTED AND TRUSTED

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Private Bag 3205 E mail@hill-labs.co.nz
Hamilton 3240 New Zealand W www.hill-laboratories.com

ANALYSIS REPORT

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| | | |
|--------------------------------------|------------------------------------|------|
| Client: Eco AgriLogic Limited | Lab No: 1911353 | SPV1 |
| Contact: Dr E Dijkstra | Date Received: 20-Jan-2018 | |
| C/- Eco AgriLogic Limited | Date Reported: 24-Jan-2018 | |
| PO Box 190 | Quote No: | |
| Carterton 5743 | Order No: | |
| | Client Reference: | |
| | Submitted By: Dr E Dijkstra | |

| Sample Type: Soil | | | | | | |
|----------------------------|--------------|----------------|---------------|-------------|------|---|
| Sample Name: | Yards | Along Driveway | North of Shed | Under Trees | | |
| Lab Number: | 1911353.1 | 1911353.2 | 1911353.3 | 1911353.4 | | |
| Heavy Metals, Screen Level | | | | | | |
| Total Recoverable Arsenic | mg/kg dry wt | 11 | 22 | 6 | 11 | - |
| Total Recoverable Cadmium | mg/kg dry wt | 0.23 | 0.18 | 0.27 | 0.23 | - |
| Total Recoverable Chromium | mg/kg dry wt | 23 | 22 | 22 | 22 | - |
| Total Recoverable Copper | mg/kg dry wt | 18 | 13 | 11 | 15 | - |
| Total Recoverable Lead | mg/kg dry wt | 44 | 16.6 | 17.5 | 20 | - |
| Total Recoverable Nickel | mg/kg dry wt | 12 | 11 | 11 | 11 | - |
| Total Recoverable Zinc | mg/kg dry wt | 119 | 71 | 74 | 141 | - |

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 | Sample No |
| Heavy Metals, Screen Level | Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, Interference removal by Kinetic Energy Discrimination if required. | 0.10 - 4 mg/kg dry wt | 1-4 |

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.

This report must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental



IANZ
ACCREDITED LABORATORY

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

Appendix B – Aerial photographs



Ca 1943



1963



2003