

Preliminary Site Investigation at 65-94A Scott Road, Te Kauwhata

✦ Prepared for

Lakeside Developments 2017 Ltd

This report, dated 13 March 2017, has been divided into parts on instruction by Lakeside Developments 2017 Ltd to enable uploading to Waikato District Council website, and should be read in full.



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13 March 2017

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Dear Simon,

PRELIMINARY SITE INVESTIGATION AT 65-94A SCOTT ROAD, TE KAUWHATA

1.0 Introduction

Lakeside Developments 2017 Limited (LDL) has engaged Pattle Delamore Partners Limited (PDP) to undertake a preliminary site investigation (PSI) for a private plan change application purposes at 65-94A Scott Road, Te Kauwhata ('the site'), comprising of six properties legally described as Section 52 Block XV Maramarua SD ('Property A'), Lot 1 DP 35516 ('Property B'), Lot 1 DP SA 85309 and Section 90 Block XV Maramarua SD ('Property C'), Lot 3 DP 489788 ('Property D'), Lot 2 DP 489788 ('Property E'), and Lot 1 DP 489788 ('Property F'); shown on Figure 1.

The desktop study has been limited to a review of existing available information for the site including; council property records, property title information, historical aerial photographs and other property information. For Property E, a previous PSI was completed in March 2016 by Contaminated Site Investigation Limited (CSI). Information from this report (appended) has been incorporated in this investigation. Following the desktop review a reconnaissance for properties A - D was undertaken on 30 September 2016. Based on the findings from the desktop review and site reconnaissance, a limited sampling and analysis plan was developed in consultation with LDL. The sampling of surface soil and water was undertaken at the site on 11 October 2016. A copy of the laboratory transcript is provided in Appendix A. For Properties E and F, a site visit was undertaken on 1 March 2017.

This report provides the results of the PSI review and has been prepared in general accordance with the requirements of the Ministry for the Environment (MfE) Contaminated Land Management Guideline No. 1 Reporting on Contaminated Sites in New Zealand (CLMG No. 1) (MfE, 2011a). It has been certified by a suitably qualified and experienced practitioner as required by the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (the NES).

2.0 Executive Summary

This Preliminary Site Investigation has confirmed that specific areas of the site have been subject to HAIL land use as noted below. However, chemical concentrations across the remainder (the majority) of the site are generally within background levels for the Waikato region or below the laboratory detection limits. On this basis there do not appear to be any significant and widespread potential contamination issues that might impact on the proposed private plan change and residential development.

The potential contamination issues identified at the site, and the recommendations to address these issues, are as follows:

- ✧ Asbestos cladding on farm buildings (possibly on Property A, C and F) – to be surveyed and removed in accordance with Asbestos Regulations 2016;
- ✧ Farm dump - elevated contaminant concentrations were detected in soil and leachate samples from this area. It was recommended that the buried waste and contaminated soil be excavated, removed and disposed of to an approved landfill. This occurred in February 2017 with 153.8 tonnes of farm dump material removed to Hampton Downs Landfill. The former farm dump area was subsequently inspected by PDP (refer to Section 7.2 for details);
- ✧ Low lying paddocks in the southeast part of the site – arsenic concentration marginally exceeds the human health standard for residential land use in the composite soil sample (and in four of the five individual sub-samples) from this area. The arsenic concentrations comply with the human health standard for recreational land use, and it is expected that most/all of this low lying area will be used for this purpose. Further sampling is recommended to confirm that the arsenic concentrations in residential land bordering this area comply with the human health standard for residential land use;
- ✧ Flood bank - arsenic concentration marginally exceeds the human health standard for residential land use in the composite soil sample from this area. However, no further action is required as the arsenic concentration complies with the human health standard for the expected land use (recreational);
- ✧ Shooting range – lead concentration exceeds the human health standard for residential land use in the composite soil sample from this area. The lead concentration complies with the human health standard for recreational land use, and it is expected that some of this area will be used for this purpose. Further sampling is recommended to confirm that the lead concentrations in residential land in this vicinity comply with the human health standard for residential land use, with any soil not suitable for residential use being removed and disposed of to an approved landfill facility as part of the redevelopment;
- ✧ Silage area - heavy metal concentrations exceed background levels in composite soil sample collected from the silage/old tyre areas but comply with human health standards for residential land use. No further action is required for this area although some surface soils may be removed to an approved disposal facility as part of the proposed site redevelopment;
- ✧ Diesel storage tank – hydrocarbon concentration in the surface soil sample from this area exceeds the human health standard for residential land use. The hydrocarbon contamination is expected to be localised and the contaminated soil will be excavated, removed from the site and disposed of to an approved landfill;
- ✧ Chemical storage shed – chemical concentrations in the surface soil sample from this area complies with human health standards for residential land use. No further action is required for this area although some surface soils may be removed to an approved disposal facility as part of the proposed site redevelopment; and
- ✧ For Property E, the CSI PSI report identifies the potential for bulk application of superphosphate and DDT to the site paddocks, and the potential passive discharge of zinc to the site paddocks from facial eczema treatments for cattle. These impacts were investigated by comprehensive soil sampling as part of the CSI report and results were within Waikato Region background criteria. CSI concluded that the NES was not applicable to the site, and no further investigations were required at the site.

3.0 Scope

According to LDL the proposed future of the site is for a private plan change to residential use, and a residential development. Therefore the scope of the PSI is to be undertaken in consideration of the proposed private plan change. The PSI review work undertaken by PDP is as follows:

- ✧ A review of publically available historical aerial photographs;
- ✧ A review of publically available previous contaminated site investigation reports;
- ✧ A review of the Land Information Memorandums (LIM) and council property file records provided by Waikato District Council (WaiDC);
- ✧ A review of Certificates of Title (CT);
- ✧ A review of the contaminated site enquiry obtained from the WaiDC and Waikato Regional Council (WRC);
- ✧ An interview and discussion on site with representatives of the current site owners/operators to discuss the historical use of the site, with a specific focus on identifying potential contamination sources and/or land uses;
- ✧ A reconnaissance of the property to visually inspect the condition of the site including any historical sheds/buildings that can be identified;
- ✧ Development of a sampling and analysis plan in consultation with LDL;
- ✧ The collection of surface soil and water samples from the site, and analysis of samples by an IANZ accredited laboratory, according to the proposed sampling and analysis plan;
- ✧ Comparison of the sample results with relevant assessment criteria;
- ✧ Consideration of the regional and national regulations; and
- ✧ Preparation of a report summarising the findings of the information review.

4.0 Site Setting

4.1 Site Description

The site is comprised of 6 separate properties, totalling approximately 194 hectares (ha), legally described as Section 52 Block XV Maramarua Survey District ('Property A'), Lot 1 DP 35516 ('Property B'), Lot 1 DP SA 85309 and Section 90 Block XV Maramarua Survey District ('Property C'), Lot 3 DP 489788 ('Property D'), Lot 2 DP 489788 ('Property E'), and Lot 1 DP 489788 ('Property F'). The site is located approximately 15 km north of Huntly and approximately 30 km southeast of Pukekohe.

The site lies within the jurisdiction of WRC and WaiDC. The site is zoned 'Rural' and 'Countryside Living' according to the WaiDC Operative District Plan. The site is currently owned by Lakeside Farms Limited and operated by Brian White (and family) for dairy farming.

The property is situated at the end of Scott Road and site access is provided off of Scott Road. Internal access within Property A to F is via private gravel farm tracks. Eighteen notable buildings are present at the site; these include three timber residential dwellings, two milking sheds, a cabin and the remaining are storage sheds for livestock, tractors, farming equipment, or storage of feed supplements and herbicides. Further detail of the site buildings and land features is provided in Section 7.0 from the site visit.

The location and layout of the site is shown on Figure 1.

4.2 Site Surroundings

The general area surrounding the site is used for agricultural purposes. The area south of the site is used as pastoral land for dairy farming purposes with few rural residential properties, and Te Kauwhata Township is situated north of the site. Immediately west of the site is the main trunk railway line. Meanwhile, Lake Waikare and Lake Kopuera are located immediately east and west of the site. Lake Waikare receives both stormwater and wastewater discharges from Te Kauwhata Township. The Te Kauwhata wastewater treatment ponds are located approximately 90 m northeast of the site and separated from the north eastern site boundary of Property D by dense scrub and wetland.

Beyond the wastewater treatment ponds and located approximately 300 m northeast of the site, an old trench landfill area which operated in the 1950s and 1960s was identified in a preliminary geotechnical report completed by Earthtech Consulting Limited (EC) in 2010 for a proposed heavy vehicle bypass adjacent to the northern site boundary. A copy of the geotechnical report is provided in Appendix B. Meeting notes provided within the geotechnical report (EC, 2010) commented that leachate from the old trench landfill drained out into the swamp at the southern end of the landfill and refuse spilled out on the eastern side of the road reserve onto neighbouring farmland properties at times (located approximately 300 m from the site). Leachate controls (two collector lines, pumping manhole and power cable) were installed after closure circa. 1998 and the landfill was capped with clay from a local quarry. The old landfill extended south over the wetland on the eastern side of the Te Kauwhata wastewater treatment ponds, and towards the west and north to create the current landfilled profile.

5.0 Geology and Hydrogeology

The Geology of the Auckland Area (Edbrooke, 2001) geological map indicates that the property is underlain by the Whangamarino Formation consisting of slightly pumiceous clays with lignite, gravel and some pure pumice silt and sand. This is generally consistent with the findings from the geotechnical investigation completed by Maunsell Limited in 2008 for the proposed Lakeside Farm Subdivision in the northern part of the site. A copy of the geotechnical report was made available through the LIM report and provided in Appendix C. Immediately to the east and west the geology is thought to change to Taupo Pumice Alluvium comprised of pumice sand, silts and gravels. The geotechnical investigation boreholes identified silty clay to a depth of greater than 5.0 metres below ground level and water levels were recorded between 0.9 m and 2.4 m deep. Based on Maunsell's assessment (2008) the recorded water levels indicated that the groundwater flow direction was eastward towards Lake Waikare. A recent geotechnical investigation was completed in 2016 for the consideration of proposed residential subdivision at the site. The following geological descriptions for the site included swampy alluvium consisting of soft saturated clays and silts restricted to the bottom of swampy gully areas; organic silt (top soil) underlain by very stiff silt (brown ash), interlayered sequence of pumiceous sand and clay (Puketoka Formation) and interlayered sequence of clay, silt, lignite and pumice sands (Whangamarino Formation) for the rolling hill country; and soft peat and silt with some loose sands within the alluvial plains (EC, 2016). Groundwater levels recorded during the EC geotechnical investigation (2016) were at depths between 2.4 m and 3.9 m at higher ground and from the surface to 0.5 m deep within the alluvial plains.

The topography of the area consists of gently rolling hills. The nearest surface water bodies are Lake Waikare located immediately adjacent to the site along the eastern site boundary, and Lake Kopuera located immediately adjacent to the site along the south western boundary.

6.0 Desktop Review of Site History

6.1 Aerial Photographs

The historical aerial photographs of the site from between 1949 and 2016, sourced from Opus and Google Earth have been reviewed and are provided in Appendix D. A summary of the key observations from the photographs is provided in Table 6.1.

Table 6.1: Summary of Historical Aerial Photographs

Year	Description of Site Use
1949	The site and surrounding land use appears to be in pastoral use. A railway line (north to south) is present off-site and adjacent to the western site boundary. Scott Road is present north of the site. Swamp and scrublands appear to occupy parts of the eastern and southern areas of the site.
1963	The site remains pastoral. The cluster of trees that were present in the 1949 aerial towards the west and south from the end of Scott Road has decreased and some areas appeared to be cleared. A new building is present at the end of Scott Road immediately south. A few paddocks at the site have been further subdivided and the present day raceway tracks providing access from the end of Scott Road to the northeast, south, southwest and western parts of the site are formed. The aerial shows commercial and residential land use which is the Te Kauwhata Township in areas approximately 300 m north of the site.
1977	The site remains unchanged from pastoral use. Swamp and scrublands that occupied the eastern and southern areas of the site are no longer present and the areas appear to have been modified for pastoral land use. Building development in areas approximately 300 m towards the north of the site (Te Kauwhata Township) appears to have intensified. A man-made pond is formed approximately 100 m northeast of the site.
2002	The site remains unchanged from pastoral use. Trees are present in gullies at various parts of the site.
2008	The site remains unchanged from pastoral use. White mottled patches are shown in the aerial over the present day farm dump/burn pit area at the site. A small pond immediately south of the farm dump is apparent. A new milking shed is built at the southeast from the end of Scott Road at the site. A pile of what appears to be hay bales are present in the aerial covering an area of approximately 1,000 m² on-site. A residential property is built at 54 Scott Road.
2009 and 2010	A small dam is present on-site and located approximately 300 m south of the milking shed and 200 m southeast of the farm dump area. Land use at the site is largely unchanged.
2012 - 2016	Stockpile area is present on-site approximately 300 m southeast from the end of Scott Road and covers an area of approximately 2,000 m². The present day settling ponds are present in the southeast corner at the site. Land use at the site is largely unchanged.

6.2 Certificates of Title

The current and historical CTs for the site are summarised in Table 6.2 below with further information provided where relevant. Historical CTs were found dating back to 1947. The CTs are attached in Appendix E.

Table 6.2: Relevant Information from Certificates of Title

Legal Description	Certificate of Title
Section 52 Block XV Maramarua Survey District (Property A)	SA870/89 (issued in 1947): ✧ The historical and current CTs concern 63.4 ha of land. ✧ The title interests note “saving and excepting all minerals within the meaning of the Land Act 1924 on or under the land and reserving always to Her Majesty the Queen and all persons lawfully entitled to work the said minerals a right of ingress, egress and regress over the said land”. ✧ The historical CT was listed to private individuals. A transfer to Lakeside Farms (1993) Limited occurred in 1994. ✧ The current site proprietor is listed as Lakeside Farms (1993) Limited.
Lot 1 Deposited Plan 35516 (Property B)	SA922/186 (issued in 1949): ✧ The historical and current CTs concern 20.9 ha of land. ✧ The title interests note that the property is subject to mining rights created by Transfer 91217 and excepting all coal clay and minerals in or under the said land. ✧ The historical CT was listed to private individuals. A transfer of the CT occurred in 1994 to Lakeside Farms (1993) Limited. ✧ The current site proprietor is listed as Lakeside Farms (1993) Limited.
Lot 1 DP SA 85309 and Section 90 Blk XV Maramarua Survey District (Property C)	SA66B/991 (issued in 1999): ✧ The historical and current CTs concern 47.2 ha of land. ✧ The title interests are subject to Section 241(2) Resource Management Act 1991 (affects DPS 83606) and Section 8 Coal Mines Act 1950. ✧ The historical CT was listed to private individuals. A transfer to Lakeside Farms (1993) Limited occurred in 2002. ✧ The current site proprietor is listed as Lakeside Farms (1993) Limited.
Lot 3 DP 489788 (Property D)	SA705543 (issued in 2016): ✧ Prior reference is SA66B/990. ✧ The current site proprietor is listed as Lakeside Farms (1993) Limited. ✧ Current CT refers to 47.5 ha of land.

Table 6.2: Relevant Information from Certificates of Title

Legal Description	Certificate of Title
Lot 2 DP 489788 (Property E)	SA705542 (issued in 2016) ✧ Prior reference is SA66B/990. ✧ The current site proprietor is listed as Lakeside Farms (1993) Limited. ✧ Current CT refers to 14.1 ha of land.
Lot 1 DP 489788 (Property F)	SA705541 (issued in 2016) ✧ Prior reference is SA66B/990. ✧ The current site proprietor is listed as Lakeside Farms (1993) Limited. ✧ Current CT refers to 7,640 m² of land

6.3 Council Files

A Land Information Memorandum (LIM) for the site was obtained from the WaiDC on 15 September 2016. A copy of the LIM for the site is provided in Appendix C.

Documents relevant to the historical and current use of the site provided in the LIM is summarised below:

- ✧ The property is not connected to a community water supply;
- ✧ The property has an existing on-site wastewater disposal system as the property is located outside an area currently served by a community system for wastewater disposal. The property is also located outside an area currently served by a community system for stormwater or land drainage disposal;
- ✧ The property is located in the Te Kauwhata Stormwater Catchment Management Area. Surface water ponding may occur on some properties during high rainfall events and the property is subject to floods (Wetland Margins). Under the Waikato District Plan, the property has been identified as being a flood risk area. It was noted that part of the land at the site may be subject to flooding or inundation;
- ✧ Several subdivision consents were issued between 1987 and 2010 which related to the relocation of boundaries, and subdivision of land for proposed residential development in areas at the northeast side of Scott Road;
- ✧ A land use consent relating to a minor increase in the distance of a proposed shed at 94 Scott Road from the property boundary. The change was not considered in the original consent and was considered to be no more than minor; and
- ✧ Several building consents/permits have been issued for the site since 1957 and were relating to extensions to the residential dwelling, transportation of a residential dwelling to the site and installation of a conservatory, septic tank, heaters, and replacing a garage. Other building consents/permits were for farming purposes such as the construction of a hay barn, garage workshop, the replacement and construction of sheds used for general storage or housing livestock.

According to WaiDC, information from the property file is provided in the LIM report and no information relating to contamination records for the site is provided.

6.4 Site Contamination Enquiry

A site contamination enquiry was requested and obtained from WRC on 13 October 2016. A copy of the enquiry for the site is provided in Appendix F.

The enquiry involves a search of the WRC Land Use Information Register (LUIR) of properties known to be contaminated on the basis of chemical measurements, or potentially contaminated on the basis of past land use. WRC confirmed that the site did not currently appear in the LUIR. The nearest properties of the Hazardous Activities and Industries List (HAIL) (MfE, 2011b) from the site that were listed from the search were relating to the persistent pesticide storage or use for Clyde Juices Limited/Te Kauwhata Viticultural Research Station/Rongopai Wines at the northwest adjacent property, and storage of fuel, chemicals or liquid waste, skin or wool processing including a tannery or fellmongery and fertiliser manufacture or bulk storage for Agrissentials NZ Limited/Richmond Abattoir/Paramount Export/PPCS at the northeast adjacent property.

6.5 HAIL Report

A Property Enquiry — HAIL report was provided by WaiDC on 20 September 2016 (attached in Appendix F). WaiDC provided a summary of registered HAIL activities or likely HAIL activities having occurred at the site, which included a record of an *“unverified HAIL A2: Chemical manufacture, formulation or bulk storage”* at the site. The unverified HAIL A2 activity was identified from a PSI completed by Contaminated Site Investigation Limited in March 2016. The PSI was undertaken in support of a subdivision application (SUB0133/16) at 94A Scott Road, Te Kauwhata (Lot 1 DPS 85308; 14.1 hectares) located at the north eastern portion of the site. The PSI stated that *“chemicals are stored in a shed located in a building to the south, which is part of a wider farm”*. WaiDC noted that further information/investigation will be required into the existence of chemical storage on site. Further details on the existing CSI PSI is provided in Section 6.6 below (with the full CSI PSI provided in Appendix B).

The WaiDC HAIL report included a review of aerial photographs (1963, 1977-1979, 1993 and 2002) and noted the site as pastoral. Significant areas of wetland were present in 1963, and the presence of milking shed and farm buildings were noted in the available aerial photographs of 1977 to 2002.

6.6 Historical Environmental Investigations

A search of records provided by the local and regional council, LDL and site records for any previous environmental reports undertaken at the site was completed. A copy of the preliminary site investigation (PSI) report completed by Contaminated Site Investigation (CSI) Limited in March 2016 was obtained from WaiDC. The PSI report was undertaken at 94A Scott Road (Property E) covering an area of approximately 14 ha (to the northwest of Property D). The PSI noted that the piece of land was proposed to be subdivided into 24 lot rural subdivision with an access road.

The potential HAIL activities identified from the PSI concerned records of superphosphate application to the land, the use of persistent pesticides, and the passive release of facial eczema remedies applied to stock grazing at the site. The active contaminants identified by the PSI were cadmium (from superphosphate), DDT (from the pesticides), and zinc (from the facial eczema treatments). CSI completed a site walkover on 8 March 2016 which included the collection of 14 soil samples tested for arsenic, cadmium, zinc and DDT and the collection of soil sample analysed for pH from the surface at 30 mm depth. According to the PSI, the soil results were found to be well below the relevant assessment criteria from NES guidelines, Canadian guidelines, Auckland Regional Council's Protection Ecological Receptor Guidelines and the soil results were within the established background range for pastoral land in the Waikato Region.

The CSI report concludes that due to these chemical contaminant levels (i.e. below the applicable background criteria of the Waikato Region), the NES is not applicable to this site, and that no further contaminated land investigations are required.

Anecdotal information from the current owner and operator (Brendon White) at the time of the PSI (March 2016) confirmed that the investigation area has been for pastoral use since 1948. To his knowledge the site has never been used for horticultural purposes; chemical storage; sheep or livestock dipping; farm dumping or offal pitting. The site walkover conducted by CSI confirmed that the land was used for pastoral purposes, and no soil staining, vegetation stress, odour, sheep/livestock dipping structures or landfills/offal pits or chemical storage was noted.

A copy of the CSI PSI report is Appendix B.

7.0 Summary of Site Visit

A site visit was undertaken by PDP on 29 September 2016 for Properties A - D. Site photographs are provided in Appendix G.

A second site visit was undertaken by PDP on 1 March 2017 for properties E and F.

7.1 Site Visit – September 2016

The site visit involved an interview with the landowner, and site reconnaissance and visual survey of the site conditions. Properties A to D were identified to largely be pastoral paddocks used for dairy farming. A network of gravel farm tracks run from the southern end of Scott Road through Property A to D towards the south, east and west. No suspected asbestos containing material (ACM) was observed on farm tracks or around farm gates or water troughs. The paddocks are divided by typical wire and batten farm fencing. One residential dwelling is located at Property C and another residential dwelling is located at Property D; the two dwellings are timber houses and appear to be in relatively good condition. An old cabin is located within Property A on the eastern side and is made from timber and corrugated iron. The old cabin is surrounded by some inorganic rubbish i.e. an empty 100 L rusty drum, old tyres, planks of timber, sheets of fibreboard, corrugated metal sheets and broken sheets of plaster board. A small pile of timber logs for firewood is stored on the western side of the old cabin.

Eight sheds are located within Property A at the end of Scott Road and are used either for the storage of tractors, farming equipment, old furniture, old rubber tyres, several 10 kg boxes of 2,4-D Amine 800 WSG herbicide, animal feed for calves. One of the corrugated iron storage sheds contained two half used crates of 25 kg bags of magnesium chloride flakes used for supplementing stock drinking water or feed.

There are two milking sheds on Property A, one milking shed is found at the end of Scott Road and the other is a newer milking shed that is located southeast from the end of Scott Road. Apart from the milking sheds, the other work sheds are constructed directly over the ground and do not have concrete or sealed floors. Three sheds on Property C and one small shed on Property A are constructed of timber framing, masonry walls, corrugated iron roofing and fibre cement cladding (potential asbestos containing material (ACM)).

On Property A at the end of Scott's Road, a mobile 1,000 L steel tank containing diesel is located on the south side of a corrugated iron storage shed. Another mobile disused 500 L steel tank formerly containing diesel is stored inside one of the storage sheds at the end of Scott Road towards the southeast.

Multiple concrete water troughs are scattered across the site. Drainage channels have formed within the paddocks incising up to 500 mm deep and discharging into larger drainage features. At some locations where drainage gullies connect with Lake Waikare towards the east of the site and a settling pond (approximately 0.3 ha) which is located at the southern end of Property C, is surrounded by an

embankment. There are four smaller drainage ponds which appear at topographically low points at the western part of Property C, the southern part of Property B and the northern part of Property A.

A stockpile bay (approximately 30 m³) of imported coarse sand is located at the end of Scott Road adjacent to the storage sheds. Several small stockpiles of dirt, broken concrete, fencing and timber (approximately 90 m³) are located in various locations across the site.

A farm dump within a gully covering an area of approximately 450 m² is located near the centre of Property A. Immediately south and in the topographically down gradient direction of the farm dump is a line of small bushes, a tree and beyond is a small pond. The farm dump reportedly contains general rubbish (timber, a refrigerator, aerosol cans, metal scraps, fencing, plastic containers and bottles, rubber tyres, concrete rubble, hose pipe, timber and ash) according to Mr. Brian White. (This farm dump has been subsequently removed, see Section 7.2 for details.)

The land slopes generally off towards the south, which appears to be the natural topography.

Mr. Brian White was met on site and provided some additional historical information, as follows:

- ✧ The land was originally used as a dairy farm since 1948 and has been family operated and owned for the past three generations;
- ✧ Mr. White owns the residential dwelling at 94A Scott Road and his son owns the residential dwelling at 65 Scott Road;
- ✧ MCPA and MCPB herbicides were used for pasture spraying for weed control historically, and were last used approximately 10 years ago. Other herbicides used more recently but in small quantities include Roundup and Escort. A small amount of Paraquat was used over a 2 year period over 30 years ago on what is now 94 Scott Road. No DDT was ever used at the site;
- ✧ A farm dump is located within a gully at the site and its location was confirmed by the landowner. Farm rubbish was burned off and then moved into the gully to form the farm dump. It was noted that the local New Zealand Police obtained permission from the landowner on two occasions to burn off and bury two truckloads marijuana at the site. A small quantity of diesel was used to supplement the burning of the marijuana piles. No further information on the exact location and date of this burning was provided;
- ✧ Mr. White confirmed that there was minimal storage and use of chemicals (typically the largest quantities consisted of 10-20 L packets/drums) at the site;
- ✧ Superphosphate fertiliser has been applied to the site;
- ✧ Mr. White commented that the Department of Conservation typically in the past has undertaken annual herbicide control of weeds around Lake Waikare. A letter provided by Mr. White from the Department of Conservation concerned a notice of discharge of herbicide over land and water for the control of pest plants under Resource Consent No. 124871 and is provided in Appendix B. The letter noted the use of metsulfuron-methyl (with an estimated withholding period of 5 days) by way of spraying with a knapsack by hand, gun and hose or aerial spraying by helicopter using low drift nozzles to control alligator weed and yellow flag iris at Lake Waikare from Te Onetea Stream along the Northern and Eastern shorelines along. Mr. White also noted that Kiwi Rail would spray for weeds along the railway track (adjacent to the western site boundary);
- ✧ Cropping has been undertaken at the site; maize, turnips and chicory plant were last grown five years ago to supplement a pasture-based feed for dairy cows; and
- ✧ It was noted that the last flooding event in the area occurred in 1998, and parts of the site towards the east, south and west were inundated.

No other observations or anecdotal information obtained was of relevance to the site history related to possible soil contamination at the site.

Furthermore, vegetation (grassed, shrubs and trees) on site did not show any visible signs of distress, with the exception of the tracks made by vehicle movements and where water had been ponded.

7.2 Site Visit – 1 March 2017

This site visit involved a visual survey of Properties E and F, and visual confirmation of the excavation of the farm dump on Property A.

Property E also comprises paddocks and associated gravel farm tracks. Two sheds were present on Property E and were inspected to check for the possible presence of ACM building materials. No such materials were confirmed or suspected to be present. No suspected ACM was observed on farm tracks or around farm gates or water troughs. The house on Property F is expected to be original (aerial images suggest that it has been present onsite since prior to 1952). The house was not investigated in detail, but did not appear to have any external cladding which appeared to contain ACM building materials.

The farm dump in the centre of Property A was visually inspected following the reported removal of the farm dump material to Hampton Downs Landfill in early February 2017. The visual inspection confirmed that the farm dump material has been removed, with the farm dump area excavated to below the topsoil layer (as observed around the edges of the excavated area) into the natural mottled orange-brown underlying subsoils. Few residual pieces of gravel and concrete were observed beyond the edges of the excavated area. No visual evidence of contamination was observed during investigation of the former farm dump area.

8.0 Conceptual Site Model

This section describes the conceptual site model (CSM) for the site and has been used to develop a limited sampling and analysis plan for plan change purposes, in consultation with LDL. The proposed future of the site is for a private plan change to residential use, and a residential development. Based on instruction from LDL, and in accordance with the high level nature of this report (for a private plan change), the CSM is conservative and identifies any/all of the potential HAIL activities which are occurring, or may have occurred, within the proposed development area. The CSM also outlines the applicable land-use scenarios, and the relevant guideline criteria for assessment of the proposed development area, both during the development works, and for the proposed end-use of the properties within the development area.

A risk to human health can only exist if there is a source (i.e. contaminated soil, groundwater or vapours), a receptor (i.e. people) and an exposure pathway between the source and the receptor. If any of these components is missing then there cannot be a risk (i.e. an 'incomplete pathway'). If a contamination linkage is confirmed (i.e. a 'complete pathway') then there may be a risk on the site. A conceptual site model (CSM) is designed to identify the sources, receptors and pathways. A CSM for the site is presented below in Table 8.0.

Table 8.0: Conceptual Site Model

HAIL land use	General storage and application of pesticides/herbicides for cropping due to historic use of the site for pastoral (dairy farm) land use. Farm dumping and burning of dairy farm waste and household materials (area covering approximately 450 m²). Potential presence of ACM (cladding on walls of work/storage sheds). Storage tank for fuel (diesel storage tank 1,000 L). Potential uncontrolled fill material used for the construction of embankments from water features at the site, or on swamp margins to develop land suitable for pastoral use and the construction of embankments.
Identified potential contaminants of concern	Heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc), polycyclic aromatic compounds, total petroleum hydrocarbons, and acid herbicides. Organochlorine pesticides (OCPs) is considered to be of low likelihood based on the anecdotal evidence provided. Paraquat is considered to be a hazardous substance; however, once diluted and applied to crop or soil, the product residue binds irreversibly to soil and effectively becomes biologically inactive. The US EPA (1995 and 1997) state that the use of currently registered products containing paraquat in accordance with approved labelling “will not pose unreasonable risk or adverse effects to humans or the environment”. 2,4-D Amine has been used onsite but is not considered to be persistent pesticide (short half-life in the environment).
Potential mechanism of soils contamination	Potential bulk application from ground spray units; leaching to ground (low risk). Spills from diesel storage to ground. Multiple burning and dumping of waste, degrading persistent chemicals from waste; leaching in to ground. Demolition of ACM walls and dispersing material to ground. Bulk usage and storage of unsealed packs; spills and leaching in to ground.
Identified receptors	<u>Short term</u> Workers during any future site development involving soil disturbance. <u>Long term</u> Future maintenance/excavations at the site (if remaining on-site); Any future residential site users; Groundwater and surface water environments from site discharges.
Potentially complete exposure pathways identified	Dermal contact from workers during soil disturbance and long term future site users – potentially complete. Soil ingestion from workers during soil disturbance and long term future site users – potentially complete. Discharges to groundwater and/or surface water during soil disturbance – complete due to the shallow water table at the site and the presence of wetland margins immediately east of the site.

Table 8.0: Conceptual Site Model

Applicable standards and guidelines for human health protection	NES SCS for residential land use, recreational land use and commercial/industrial outdoor worker (unpaved) land use. MfE (2011c) Tier 1 soil acceptance criteria for residential land use.
Applicable discharge criteria	WRC Background Elements in Waikato Region (Kim, 2009). Australian and New Zealand Environment and Conservation Council (ANZECC, 2000) trigger values for the protection of 80% freshwater species.

Note that the actual/potential HAIL identified is restricted to specific locations and limited areas on the site.

9.0 Preliminary Sampling Investigation

For plan change purposes and to understand the soil conditions at the site, a sampling and analysis plan was prepared in consultation with LDL. The sampling investigation was undertaken by PDP field operatives on 11 October 2016.

9.1 Sampling Method

Sampling was undertaken in general accordance with *MfE Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils* (MfE, 2011d). The soil sampling was undertaken by PDP on 11 October 2016 where a range of broad-scale composite and targeted surface sampling was completed. The sample locations were chosen to ensure a good distribution across the site and to best target areas most likely to have been potentially impacted by current and former site use. The following samples were collected:

1. 30 general surface soil samples grouped into 6 composites (5 sub-samples each) were collected from across the open farmland on-site. These composite samples were tested for heavy metals, organochlorine pesticides (OCPs), polycyclic aromatic hydrocarbons (PAHs), and acid herbicides (AHs).
2. 17 surface soil samples grouped into 6 composites were collected at targeted locations based on potential HAIL activities noted during the desktop study and site reconnaissance. These included:
 - a. Embankment fill area (2 sub-samples composited and tested for heavy metals, OCPs and PAHs.);
 - b. Shooting range (4 sub-samples composited and tested for heavy metals);
 - c. Flood bank bund (2 sub-samples composited and tested for heavy metals, OCPs and PAHs);
 - d. Stockpile fill area (2 sub-samples composited and tested for heavy metals, OCPs, and PAHs);
 - e. Silage fill area near cowshed (2 sub-samples composited and tested for heavy metals, OCPs, and PAHs, AHs); and
 - f. Farm dump (4 sub-samples composited and tested for heavy metals, OCPs, PAHs, AHs, and TPHs).
3. Targeted individual soil sample taken from below the above ground diesel tank (SS39) and tested for total petroleum hydrocarbons (TPHs) and PAHs.
4. Targeted individual soil sample taken from the soil near the chemical storage shed (SS38) tested for heavy metals, OCPs and AHs.

5. 1 sediment sample taken from toe of farm dump and tested for heavy metals, OCPs, PAHs, AHs, and TPHs.
6. 1 leachate sample was taken from the toe of the farm dump and tested for heavy metals, OCPs, PAHs, AHs, and TPHs.

All surface soil samples (0 – 0.15 m) were collected using a spade and trowel and placed into clean containers provided by the laboratory. An individual sample was collected at each location as shown on Figure 1 and sent to Hill Laboratories (Hills) for analysis. Selected soil samples were then composited by the laboratory where it was appropriate to maximise the coverage of the site. The leachate sample was collected by excavating a small hole and allowing the leachate seepage to flow directly into the laboratory approved sampling bottles.

A fresh pair of nitrile gloves were used for each sample, and the sampling equipment was decontaminated (with Decon90) between sample locations. Samples were kept cool following collection and submitted to the laboratory following standard chain of custody procedures.

9.2 Assessment Criteria

Applicable evaluation criteria for soil samples have been selected and are presented below. The analytes for the samples listed above were selected according to the potential contaminants of concern identified in the CSM. The analysis suite was developed in consultation with LDL to meet the objectives of the investigation.

Appropriate guidelines have been selected for comparison to carry out a preliminary health and environmental risk assessment (as outlined in Table 1 appended). These guideline values were selected in accordance with the guidance provided in the MfE (2011e) 'Contaminated Land Management Guidelines No. 2: Hierarchy and application in New Zealand of environmental guideline values'. The samples have been compared to the NES SCS for residential (10% produce) land use, NES SCS for recreational land use and NES SCS for commercial/industrial outdoor worker (unpaved) land use (MfE, 2012).

In addition to the guideline values provided in Table 1, the results of the analysis for heavy metals have been compared to the background levels for these elements published in the WRC (Kim, 2009) for background concentration of elements commonly found in soil. This comparison provides an indication of whether the contaminant concentrations observed have been contributed to by anthropogenic processes (e.g. HAIL use). Hydrocarbons were considered a likely source of contaminants within the site (at the above ground diesel tank location). Selected samples were analysed for petroleum hydrocarbons and compared against the MfE values given for residential/agricultural land use within sandy silt at a depth of <1 m (MfE, 2011c) as this was considered the most common exposure pathway at this site.

9.3 Results and Comparison to Evaluation Criteria

A summary of the laboratory analysis for the soil samples are presented in Table 1 and the analytical results of the leachate sample is summarised in Table 2. The laboratory results of soil samples and a leachate sample are included in Appendix A. The laboratory results have been compared with evaluation criteria as reported with no adjustment for composite sample results (i.e. evaluation criteria have not been divided by the number of sub-samples in the composite sample due to the expected broad-scale nature of the potential contaminants of concern across composite sample areas (paddocks, etc.) and expected consistent application/deposition).

A summary of the results is as follows:

1. Paddock area composite samples (SS1-SS5; SS6-SS10; SS17,SS18, SS32 and SS37; SS19-SS22 and SS31; SS23-SS25, SS34 and SS40; SS42, SS44-SS47):

- a. Heavy metals – within WRC background levels and the adopted human health evaluation criteria for residential land use, apart from arsenic concentration in composite sample collected from the southeast part of the site (SS19-SS22 & SS31) (although the arsenic concentration does comply with recreational land use). Analysis of individual samples SS19-SS22 & SS31 reported arsenic concentrations between 9 and 46 mg/kg (SS31 (9 mg/kg arsenic) meets the residential land use criterion, with other samples (SS19-SS22) meeting the recreational land use criterion).
 - b. OCPs, PAHs, and AHs – all less than laboratory screening level detection limit.
2. Targeted composite samples:
- a. Embankment fill area (SS11 and SS12)
 - i. Heavy metals – all detected heavy metal concentrations were within WRC background levels and below the NES SCS for residential land use.
 - ii. OCPs and PAHs - all less than laboratory screening level detection limit.
 - b. Shooting range (SS13-SS16)
 - i. Heavy metals - concentrations of copper and zinc marginally exceeded the WRC background levels and lead concentrations exceeded the NES SCS for residential land use (but comply with NES SCS for recreational land use); all other heavy metal concentrations were within the WRC background levels.
 - c. Flood bank bund (SS41 and SS43)
 - i. Heavy metals – within WRC background levels and the adopted human health evaluation criteria for residential land uses, apart from arsenic concentrations which marginally exceeded the NES SCS for residential land use.
 - ii. OCPs and PAHs - all less than laboratory screening level detection limit.
 - d. Stockpile fill area (SS35 and SS36)
 - i. Heavy metals –all detected concentrations were within WRC background levels.
 - ii. OCPs and PAHs - all less than laboratory screening level detection limit.
 - e. Silage area containing old tyres near cowshed (SS48 and SS49)
 - i. Heavy metals – concentrations of cadmium and lead were above the WRC background levels and all other concentrations were below the NES SCS for residential land use.
 - ii. OCPs, PAHs and AHs - all less than laboratory screening level detection limit.
 - f. Farm dump (SS26, SS27, SS29 and SS30)
 - i. Heavy metals – concentrations of cadmium, copper, lead and zinc were above the WRC background levels and all other concentrations were below the NES SCS for residential land use.
 - ii. OCPs – apart from trace levels of 4,4'-DDT compounds, all other OCP compounds were less than laboratory screening level detection limit
 - iii. PAHs, AHs and TPHs - all less than laboratory screening level detection limit.

3. Above ground diesel tank (SS39):
 - a. TPHs – elevated concentrations of TPH compounds within the C₁₅-C₃₆ band range exceeded the relevant human health criteria of the MfE (2011c) Tier 1 soil acceptance criteria for residential land use and indicated the PAH surrogate as a limiting pathway.
 - b. PAHs - Further testing of the sample for individual PAH compounds reported concentrations of pyrene at 12.3 mg/kg which exceeded the MfE (2011c) soil acceptance criteria for the protection of groundwater quality, the remaining PAH compounds were below laboratory detection limit.
 - c. The gas chromatogram indicated a hydrocarbon sequence similar to diesel product.
4. Chemical storage shed (SS38):
 - a. Heavy metals – apart from elevated zinc concentrations all other heavy metal concentrations were within the WRC background levels.
 - b. OCPs and AHs – all less than laboratory screening level detection limit.
5. Sediment sample from toe of farm dump (SS28):
 - a. Heavy metals – all concentrations were within the WRC background levels.
 - b. OCPs, PAHs, AHs and TPHs - all less than laboratory screening level detection limit.
6. Leachate sample from the toe of farm dump:
 - a. Heavy metals – concentrations of cadmium, copper, lead and zinc which exceeded the ANZECC guideline criteria for 80% of freshwater species.
 - b. OCPs, PAHs, AHs and TPHs - all less than laboratory screening level detection limit.

The sampling results are further summarised in Table 9.3 below and compared to relevant standards and guidelines for the proposed land use.

Table 9.3: Summary of Sample Results and Comparison with Expected Land Use Criteria

Sample Location	Sample ID	Expected Land Use	Sample Result below guidelines for proposed use (Y/N)	Heavy Metals		OCP, PAHs and AHs	Arsenic			Comments
				Below WRC background levels (Y/N)	Below adopted residential land use criteria (Y/N)		Sample Result within background (Y/N)	Sample Result below adopted residential criteria (Y/N)	Sample Result below adopted recreational criteria (Y/N)	
Paddock (Property A West)	Composite SS17, SS18, SS32, SS33 and SS37	Low/Medium Density Residential Lots; Managed Grazed Farmland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Paddock (Property A East)	Composite SS23-SS25, SS34 and SS40	Low/Medium Density Residential Lots; Recreational Use	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Paddock (Property B)	Composite SS19-SS22 and SS31*	Recreational Use; Managed Grazed Farmland	Yes	Yes	No*	Yes	Yes*	No	Yes	* See note below regarding background concentration and individual sample results
Paddocks (Property C North)	Composite SS1-SS5	Low/Medium Density Residential Lots	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Paddocks (Property C South)	Composite SS6-SS10	Low Density Residential Lots; Managed Grazed Farmland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Paddock (Property D)	Composite SS42,SS44-SS47	Low/Medium Density Residential Lots; Recreational Use	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-

Table 9.3: Summary of Sample Results and Comparison with Expected Land Use Criteria

Sample Location	Sample ID	Expected Land Use	Sample Result below guidelines for proposed use (Y/N)	Heavy Metals		OCP, PAHs and AHs	Arsenic			Comments
				Below WRC background levels (Y/N)	Below adopted residential land use criteria (Y/N)		Sample Result within background (Y/N)	Sample Result below adopted residential criteria (Y/N)	Sample Result below adopted recreational criteria (Y/N)	
Paddock (Property E)	Refer to CSI PSI	Low/Medium Density Residential Lots	Yes	Yes	Yes	Yes	N/A	N/A	N/A	Arsenic not tested as a contaminant of concern
Embankment (Settling Ponds)	Composite SS11-SS12	Recreational Use	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Shooting Range	Composite SS13-SS16	Low Density Residential Lots	No	No	No	NA	Yes	Yes	Yes	Soil to be removed to an approved disposal facility
Embankment (Lake Waikare)	Composite SS41 and SS43	Recreational Use	Yes	Yes	No	Yes	Yes	Yes	Yes	-
Stockpile	SS35 and SS36	Medium Density Residential Lots	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Silage/Old Tyres	Composite SS48 and SS49	Medium Density Residential Lots	Yes	No	Yes	Yes	Yes	Yes	Yes	Soil to be removed to an approved disposal facility
Farm Dump	Composite SS26,SS27,SS29 and SS30	Medium Density Residential Lots	Yes	No	Yes	No	Yes	Yes	Yes	Farm dump material (153.8 t) removed to Hampton Downs Landfill on 7-8 February 2017 (landfill docketts attached in Appendix H)

Table 9.3: Summary of Sample Results and Comparison with Expected Land Use Criteria

Sample Location	Sample ID	Expected Land Use	Sample Result below guidelines for proposed use (Y/N)	Heavy Metals		OCP, PAHs and AHs	Arsenic			Comments
				Below WRC background levels (Y/N)	Below adopted residential land use criteria (Y/N)		Sample Result within background (Y/N)	Sample Result below adopted residential criteria (Y/N)	Sample Result below adopted recreational criteria (Y/N)	
Diesel AST	SS39	Community Hub	No	NA	NA	No	Yes	Yes	Yes	Soil to be removed to an approved disposal facility
Chemical Storage Shed	SS38	Community Hub	Yes	No	Yes	Yes	Yes	Yes	Yes	
Toe of Farm Dump	SS28	Medium Density Residential Lots	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Notes:

NA - Not analysed

Background arsenic concentrations up to 25 mg/kg (possibly from geothermal activity).

Individual sub-sample results tested for arsenic (SS19 – 33 mg/kg; SS20 – 22 mg/kg; SS21 – 46 mg/kg; SS22 – 42 mg/kg; SS31 – 9 mg/kg). All sub-sample results comply with NES SCS for arsenic for recreational land use. Sub-sample SS31 also complies with NES SCS for residential land use (10% produce).

10.0 Risk Assessment

10.1 Human Health Risk Assessment

As detailed above, a majority of the composite soil samples collected from the farm dump, paddocks (Property A, C, D and E), stockpile of fill material, silage area near the cow shed, and the settling pond embankment, including the target soil samples from the chemical storage shed and toe of the farm dump reported the various contaminants of concern at levels below the applicable human health criteria. All OCPs and AHs were reported below laboratory detection or at trace concentrations within all samples collected and therefore were not considered necessary for comparison to the adopted human health criteria.

Arsenic concentrations that marginally exceeded the human health evaluation criteria for residential land use for composite soil samples were localised to the paddocks in the southeast part of the site (SS19-SS22 and SS31) and the Lake Waikare flood bank bund (SS41 and SS43). These sample locations are outside of the land area proposed for residential use and within the land area proposed for recreational and managed grazing farmland use. Arsenic concentrations in the above composite samples complied with human health standards for recreational land use¹. All other composite soil samples reported arsenic concentrations (<14 mg/kg) below the adopted human health NES SCS (<20 mg/kg). The analysis of the individual SS19 to SS22 and SS31 samples (and the low arsenic concentrations in the other composite samples) indicates that the elevated arsenic is limited to the low lying areas of the site and outside of the areas designated for residential land use.

Similarly, elevated lead concentrations in composite soil samples from the shooting range exceeded the human health evaluation criteria for residential land use. This lead concentration complied with human health standards for recreational land use and is considered to be localised. All other composite soil samples reported lead concentrations well below the adopted human health evaluation criteria.

The single targeted sample collected beneath the diesel above ground storage tank appeared to represent a localised impact at the surface as staining of the surface soil was evident. The TPH soil sample results were at values which prompted the testing for individual PAH compounds. Apart from pyrene, all other PAH compounds reported within the sample were at trace concentrations or below detection levels. Overall none of the PAH compounds were at levels exceeding any of the relevant MfE (2011c) route-specific human health based criteria.

Properties A, C and F may contain buildings with ACM building materials present. Before demolition of these buildings, the Asbestos Regulations 2016 require that a demolition survey be completed by a competent person for any building built before 1 January 2000. Any asbestos or ACM building materials confirmed or assumed to be present must be removed by a competent person (for <10 m² of non-friable ACM) or by a licenced asbestos removalist (for >10 m² non-friable ACM and for friable asbestos), and a clearance certificate issued, prior to the demolition of buildings.

10.2 Environmental Risk Assessment

A single soil sample from the chemical storage shed and composite soil samples collected from the shooting range, farm dump, silage/old tyre areas contained elevated heavy metal concentrations of cadmium, copper, lead and/or zinc which exceeded the WRC background levels.

¹ The individual samples comprising this composite were tested for arsenic and reported results were: SS19 – 33 mg/kg; SS20 – 22 mg/kg; SS21 – 46 mg/kg; SS22 – 42 mg/kg; and, SS31 – 9 mg/kg. All individual sample results comply with NES SCS for arsenic for recreational land use, with individual sample SS31 also complying with NES SCS for residential land use (10% produce).

Pyrene concentrations detected within the single soil sample collected from beneath the diesel AST were above the MfE (2011c) Tier 1 soil acceptance criteria for the protection of groundwater quality, however given that the hydrocarbon impact appears to be localised (<1 m²) and surficial (i.e. from minor spills while refilling vehicles), it is unlikely for the nearest surface water receptors to be impacted due to hydrocarbon concentrations attenuating with depth and distance. It is proposed that this soil is removed and disposed of to an approved landfill facility.

The leachate sample collected from the farm dump contained heavy metal concentrations (cadmium, copper, lead and zinc) which exceeded the ANZECC guideline criteria for 80% of freshwater species. The source of the contamination (the farm dump material) has since been removed and disposed of to an approved landfill facility.

11.0 Conclusions and Recommendations

This Preliminary Site Investigation has confirmed that specific areas of the site have been subject to HAIL land use as noted below. However, chemical concentrations across the remainder (the majority) of the site are generally within background levels for the Waikato region or below the laboratory detection limits. On this basis there do not appear to be any significant and widespread potential contamination issues that might impact on the proposed private plan change and residential development.

In summary, the following potential areas of concern were investigated and the recommended measures to address the potentially contaminated areas are listed below:

- ✧ Asbestos cladding on farm buildings (possibly present in sheds and buildings on Property A, C, and F) – survey and remove in accordance with the Asbestos Regulations 2016;
- ✧ Farm dump – the farm dump material (including impacted soil) on Property A was excavated and removed to Hampton Downs Landfill facility on 7 and 8 February 2017. Landfill dockets totalling 153.8 tonnes are included in Appendix H. A site visit conducted by PDP on 1 March 2017 visually confirmed that the farm dump material had been removed. It is recommended that this visual observation be supported by the collection and analysis of soil validation samples from across the former farm dump location prior to any soil disturbance in this location;
- ✧ Paddocks in the southeast part of the site – the elevated arsenic concentrations (25 mg/kg in the composite sample (SS19-SS22 and SS31), and between 9 and 43 mg/kg in the respective individual samples) in the southeast part of the site exceed the NES SCS for residential (10% produce consumption) land use (20 mg/kg), but comply with the NES SCS for recreational land use. Further sampling may be required to investigate arsenic concentrations on proposed residential land bordering this part of the site;
- ✧ Shooting range - the elevated lead concentration in the vicinity of the shooting range exceeds the NES SCS for residential (10% produce consumption), but complies with the NES SCS for recreational land use. Further sampling may be required to investigate lead concentrations on proposed residential land in this part of the site. Where necessary soil will be removed and disposed of to an approved landfill facility as part of the redevelopment;
- ✧ Flood bank – the arsenic concentration in the composite soil sample from Lake Waikare stop bank (SS41 and SS43) marginally exceeded the NES SCS for residential (10% produce consumption) land use. However, no further action is required as the arsenic concentration complies with the human health standard for the expected land use (recreational);
- ✧ Silage area - heavy metal concentrations exceed background levels in composite soil sample collected from the silage/old tyre areas but comply with human health standards for residential

land use. No further action is required for this area although some surface soils may be removed to an approved disposal facility as part of the proposed site redevelopment;

- ✧ Diesel storage tank – hydrocarbon concentration in the surface soil sample from this area exceeds the human health standard for residential land use. The hydrocarbon contamination is expected to be localised and the contaminated soil will be excavated, removed from the site and disposed of to an approved landfill; and
- ✧ Chemical storage shed – chemical concentrations in the surface soil sample from this area complies with human health standards for residential land use. No further action is required for this area although some surface soils may be removed to an approved disposal facility as part of the proposed site redevelopment.

12.0 References

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13.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Lakeside Developments 2017 Limited, and others (not directly contracted by PDP for the work) including Waikato Regional Council, Waikato District Council and Contaminated Site Investigation 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.

The information contained within this report applies to sampling undertaken on the dates staged in this report. With time, the site conditions and environmental standards could change so that the reported assessment and conclusions are no longer valid. Accordingly, the report should not be used to refer to site conditions and environmental standards applying at a later date without first confirming the validity of the report's information at that time.

This report has been prepared by PDP on the specific instructions of Lakeside Developments 2017 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.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

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SOURCE :
1. AERIAL IMAGERY (FLOWN 2012-2013) SOURCED FROM THE LINZ DATA SERVICE
WWW.DATA.LINZ.GOVT.NZ/LAYER/1872 AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 3.0 NEW ZEALAND LICENCE.
2. PARCEL BOUNDARY OBTAINED FROM QUICKMAP (UPDATED 31/10/2016)
3. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

FIGURE 1 : SITE LOCATION AND SAMPLING PLAN

SCALE: 1:7,500 (A3)



Table 1: Soil Analytical Results ¹

Soil Sample ID	Composite SS17, SS18, SS32, SS33 and SS37	Composite SS23, SS25, SS34 and SS40	Composite SS19 SS22 and SS31	Composite SS1-SS5	Composite SS6-SS10	Composite SS42,SS44-SS47	Composite SS11-SS12	Composite SS13-SS16	Composite SS41 and SS43	SS35 and SS36	Composite SS48 and SS49	Composite SS26,SS27,SS29 and SS30	SS39	SS38	SS28	Background Elements in Waikato Region ³	Human Health Evaluation Criteria - NES SCS ⁴		
Sample Depth (m)	0.15																Residential 10% produce	Commercial / industrial outdoor worker (unpaved)	Recreation
Lab ID	1663557.55	1663557.57	1663557.56	1663557.51	1663557.52	1663557.60	1663557.53	1663557.54	1663557.58	1663557.59	1663557.62	1663557.61	1663557.47	1663557.46	1663557.43				
Sample Location	Paddock (Property A West)	Paddock (Property A East)	Paddock (Property B)	Paddocks (Property C North)	Paddocks (Property C South)	Paddock (Property D)	Embankment (Settling Ponds)	Shooting Range	Embankment (Lake Waikare)	Stockpile	Silage/Old Tyres	Farm Dump	Diesel AST	Chemical Storage Shed	Toe of Farm Dump				
NZGS Soil type ²	Sandy Silt																		
Heavy Metals																			
Arsenic	5	6	25	6	7	12	4	5	21	< 2	9	14	-	6	3	0.44 - 25.3	20	70	80
Cadmium	0.41	0.33	0.27	0.46	0.43	0.33	< 0.10	0.14	0.13	< 0.10	0.52	0.54	-	0.16	0.45	0.03 - 0.47	3	1300	400
Chromium (total)	6	6	6	11	10	6	3	4	9	3	15	15	-	9	4	0.16 - 27.8	460	6300	2,700
Copper	8	7	12	14	11	10	4	29	16	3	15	33	-	21	10	2.2 - 28	>10,000	>10,000	>10,000
Lead	16.8	15.4	13.8	21	28	15.8	13.2	420	18.0	11.1	49	65	-	19.5	13.7	2.57 - 32.1	210	3300	880
Nickel	3	3	4	3	3	3	< 2	2	4	< 2	5	7	-	7	2	0.56 - 14	400 ⁵	-	-
Zinc	35	28	35	62	50	29	16	67	38	28	53	840	-	135	55	8.3 - 65	7,400 ⁵	-	-
Total Petroleum Hydrocarbons (TPH)																			
C ₇ - C ₉	-	-	-	-	-	-	-	-	-	-	< 9	< 10	< 9	-	<16	-	(500) ^{6,7m,8}	500	-
C ₁₀ - C ₁₄	-	-	-	-	-	-	-	-	-	-	< 20	< 20	2,000	-	<40	-	(510) ^{6,7x}	31,000	-
C ₁₅ - C ₃₆	-	-	-	-	-	-	-	-	-	-	< 40	< 40	37,000	-	<70	-	NA ⁹	NA ⁹	-
Total (C ₇ - C ₃₆)	-	-	-	-	-	-	-	-	-	-	< 70	< 70	39,000	-	<120	-	-	-	-
Polycyclic Aromatic Hydrocarbons (PAH)																			
Total PAH	ND	ND	ND	ND	ND	ND	ND	-	ND	ND	ND	ND	12.9 ¹⁰	-	ND	-	-	-	-
Organochlorine Pesticides (OCP)																			
Total OCPs	ND	ND	ND	ND	ND	ND	ND	-	ND	ND	ND	0.013 ¹¹	-	ND	ND	-	-	-	-
Acid Herbicides																			
Total Acid Herbicides	ND	ND	ND	ND	ND	ND	-	-	-	-	ND	ND	-	ND	ND	-	-	-	-

21	Values in bold exceed the background element range for Waikato soils
78	Values underlined exceed the NES SCS Human Health Evaluation Criteria
ND	All values for individual compounds are below the laboratory limit of detection

Notes.

1. All results in mg/kg.

2. Soil descriptions are reported using the guidelines outlined in Field Descriptions of Soil and Rock (New Zealand Geotechnical Society Inc., 2005).

3. Values from 'Land and Soil Monitoring: A Guide for SoE and Regional Council Reporting'. Trace Element Monitoring Chapter 5. Kim and Taylor (2009).

4. NES Soil Contaminant Standards from "Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health" (MfE, 2011) - Residential 10% produce consumption and Commercial/Industrial Outdoor Worker (unpaved) land uses.

5. Criteria Guideline values from "Schedule B(1) Guideline on the Investigation Levels for Soils and Groundwater NEPC 1999 (Updated 2013) Schedule B Table 1A(1) Health Investigation Levels for Soil Contaminants HIL-A: Residential A and HIL-C: Recreational C.

6. Criteria from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Revised 2011. Ministry for the Environment. Tier 1 All Pathways Soil Criteria for residential land use or maintenance/excavation workers (Sandy Silt <1m).

7. The following notes indicate the limiting pathway for each criterion: m - maintenance/excavation, x - PAH surrogate.

8. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.

9. NA indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix. Some aesthetic impact may be noted.

10. Value is a sum of Fluorene (0.6 kg/mg) and Pyrene (12.3mg/kg). The equivalent BaP concentration for this sample is ND.

11. Value is of detected concentrations of 4,4-DDT; all other OCPs reported below the limit of detection.

Table 2: Leachate Analytical Results ¹

Leachate Sample ID	LEACH 1	ANZECC 80% Freshwater Species ²
Lab ID	1663557.48	
Sample Location	Farm Dump	
Heavy Metals		
Arsenic	0.049	0.5
Cadmium	0.00136	0.0008
Chromium (total)	0.024	0.04
Copper	0.056	0.0025
Lead	0.083	0.0094
Nickel	0.0078	0.017
Zinc	0.57	0.0031
Total Petroleum Hydrocarbons (TPH)		
C ₇ - C ₉	<0.10	-
C ₁₀ - C ₁₄	<0.2	-
C ₁₅ - C ₃₆	<0.4	-
Total hydrocarbons (C ₇ - C ₃₆)	<0.7	-
Polycyclic Aromatic Hydrocarbons (PAH)		
Total PAH	ND	-
Organochlorine Pesticides (OCP)		
Total OCPs	ND	-
Acid Herbicides		
Total Acid Herbicides	ND	-

0.065	Value exceeds the ANZECC guidelines for 80% protection of freshwater species
ND	All values for individual compounds are below the laboratory limit of detection

Notes.

1. All results in mg/L.

2. Values from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC), 2000, for the protection of 80% of freshwater species.



APPENDIX A – LABORATORY TRANSCRIPT



ANALYSIS REPORT

Page 1 of 9

Client:	Pattle Delamore Partners Limited	Lab No:	1663557	SPV5
Contact:	T Bellingham C/- Pattle Delamore Partners Limited PO Box 9528 Newmarket Auckland 1149	Date Received:	13-Oct-2016	
		Date Reported:	04-Nov-2016	
		Quote No:	81087	
		Order No:		
		Client Reference:	A03076100	
		Submitted By:	Scott Nicol	

Amended Report

This report replaces an earlier report issued on the 27 Oct 2016 at 4:23 pm
Arsenic added to samples SS19, SS20, SS21, SS22 and SS31 as per clients request.

Sample Type: Soil						
Sample Name:	SS19	SS20	SS21	SS22	SS31	
	11-Oct-2016	11-Oct-2016	11-Oct-2016	11-Oct-2016	11-Oct-2016	
Lab Number:	1663557.22	1663557.23	1663557.24	1663557.25	1663557.26	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	33	22	46	42	9
Sample Name:	SS28	SS38	SS39	Composite of SS1, SS2, SS3, SS4 & SS5	Composite of SS6, SS7, SS8, SS9 & SS10	
	11-Oct-2016	11-Oct-2016	11-Oct-2016			
Lab Number:	1663557.43	1663557.46	1663557.47	1663557.51	1663557.52	
Individual Tests						
Dry Matter	g/100g as rcvd	41	78	83	74	75
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	6	-	6	7
Total Recoverable Cadmium	mg/kg dry wt	0.45	0.16	-	0.46	0.43
Total Recoverable Chromium	mg/kg dry wt	4	9	-	11	10
Total Recoverable Copper	mg/kg dry wt	10	21	-	14	11
Total Recoverable Lead	mg/kg dry wt	13.7	19.5	-	21	28
Total Recoverable Nickel	mg/kg dry wt	2	7	-	3	3
Total Recoverable Zinc	mg/kg dry wt	55	135	-	62	50
Acid Herbicides Screen in Soil by LCMSMS						
Acifluorfen	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Bentazone	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Bromoxynil	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Clopyralid	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Dicamba	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
2,4-Dichlorophenoxyacetic acid (24D)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
2,4-Dichlorophenoxybutyric acid (24DB)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Dichlorprop	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Fluazifop	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Fluroxypyr	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Haloxypop	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
2-methyl-4-chlorophenoxyacetic acid (MCPA)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
2-methyl-4-chlorophenoxybutanoic acid (MCPB)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Mecoprop (MCP; 2-methyl-4-chlorophenoxypropionic acid)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Oryzalin	mg/kg dry wt	< 0.4	< 0.4	-	< 0.4	< 0.4



Sample Type: Soil						
Sample Name:		SS28 11-Oct-2016	SS38 11-Oct-2016	SS39 11-Oct-2016	Composite of SS1, SS2, SS3, SS4 & SS5	Composite of SS6, SS7, SS8, SS9 & SS10
Lab Number:		1663557.43	1663557.46	1663557.47	1663557.51	1663557.52
Acid Herbicides Screen in Soil by LCMSMS						
Pentachlorophenol (PCP)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Picloram	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Quizalofop	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
2,4,5-trichlorophenoxypropionic acid (245TP, Fenoprop, Silvex)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
2,4,5-Trichlorophenoxyacetic acid (245T)	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Triclopyr	mg/kg dry wt	< 0.2	< 0.2	-	< 0.2	< 0.2
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
alpha-BHC	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
beta-BHC	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
delta-BHC	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
trans-Chlordane	mg/kg dry wt	< 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
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
4,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
4,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
2,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
4,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Total DDT Isomers	mg/kg dry wt	< 0.06	< 0.06	-	< 0.06	< 0.06
Dieldrin	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Endosulfan I	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Endosulfan II	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Endrin	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Endrin aldehyde	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Endrin ketone	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Heptachlor	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Methoxychlor	mg/kg dry wt	< 0.010	< 0.010	-	< 0.010	< 0.010
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Acenaphthylene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Anthracene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Benzo[a]anthracene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Benzo[k]fluoranthene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Chrysene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Fluoranthene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Fluorene	mg/kg dry wt	< 0.06	-	0.6	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Naphthalene	mg/kg dry wt	< 0.3	-	< 1.4	< 0.15	< 0.15
Phenanthrene	mg/kg dry wt	< 0.06	-	< 0.3	< 0.03	< 0.03
Pyrene	mg/kg dry wt	< 0.06	-	12.3	< 0.03	< 0.03

Sample Type: Soil						
Sample Name:		SS28 11-Oct-2016	SS38 11-Oct-2016	SS39 11-Oct-2016	Composite of SS1, SS2, SS3, SS4 & SS5	Composite of SS6, SS7, SS8, SS9 & SS10
Lab Number:		1663557.43	1663557.46	1663557.47	1663557.51	1663557.52
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 16	-	< 9	-	-
C10 - C14	mg/kg dry wt	< 40	-	2,000	-	-
C15 - C36	mg/kg dry wt	< 70	-	37,000	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 120	-	39,000	-	-
Sample Name:		Composite of SS11 & SS12	Composite of SS13, SS14, SS15 & SS16	Composite of SS17, SS18, SS32, SS33 & SS37	Composite of SS19, SS20, SS21, SS22 & SS31	Composite of SS23, SS24, SS25, SS34 & SS40
Lab Number:		1663557.53	1663557.54	1663557.55	1663557.56	1663557.57
Individual Tests						
Dry Matter	g/100g as rcvd	71	-	70	54	66
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	5	5	25	6
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.14	0.41	0.27	0.33
Total Recoverable Chromium	mg/kg dry wt	3	4	6	6	6
Total Recoverable Copper	mg/kg dry wt	4	29	8	12	7
Total Recoverable Lead	mg/kg dry wt	13.2	420	16.8	13.8	15.4
Total Recoverable Nickel	mg/kg dry wt	< 2	2	3	4	3
Total Recoverable Zinc	mg/kg dry wt	16	67	35	35	28
Acid Herbicides Screen in Soil by LCMSMS						
Acifluorfen	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Bentazone	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Bromoxynil	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Clopyralid	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Dicamba	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenoxyacetic acid (24D)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenoxybutyric acid (24DB)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Dichlorprop	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Fluazifop	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Fluroxypyr	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Haloxypop	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2-methyl-4-chlorophenoxyacetic acid (MCPA)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2-methyl-4-chlorophenoxybutanoic acid (MCPB)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Mecoprop (MCP; 2-methyl-4-chlorophenoxypropionic acid)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Oryzalin	mg/kg dry wt	-	-	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Picloram	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Quizalofop	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4,5-trichlorophenoxypropionic acid (245TP, Fenoprop, Silvex)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4,5-Trichlorophenoxyacetic acid (245T)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Triclopyr	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
alpha-BHC	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
beta-BHC	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
delta-BHC	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
cis-Chlordane	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010

Sample Type: Soil						
Sample Name:		Composite of SS11 & SS12	Composite of SS13, SS14, SS15 & SS16	Composite of SS17, SS18, SS32, SS33 & SS37	Composite of SS19, SS20, SS21, SS22 & SS31	Composite of SS23, SS24, SS25, SS34 & SS40
Lab Number:		1663557.53	1663557.54	1663557.55	1663557.56	1663557.57
Organochlorine Pesticides Screening in Soil						
trans-Chlordane	mg/kg dry wt	< 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
2,4'-DDD	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
4,4'-DDD	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
2,4'-DDE	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
4,4'-DDE	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
2,4'-DDT	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
4,4'-DDT	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Total DDT Isomers	mg/kg dry wt	< 0.06	-	< 0.06	< 0.06	< 0.06
Dieldrin	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Endosulfan I	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Endosulfan II	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Endosulfan sulphate	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Endrin	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Endrin aldehyde	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Endrin ketone	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Heptachlor	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Heptachlor epoxide	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Hexachlorobenzene	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Methoxychlor	mg/kg dry wt	< 0.010	-	< 0.010	< 0.010	< 0.010
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Anthracene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Benzo[a]anthracene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Benzo[k]fluoranthene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Chrysene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Fluoranthene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Fluorene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Naphthalene	mg/kg dry wt	< 0.16	-	< 0.16	< 0.2	< 0.17
Phenanthrene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Pyrene	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
Sample Name:		Composite of SS41 & SS43	Composite of SS35 & SS36	Composite of SS42, SS44, SS45, SS46 & SS47	Composite of SS26, SS27, SS29 & SS30	Composite of SS48 & SS49
Lab Number:		1663557.58	1663557.59	1663557.60	1663557.61	1663557.62
Individual Tests						
Dry Matter	g/100g as rcvd	58	79	56	65	76
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	21	< 2	12	14	9
Total Recoverable Cadmium	mg/kg dry wt	0.13	< 0.10	0.33	0.54	0.52
Total Recoverable Chromium	mg/kg dry wt	9	3	6	15	15
Total Recoverable Copper	mg/kg dry wt	16	3	10	33	15
Total Recoverable Lead	mg/kg dry wt	18.0	11.1	15.8	65	49
Total Recoverable Nickel	mg/kg dry wt	4	< 2	3	7	5
Total Recoverable Zinc	mg/kg dry wt	38	28	29	840	53

Sample Type: Soil						
Sample Name:		Composite of SS41 & SS43	Composite of SS35 & SS36	Composite of SS42, SS44, SS45, SS46 & SS47	Composite of SS26, SS27, SS29 & SS30	Composite of SS48 & SS49
Lab Number:		1663557.58	1663557.59	1663557.60	1663557.61	1663557.62
Acid Herbicides Screen in Soil by LCMSMS						
Acifluorfen	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Bentazone	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Bromoxynil	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Clopyralid	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Dicamba	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenoxyacetic acid (24D)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenoxybutyric acid (24DB)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Dichlorprop	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Fluazifop	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Fluroxypyr	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Haloxypfop	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2-methyl-4-chlorophenoxyacetic acid (MCPA)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2-methyl-4-chlorophenoxybutanoic acid (MCPB)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Mecoprop (MCP; 2-methyl-4-chlorophenoxypropionic acid)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Oryzalin	mg/kg dry wt	-	-	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Picloram	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Quizalofop	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4,5-trichlorophenoxypropionic acid (245TP, Fenoprop, Silvex)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4,5-Trichlorophenoxyacetic acid (245T)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Triclopyr	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
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	0.013	< 0.010
Total DDT Isomers	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
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

Sample Type: Soil						
Sample Name:		Composite of SS41 & SS43	Composite of SS35 & SS36	Composite of SS42, SS44, SS45, SS46 & SS47	Composite of SS26, SS27, SS29 & SS30	Composite of SS48 & SS49
Lab Number:		1663557.58	1663557.59	1663557.60	1663557.61	1663557.62
Organochlorine Pesticides Screening in Soil						
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
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Acenaphthylene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Benzo[a]anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Benzo[k]fluoranthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Chrysene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Fluoranthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Fluorene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Naphthalene	mg/kg dry wt	< 0.19	< 0.15	< 0.19	< 0.17	< 0.15
Phenanthrene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Pyrene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	-	-	< 10	< 9
C10 - C14	mg/kg dry wt	-	-	-	< 20	< 20
C15 - C36	mg/kg dry wt	-	-	-	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	-	-	< 70	< 70

Sample Type: Aqueous						
Sample Name:		LEACH 1				
Lab Number:		11-Oct-2016				
		1663557.48				
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m ³	0.049	-	-	-	-
Total Cadmium	g/m ³	0.00136	-	-	-	-
Total Chromium	g/m ³	0.024	-	-	-	-
Total Copper	g/m ³	0.056	-	-	-	-
Total Lead	g/m ³	0.083	-	-	-	-
Total Nickel	g/m ³	0.0078	-	-	-	-
Total Zinc	g/m ³	0.57	-	-	-	-
Acid Herbicides Trace in Water by LCMSMS						
Acifluorfen	g/m ³	< 0.0004	-	-	-	-
Bentazone	g/m ³	< 0.0004	-	-	-	-
Bromoxynil	g/m ³	< 0.0004	-	-	-	-
Clopyralid	g/m ³	< 0.0006	-	-	-	-
2,4-Dichlorophenoxyacetic acid (24D)	g/m ³	< 0.0004	-	-	-	-
2,4-Dichlorophenoxybutyric acid (24DB)	g/m ³	< 0.0004	-	-	-	-
Dicamba	g/m ³	< 0.0004	-	-	-	-
Dichlorprop	g/m ³	< 0.0004	-	-	-	-
Fluazifop	g/m ³	< 0.0004	-	-	-	-
Fluroxypyr	g/m ³	< 0.0004	-	-	-	-
Haloxypop	g/m ³	< 0.0004	-	-	-	-
2-methyl-4-chlorophenoxyacetic acid (MCPA)	g/m ³	< 0.0004	-	-	-	-
2-methyl-4-chlorophenoxybutanoic acid (MCPB)	g/m ³	< 0.0004	-	-	-	-
Mecoprop	g/m ³	< 0.0004	-	-	-	-

Sample Type: Aqueous						
Sample Name:		LEACH 1				
		11-Oct-2016				
Lab Number:		1663557.48				
Acid Herbicides Trace in Water by LCMSMS						
Oryzalin	g/m ³	< 0.0011	-	-	-	-
2,3,4,6-Tetrachlorophenol (TCP)	g/m ³	< 0.0004	-	-	-	-
2,4,5-trichlorophenoxypropionic acid (245TP, Fenoprop, Silvex)	g/m ³	< 0.0004	-	-	-	-
2,4,5-Trichlorophenoxyacetic acid (245T)	g/m ³	< 0.0004	-	-	-	-
Pentachlorophenol (PCP)	g/m ³	< 0.0004	-	-	-	-
Picloram	g/m ³	< 0.0006	-	-	-	-
Quizalofop	g/m ³	< 0.0004	-	-	-	-
Triclopyr	g/m ³	< 0.0004	-	-	-	-
Organochlorine Pesticides Screening in Water, By Liq/Liq						
Aldrin	g/m ³	< 0.00010	-	-	-	-
alpha-BHC	g/m ³	< 0.0002	-	-	-	-
beta-BHC	g/m ³	< 0.0002	-	-	-	-
delta-BHC	g/m ³	< 0.0002	-	-	-	-
gamma-BHC (Lindane)	g/m ³	< 0.0002	-	-	-	-
cis-Chlordane	g/m ³	< 0.00010	-	-	-	-
trans-Chlordane	g/m ³	< 0.00010	-	-	-	-
2,4'-DDD	g/m ³	< 0.0002	-	-	-	-
4,4'-DDD	g/m ³	< 0.0002	-	-	-	-
2,4'-DDE	g/m ³	< 0.0002	-	-	-	-
4,4'-DDE	g/m ³	< 0.0002	-	-	-	-
2,4'-DDT	g/m ³	< 0.0002	-	-	-	-
4,4'-DDT	g/m ³	< 0.0002	-	-	-	-
Dieldrin	g/m ³	< 0.00010	-	-	-	-
Endosulfan I	g/m ³	< 0.0002	-	-	-	-
Endosulfan II	g/m ³	< 0.0002	-	-	-	-
Endosulfan sulfate	g/m ³	< 0.0002	-	-	-	-
Endrin	g/m ³	< 0.00010	-	-	-	-
Endrin aldehyde	g/m ³	< 0.00010	-	-	-	-
Endrin ketone	g/m ³	< 0.0002	-	-	-	-
Heptachlor	g/m ³	< 0.00010	-	-	-	-
Heptachlor epoxide	g/m ³	< 0.00010	-	-	-	-
Hexachlorobenzene	g/m ³	< 0.0008	-	-	-	-
Methoxychlor	g/m ³	< 0.00010	-	-	-	-
Total Chlordane [(cis+trans)*100/42]	g/m ³	< 0.0004	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq						
Acenaphthene	g/m ³	< 0.00010	-	-	-	-
Acenaphthylene	g/m ³	< 0.00010	-	-	-	-
Anthracene	g/m ³	< 0.00010	-	-	-	-
Benzo[a]anthracene	g/m ³	< 0.00010	-	-	-	-
Benzo[a]pyrene (BAP)	g/m ³	< 0.00010	-	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	g/m ³	< 0.00010	-	-	-	-
Benzo[g,h,i]perylene	g/m ³	< 0.00010	-	-	-	-
Benzo[k]fluoranthene	g/m ³	< 0.00010	-	-	-	-
Chrysene	g/m ³	< 0.00010	-	-	-	-
Dibenzo[a,h]anthracene	g/m ³	< 0.00010	-	-	-	-
Fluoranthene	g/m ³	< 0.00010	-	-	-	-
Fluorene	g/m ³	< 0.0002	-	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m ³	< 0.00010	-	-	-	-
Naphthalene	g/m ³	< 0.0005	-	-	-	-
Phenanthrene	g/m ³	< 0.0004	-	-	-	-
Pyrene	g/m ³	< 0.0002	-	-	-	-

Sample Type: Aqueous

Sample Name: LEACH 1
11-Oct-2016
Lab Number: 1663557.48

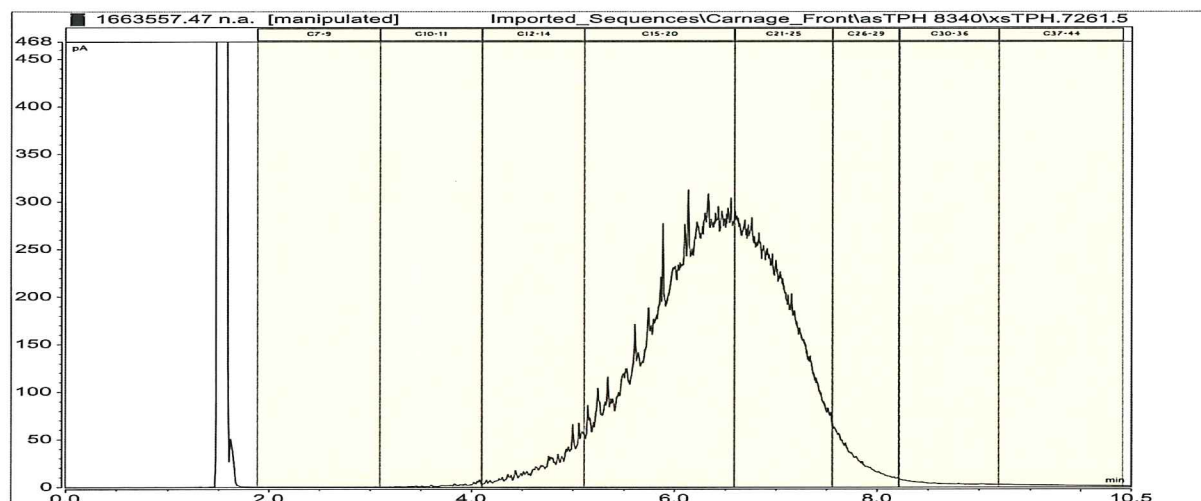
Total Petroleum Hydrocarbons in Water

C7 - C9	g/m ³	< 0.10	-	-	-	-
C10 - C14	g/m ³	< 0.2	-	-	-	-
C15 - C36	g/m ³	< 0.4	-	-	-	-
Total hydrocarbons (C7 - C36)	g/m ³	< 0.7	-	-	-	-

1663557.47

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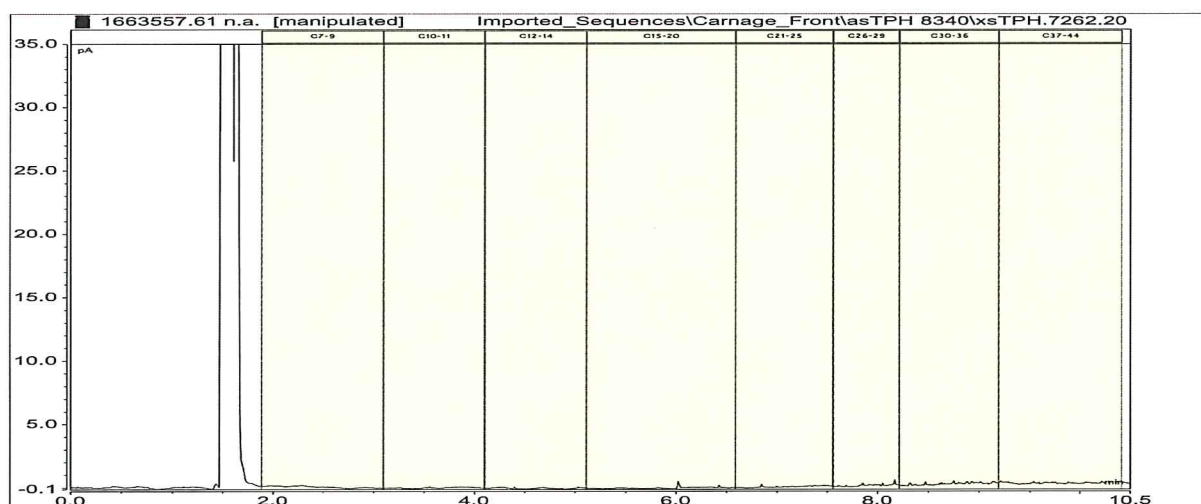
Client Chromatogram for TPH by FID



1663557.61

Composite of SS26, SS27, SS29 & SS30

Client Chromatogram for TPH by FID

**Analyst's Comments**

Due to high interference found in the chromatography for the PAH analysis on sample 1663557.47, the extract was diluted and re-analysed. Hence the higher detection limits reported.

Due to the matrix type of sample 1663557.48, the sample was diluted for the Acidic Herbicide analysis. Hence the higher detection limits reported.

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
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Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
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%.	-	22-26
TPH Oil Industry Profile + PAHscreen	Sonication in DCM extraction, SPE cleanup, GC-FID & GC-MS analysis. Tested on as received sample. US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:5786,2805,10734;2695]	0.010 - 60 mg/kg dry wt	43, 47, 61-62
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	43, 46, 51-62
Acid Herbicides Screen in Soil by LCMSMS	Solvent extraction with sonication, dilution, analysis by LCMSMS with online SPE. Tested on dried sample	0.2 - 0.4 mg/kg dry wt	43, 46, 51-52, 55-57, 60-62
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082).. Tested on dried sample	0.010 - 0.06 mg/kg dry wt	43, 46, 51-53, 55-62
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	0.010 - 0.05 mg/kg dry wt	51-53, 55-60
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	43, 46-47, 51-53, 55-62
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	22-26
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-42, 44-45, 49-50
Total Recoverable Arsenic	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	22-26

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m ³	48
Acid Herbicides Trace in Water by LCMSMS	Acid Herbicides in water, trace level	0.00003 - 0.00004 g/m ³	48
Organochlorine Pesticides Screening in Water, By Liq/Liq	Liquid / liquid extraction, SPE (if required), dual column GC-ECD analysis	0.00010 - 0.0008 g/m ³	48
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, SPE (if required), GC-MS SIM analysis [KBIs:4736,2695]	0.00010 - 0.0005 g/m ³	48
Total Petroleum Hydrocarbons in Water	Hexane extraction, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:2803,10734]	0.10 - 0.7 g/m ³	48
Total Digestion	Nitric acid digestion. APHA 3030 E 22 nd ed. 2012 (modified).	-	48

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.

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