

REPORT

Ministry of Education

Ground Contamination Investigation
Flat Bush School Road, Flat Bush



Tonkin & Taylor

ENVIRONMENTAL AND ENGINEERING CONSULTANTS



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Flat Bush School Road, Flat Bush

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1 Introduction

Tonkin & Taylor Ltd (T&T) has been commissioned by Frequency Project Management on behalf of the Ministry of Education to undertake a ground contamination investigation for a 3.71 ha site located on the southern side of Flat Bush School Road in Flat Bush, approximately 325 m east of the intersection with Murphys Road (shown as Area 2 on a Candor3 plan provided by Frequency Project Management, Appendix B). The site is part of a larger property addressed as 187 Flat Bush School Road. The site is shown in Figure 1 below.

This report has been prepared in general accordance with the requirements for both a Preliminary Site Investigation (PSI) and a Detailed Site Investigation (DSI) as referred to in the NES Soil regulations¹, and as outlined in the MfE's Contaminated Land Management Guidelines².

The persons undertaking, managing, reviewing, and certifying this investigation are suitably qualified and experienced practitioners as defined in the NES Soil.

This work was undertaken in accordance with our proposal of 3 September 2014 and variation of 13 October 2014.

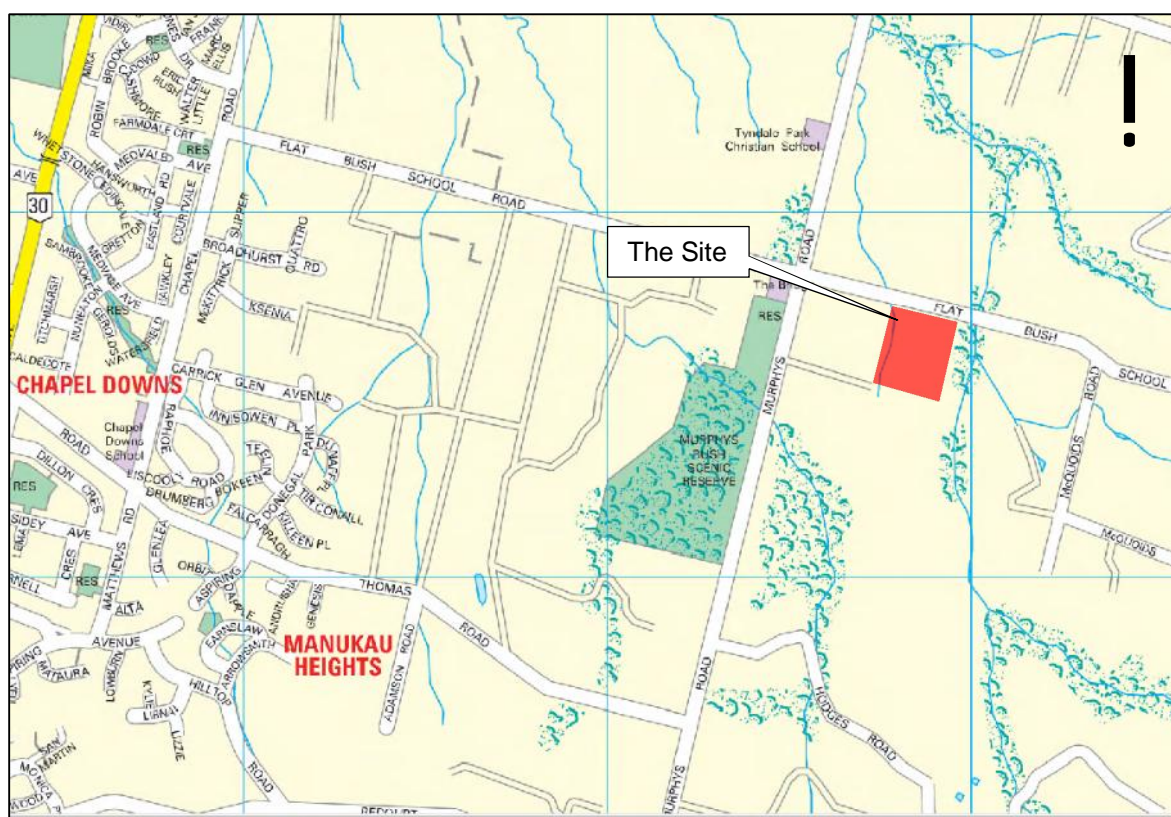


Figure 1: Site Location (Source: Terralink International Limited)

¹ Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

² Ministry for the Environment, updated 2011, Contaminated land management guidelines No. 1: *Reporting on Contaminated Sites in New Zealand*.

1.1 Background

The site currently consists of vacant farmland and has been identified as a proposed new school site in Flat Bush.

The Flat Bush area has a history of use of asbestos containing materials (ACMs) in constructing farm tracks. The operative Manukau District Plan and Proposed Auckland Unitary Plan (PAUP) require bulk ACM investigations for proposed land disturbance or subdivision activities located in nominated areas within Flat Bush. Although the property is not located within the Council nominated areas, adjacent land is.

If an activity or industry described in the Ministry for the Environment's (MfE) Hazardous Activities and Industries List (HAIL) is being, or has been, undertaken on a site, the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES Soil) apply if soil disturbance and/or land development activities take place at the site.

T&T has undertaken this investigation to assess whether HAIL activities, in addition to the potential placement of ACM, have occurred at the site, and the potential for these activities to have resulted in ground contamination. This report also assesses the need for further investigation and resource consents for the proposed soil disturbance and/or land development activities with regard to ground contamination as required under the NES Soil, and other relevant regulations.

This investigation was conducted concurrently with a geotechnical investigation undertaken by T&T³ which has been reported separately. This report provides a brief summary of relevant findings of the geotechnical investigation, as they relate to this assessment.

1.2 Description of proposal

At the time of this report, T&T are not aware of any specific development plans for the site. However, we understand that the Ministry of Education proposes to establish a public primary school on the site, to service the rapidly developing surrounding residential areas.

1.3 Objective and scope of work

The objective of this investigation is to identify activities at the site that may have resulted in ground contamination, and assess the likelihood, potential magnitude and extent of any contamination as a result of those activities.

The scope of work for this investigation comprised:

- Review Auckland Council property files and district planning maps;
- Review of an Auckland Council "Site Contamination Enquiry";
- Review of selected historic aerial photographs from the T&T Library and Auckland Council GIS Viewer, dating back to 1960;
- Review of current and historic certificates of title;
- Interviews with farm manager to establish historic land uses and potentially contaminating activities;

³ Tonkin & Taylor, October 2014, *Flatbush School: Geotechnical Investigation Report*. Prepared for Ministry of Education. T&T Ref: 30393

- A site walkover to assess the potential for contaminating activities to be (or have been) present;
- Review of ground contamination related environmental regulations and planning documents to identify relevant resource consent requirements;
- Collection of soil samples from 19 test pit and hand auger borehole locations across the site and analysis of selected samples for metals, organochlorine pesticides (OCP), and asbestos; and
- Preparation of this report.

This report documents our findings and comments on ground contamination at the site, in the context of the proposed development, including potential consenting implications.

2 Site description

2.1 Site identification

The site is located on the southern side of Flat Bush School Road in Flat Bush, approximately 325 m east of the intersection with Murphys Road. It is legally described as PT Lot 2 DP 48950, Certificate of Title 69A/619. The site is approximately 3.71 ha in size, rectangular in shape and currently forms part of a larger agricultural property, addressed as 187 Flat Bush School Road. The site details are summarised in Table 2.1 and the site layout is shown in Figure 2 provided in Appendix A.

The relevant operative and proposed plans in Auckland indicate that under the Auckland Council District Plan (Manukau Section) the site is zoned 'Future Development'. The majority of the site is designated as an 'Airport Noise Notification Area'.

Table 2.1: Site identification

Street address	187 Flat Bush School Road
Legal Description	PT Lot 2 DP 48950
Site Owner	Auckland Council
Site Area	3.71 ha
Zoning	'Future Development'

2.2 Site condition

A T&T environmental scientist completed a site walkover inspection on 9 October 2014. Relevant observations made at the time of the inspection are summarised below. Key site features are shown on Figure 2, Appendix A and selected photographs are included in Appendix C.

The site is currently being used to grow pasture for the production of silage. The site contains the following features:

- The site has an undulating topography and overall slopes down to the north towards Flat Bush School Road (Photographs 1 and 2, Appendix C);
- A large soil stockpile (approximately 200 m³ to 300 m³) is present in the northern portion of the site, adjacent to Flat Bush School Road (Photograph 3, Appendix C). This stockpile contained soils consistent with natural materials identified on site and is therefore assumed to have been sourced from the site (e.g. during construction of farm tracks, etc.);
- A farm track is located on the neighbouring land, adjacent to the southern boundary of the site. An adjoining farm track extends through the site to the north before terminating in the north-eastern portion of the site (Photograph 4, Appendix C). These tracks have been formed with imported weathers greywacke basecourse material (rotten rock), placed above natural clayey SILT (refer to Section 5.2.1 and Photograph 5, Appendix C);
- No evidence of ACM or other anthropogenic building material was identified has having been used to form the farm tracks;
- An open shallow drain is located in the eastern portion of the site, extending from the farm track to a vegetated gully area (offsite) (Photograph 6, Appendix C). This drain was observed to be dry and overgrown with grass and weeds. A slightly undulating/elevated area was identified adjacent to the western end of the drain. This areas comprised disturbed natural soil, likely to represent material excavated from the drain;

- No other significant topographical evidence of filling was identified on site. However, based on the intensive agricultural use of the site, it is expected shallow soil disturbance (tilling, ploughing) has occurred periodically;
- No buildings or other structures are present on site with the exception of farm fencing and concrete water troughs;
- A small stream (un-named tributary of Otara Creek) is located along the western side of the site (Photograph 7, Appendix C). This stream flows to the north, towards a culvert under Flat Bush School Road. The stream contained a small amount of water in the base during the inspection and is lined with mature trees;
- The site is predominantly covered in a pastoral grass crop which was seeded earlier in the year and was overdue for harvesting. The farm tracks are also covered in grass and weeds (Photograph 4, Appendix C);
- Vegetation on site (including grass, trees, and weeds) appeared to be in good health. Evidence of weed spraying was observed at occasional places around the perimeter of the site (Photograph 8, Appendix C);
- Two water filled holes (possible soak holes) were observed adjacent to the farm track in the southern portion of the site. The holes were approximately 0.5 m deep and 0.6 m in diameter (Photograph 9, Appendix C);
- Several areas of ponding or saturated ground were identified across the site;
- No surface staining or significant areas of bare soil were observed; and
- One sensitive environmental receptor was identified on site and one was identified offsite (two un-named tributaries of Otara Creek). These streams receive storm water and groundwater originating at from the site.

2.3 Surrounding land use and environment

The land uses in the area surrounding the site include:

- North – Flat Bush School Road, with rural residential properties further north. A plant nursery and a small orchard are located approximately 650 m to the north-east;
- South – Agricultural land (pastoral) including occasional agricultural buildings and rural residential properties. A cluster of agricultural buildings is located less than 50 m from the southern boundary of the site. These buildings include barns, sheds, and houses, and service the farm on which the site is located. Other structures and materials (including above ground fuel storage tanks, grain silos, old machinery, and fencing materials) are located in this area;
- East – Vegetated gully (with un-named tributary of Otara Creek in base), with rural residential properties further east; and
- West – Agricultural land (pastoral) and occasional agricultural buildings and rural residential properties.

2.4 Geology

A summary of available geological information for the area is presented in this Section.

2.4.1 Published geology

The published geology of the area⁴ indicates that the site lies within an alluvial basin, substantially surrounded to the north, east and south by higher ground formed by the East Coast Bays Formation (ECBF), as indicated in Figure 3. The alluvium is mapped in this area as Puketoka Formation comprising:

- Pumiceous deposits consisting of "light grey to orange brown, pumiceous mud, sand and gravel with black muddy peat and lignite"; and
- Rhyolite pumice consisting of light grey, massive to finely laminated mud- to sand sized pumice".

2.4.2 Site geological information

The soil profile obtained from the intrusive ground contamination and geotechnical investigation (conducted concurrently) is shown in Table 2.2. Further description of the site soils is contained within the T&T geotechnical report and in Section 5.2.1 of this report.

Table 2.2: Observed soil profile

Depth below ground level to top of layer (m)	Unit thickness (m)	Geological unit	Description
0.0	0.0 – 0.3	Disturbed natural ground (topsoil/ Puketoka Formation)	Light brown to brown, SILT with some clay.
0.0	0.15 – 0.3	FILL: basecourse material (rotten rock)*	Greyish brown, sandy, silty, fine to cobble sized, greywacke GRAVEL;
0.0 – 0.5	3.7 – 7.6	Puketoka Formation	Grey to brown, clayey or sandy SILT, and silty CLAY.
3.7 – 7.6	> 0.65 – >1.9	Weathered ECBF	Grey to dark grey, sandy or clayey SILT.

* Farm track areas only

2.4.3 Hydrogeology and hydrology

Groundwater was encountered at depths of between 0.3 m and 3.0 m below ground level in the hand auger boreholes, one day after the drilling as part of T&T's geotechnical investigation. The investigation was undertaken after an extended period of wet winter weather and a typical groundwater depth of 0.5 m expected at the lower (northern) end of the site, increasing to 1.0 m to 1.5 m depth at the southern boundary.

Based on topography, shallow groundwater and surface water at the site is generally expected to flow towards the north, while groundwater and surface water in the eastern and western portions of the site is expected to flow in to the gully and the stream respectively. Groundwater and surface water is eventually expected to discharge to Otara Creek via groundwater or via unnamed tributaries and surface drains. Otara Creek discharges to Curlew Bay, Tamaki Estuary approximately 6.8 km north-west of the site.

⁴ Kermode, L., 1992. Geology of the Auckland Urban Area, Geological Map 2 1:50,000. Institution of Geological and Nuclear Sciences.

3 Site history

Historical information relating to the site was collected from a variety of sources. The information presented documents on-site activities, except for the aerial photograph review where comments are also provided on readily observable surrounding land use.

3.1 Certificates of title

A review of historic certificates of title for the site revealed a complex history of subdivision, amalgamation and transfers. Copies of the certificates of title can be provided on request. Relevant points are summarised below.

- The earliest record for the site, dated 1940, details 160 acres (including the site), owned by Green Family. Records indicate that they were farmers.
- Ownership of 120 acres (including the site) was transferred to Flat Bush Farms Ltd by 1962 and Manukau City by 2001.
- A record for the larger property, dated 1988, indicates transfer of a pipeline easement from Maui Gas Pipeline to Natural Gas Corporation of New Zealand.

3.2 Council property file

A copy of the Auckland Council property file was obtained on 15 October 2014. The files provided by Auckland Council relate to the entire property. Relevant information obtained from the property files is summarised below:

- July 1980 – the earliest document on record is an application for building permit by Flat Bush Farm Ltd for a hay barn;
- November 1995 – application for resource consent by New Zealand Ostrich Corp Ltd for non-complying activity to operate an ostrich farming/quarantine facility.
- November 1995 – application for building consent by Exotic Corp Ltd for a new farm shed and facilities intended for avian quarantine facility and hatchery. Water connection form required. Septic tank located to the east of the shed (offsite).
- October 1996 – application for building consent by Exotic Corp Ltd. For a new house structure (offsite).
- November 1996 – application for building consent by Ostrich Corp for a new building intended for incubation. Remove old septic tank and install new septic tank.
- March 1999 – application for building consent by Nova Gas Ltd for a building and gas gate and compound (offsite); erect concrete block wall. Installation of rock soak pit.
- March 1999 – Resource consent granted for gas control station (offsite).

3.3 Aerial photography

Historic aerial photographs were obtained from the T&T library and Auckland Council GIS website⁵, and reviewed. Relevant features of the site and surrounds are summarised from each aerial photograph in Table 3.1.

⁵ <http://maps.aucklandcouncil.govt.nz/aucklandcouncilviewer>

Table 3.1: Summary of aerial photograph review

Aerial photograph (date and source)	Key points identified	Surrounding land features
1960 1924/38 T&T Library	The site appears to consist of undeveloped grassed farmland. No clear farm tracks were observed in this photograph.	The site is bounded by Flat Bush School Road to the north and farmland to the east, west and south. A farming operation consisting of several sheds and buildings is observed to be located adjacent to the south-western corner of the site, located up-gradient of the onsite stream.
1972 4605/24 T&T Library	No significant changes were observed from the 1960 photograph.	
1980 SN5783 Q/19	The site is largely similar to that observed in the 1972 photograph, with the exception of an apparent bare soil area in the south-western portion of the site. A farm track now appears to run along the southern boundary.	The surrounding sites are similar to those observed in the 1972 photograph.
1988 8772R/8 T&T Library	The site was observed to consist of undeveloped grassed farmland. A farm track appears to run along the southern boundary and through the centre of the site.	The surrounding sites are similar to those observed in the 1980 photograph. Several additional farm buildings and sheds have been erected off the south-western corner of the site, located up-gradient of onsite stream. The surrounding sites are similar to those observed in the 1988 photograph with the exception of a small shed located immediately to the south-west of the site.
1996 Auckland Council	No significant changes were observed from the 1988 photograph.	The surrounding sites are similar to those observed in the 1988 photograph with the exception of a small shed located immediately to the south-west of the site.
2006 Auckland Council	A stockpile of soil, covering an area of approximately 500 m ² , has been placed in the northern portion of the site.	The shed located to the south-west of the site appears to be removed. No other significant changes were observed.
2008 Auckland Council	No significant changes were observed from the 2006 photograph.	
2010 Auckland Council		

3.4 Council contamination records

The response to a contamination enquiry placed with Auckland Council was received on 30 September 2014. A copy of the response is provided in Appendix D. Three individual pollution incidents are held on record for the agricultural property including the site area. The search included the entire property at 187 Flat Bush School Road, and therefore the individual incidents may not relate directly to the site. The incidents are summarised below:

- October 2008, 'Rural – spray drift';

- October 2009, 'Rural – spray drift'; and
- March 2013, 'Open burning' in 2013.

One contaminated site discharge consent applies to properties within 200 m of the site as summarised in Table 3.2 below.

Table 3.2: Ground contamination-related resource consents

Location	Type of consent	Consent holder	Activity description	Status
217 Murphys Road, Flat Bush	Contaminated site discharge	Ivan Frisken Estates Ltd	Contaminated site discharge relating to the bulk earthworks and vegetation removal including silt and sediment control. To discharge contaminants to land or water from land undergoing remediation and the disturbance of a site where activities on the HAIL have been undertaken.	Occurring

Based on the information indicated, discharges at the consented location are unlikely to have the potential to cause soil contamination at the site due to location, distance, and the nature and likely extent of the contaminants at that location.

3.5 Discussions with site employee

Discussions with the farm hand, Tony, revealed that the site previously operated as a dairy farm, before it was converted to an ostrich farm around 1996. The ostrich farm operated for approximately 15 years, until 2011, when the site started producing maize and pasture crops. According to Tony, no pesticides application occurred during his tenure (approximately 7 years); however, grass crops were sprayed off (presumably using glyphosate-based herbicides, which are readily degradable, immediately prior to re-seeding). Tony reported that the soil stockpile had been present on site since he was involved in the operation of the farm. When asked about the water filled holes adjacent to the farm track, Tony reported that they had been on present on site since he had started and was unaware of their purpose.

4 Potential for contamination

The historical review indicates that the site has been used for agricultural purposes for more than 60 years. No buildings or other significant structures are known to have been present on the site during this time. Farm tracks were formed on site during the 1980s. The Flat Bush area has a history of use of ACM in constructing farm tracks. Although the property is not located within the Council nominated areas where bulk ACM investigation is required, adjacent land is. Thus there is potential for ACM to be present on farm tracks and at other areas across the site.

Review of historical aerial photographs showed an apparent bare soil area in the south-western portion of the site in 1980, and a stockpile of soil placed on site sometime between the late 1990s and early 2000s. However, these areas of potential filling are expected to comprise locally derived material, sourced from across the site and wider farm property.

We understand that the site may have been exposed to agrichemicals (particularly herbicides and pesticides) via direct application (e.g. weed spraying, grass spraying) and via spray drift. However, it is unlikely that bulk storage or mixing of agrichemicals occurred on site and therefore any contamination is likely to be widespread, occurring at low concentrations, and limited to shallow soils. Historical evidence also indicates that open burning has occurred on the site or wider farm property recently.

The activities, potential contaminants and an assessment of the likelihood, potential magnitude and possible extent of contamination are presented in Table 4.1 below. The inferred locations of these activities are presented on Figure 2, Appendix A.

Table 4.1: Potential for contamination

Land use/activity	Potential contaminants	Likelihood, magnitude and possible extent of contamination	HAIL reference	Relevant sample location
Use of ACM in farm track construction and at other locations across the site	Asbestos	Based on the location of the site, there is potential for ACM to be present particularly on the farm tracks. Asbestos is likely to be limited to farm tracks basecourse/covering material.	Yes Activity E1 - Asbestos products manufacture or disposal	All (TP1 – TP4, HA1 – HA15)
Exposure to agrichemicals via direct spraying and spray drift	Potential for arsenic, lead, copper, mercury, wide range of organic compounds including acid herbicides, organophosphates and organochlorines. However, historical information suggests that pesticides have not been used on site in recent years and that herbicide use has been limited to glyphosate based products.	Historic evidence shows the site has had a long history of agricultural use. Contamination may be widespread across the entire site, although it is likely confined to shallow soils. Contamination is likely to be concentrated around former chemical mixing/storage shed buildings (none identified on site).	Yes Activity A10 - Persistent pesticide bulk storage or use including... market gardens, orchards, glass houses or spray sheds	HA2 – HA12, HA14 and HA15)
Filling: including soil stockpile and observed bare soil area	A broad range of contaminants possible depending on origin of material used. If sourced from offsite industrial areas then most typically metals.	The stockpile and bare soil areas are expected to comprise locally derived material, sourced from across the site and wider farm property. There is potential for locally derived fill soils at the site to contain low concentrations of contaminants associated with the agricultural use of the site (detailed above).	No ¹	HA1 and HA2, HA14 and HA15
Open burning	PAH, TPH, metals a wide range of contaminants dependant on materials burnt.	No evidence of burning was identified during the site inspection. Open burning is most likely to have occurred offsite and included burning of green waste material. Associated contamination is likely to be restricted to burning areas and limited to surface soils.	No	None
<p>Notes:</p> <p>1. Fill encountered at the site would only be considered a HAIL activity if it:</p> <ul style="list-style-type: none"> • Contained waste (HAIL category G5); or • Contained a hazardous substance in sufficient quantity that it could be a risk to human health or the environment (HAIL category I). 				

5 Intrusive investigations

5.1 Investigation rationale

Soil investigations were conducted primarily to:

- Assist with characterising cut spoil for disposal; and
- Assess the potential for the previous use of the site, principally the potential use of ACM and past agricultural use, to have resulted in ground contamination.

Based on review of site history information, contamination present on site is expected to be confined to shallow/fill soils and thus the investigation was designed to target these materials. As shown in Figure 4, the soil sampling works comprised:

- Collection of soil samples from four (4) test pits, mechanically excavated along the farm track to depths of between 0.6m and 0.9m;
- Collection of soil samples from fifteen (15) hand augered boreholes, located on an approximately grid pattern (approximate 50 m spacing) across the site, and from several targeted locations (HA2, HA13, HA14, HA15) based on site history information and field observations.
- Submission of 20 soil samples (including one quality control sample) to IANZ accredited laboratories for analysis for a selection of metals, OCPs and asbestos.

Soil sampling was conducted as follows:

- Investigation locations were cleared for services with regard to available underground service plans of the area;
- Soil samples were collected via hand-auger or excavator, from surface (to 0.1 m) with deeper samples (0.3 m) collected from half of the hand auger locations and from all of the test pits. Deeper samples were also collected from the soil stockpile at depths of 0.5m and 1.0 m bgl in HA14 and HA15 respectively.
- All samples were collected directly from the auger or directly from the bucket of the excavator with freshly-gloved hands, and placed into laboratory-prepared sample containers. The hand-auger, and other non-dedicated equipment, was decontaminated between sampling locations using Decon 90 (a phosphate-free detergent) and fresh water rinses;
- The materials encountered were logged in accordance with the NZ Geotechnical Society guidance⁶;
- All shallow samples were tested for asbestos. Samples collected from the soil stockpile at 0.1 and 1.0 m depth (HA14 and HA15 respectively) were tested for asbestos. One duplicate sample was also analysed for asbestos.
- Eleven (11) shallow samples (to 0.1 m) and two deeper samples from HA14 and HA15 (0.5m and 1.0 m depth respectively) were analysed for selected metals and OCPs. One duplicate sample was analysed for metals only. Additional samples were held at the laboratory for further analysis, if required.

⁶ New Zealand Geotechnical Society, December 2005, *Guideline for the field classification and description of soil and rock or engineering purposes*.

- On completion of the sampling, reinstatement comprised backfilling with soil. Care was taken to replace ground surface as flush as possible with the original surface at the test pit locations.

5.1.1 Assessment criteria

The data has been evaluated according to the requirements of the regulatory framework applicable to the site as follows:

- Published background concentrations for Auckland described in the Auckland Regional Council Technical Publication 153 – Background concentrations of Inorganic Elements in Soils from the Auckland Region. This data is also generally used as a basis for criteria for disposal of soil to cleanfill sites. Disposal criteria refer to either the background soil concentration for the cleanfill site or the upper limit concentration for non-volcanic soils in the Auckland region defined in the document above. These are referred to as the default AC cleanfill disposal criteria;
- The NES Soil requires soil results to be assessed against published background concentrations and soil contaminant standards (SCS) that define an adequate level of protection for human health. Future use of the site is proposed to comprise a school. With regard to potential risks to human health, SCS for rural residential land use has been used as a conservative approach to evaluate site data;
- Permitted activity soil acceptance criteria set out in the Regional and Unitary Plan; and
- Example managed fill acceptance criteria for the Auckland Region.

The assessment criteria adopted for the project are shown together with the analytical results in Appendix E.

5.2 Results

5.2.1 Field observations

Material encountered across the site typically included:

- Disturbed natural ground (topsoil/Puketoka Formation) comprising light brown to brown, SILT with some clay, located across the site to depth of between 0.0 and 0.3 m bgl (and to greater than 1.0 m in the soil stockpile);
- Basecourse material comprising, greyish brown, sandy, silty, fine to cobble sized, moderately weathered greywacke gravel to depths of between 0.15 and 0.3 m bgl, located beneath the farm track;
- Natural soils (Puketoka Formation) generally comprising yellowish brown, clayey SILT, and silty CLAY to at least the base of the investigation locations (up to 1.0 m bgl); and
- No visual or olfactory evidence of contamination, building or waste materials was identified within soils recovered from the boreholes or test pits.

5.2.2 Data quality

5.2.2.1 Sample handling and holding times

The chain of custody records, attached in Appendix E, show that the samples were submitted to Hill Laboratories within the generally accepted holding times for these analytes⁷.

5.2.2.2 Laboratory quality control

Hill Laboratories is accredited by IANZ and as such is expected to comply with the accreditation requirements that include the confirmation of validity and suitability of results. Any breaches in laboratory control would be expected to be notified at the time of release of the analytical results. No breaches were reported.

5.2.2.3 Duplicate samples

A quantitative measure of the variability in the results was undertaken independently of the laboratory by calculating the Relative Percentage Difference (RPD) values for the duplicate pairs of samples. The RPD value was calculated as follows:

$$RPD := \frac{(Co - Cs)}{\left(\frac{Co + Cs}{2}\right)} \cdot 100$$

Where Co = concentration of the original sample

Cs = concentration of the duplicate sample

Table 5.1 presents a summary of the QA/QC analytical results.

Table 5.1: Summary of QA/QC data

Sample	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
BH3 0.5m	< 2	0.28	17	6	9.5	6	21
Duplicate	< 2	0.27	16	6	9.9	7	22
RPD (%)	NC	4	6	0	4	15	5

NC – not calculated due to one or more concentration below laboratory limit of reporting

It is typically considered acceptable (refer to MfE Guideline No. 5) if an RPD range of less than 50% is achieved for soil samples. As shown in Table 5.1, the metal concentrations in the duplicate samples reported RPD's well within this range indicating that variability in sample collection, handling and analysis is acceptable.

A duplicate sample was also analysed by Dowdell & Associates Ltd for asbestos. Asbestos was not detected in either the primary (TP2/0.1) or duplicate sample (QC101).

⁷ Ministry for the Environment. Contaminated Land Management Guidelines No. 5, Site Investigation and Analysis of Soils. Published 2004, Revised 2011.

5.2.3 Analytical results

A summary of analytical results from samples analysed during this investigation is presented in Table E1 provided in Appendix E, alongside a comparison to the relevant acceptance criteria. Full laboratory transcripts and chain of custody documentation are provided in Appendix F. Key findings are summarised as follows:

- Asbestos was not detected in any of the samples.
- OCPs were all reported at concentrations below the laboratory limits of detection and thus below all acceptance criteria including the published background concentrations.
- Metals were all reported at low concentrations, below all acceptance criteria and within the published background concentrations.

6 Development implications

6.1 Earthworks requirements

The soil testing results indicate that site soils typically contain no detectable asbestos fibres, and low metal and pesticide concentrations which are consistent with published background concentrations. Consequently, no special precautions, controls and/or restrictions with respect to soil contamination are required during the proposed site development earthworks as detailed in the following sub-sections.

6.2 Regulatory requirements

The rules and associated assessment criteria relating to the control of contaminated sites in the Manukau area are specified in the following documents:

- The NES Soil regulations;
- The Auckland Council District Plan (Operative Manukau Section 2002) (herein referred to as the District Plan);
- The Auckland Council Regional Plan (Air Land and Water) (herein referred to as the Regional Plan); and
- The Proposed Auckland Unitary Plan (herein referred to as the Unitary Plan).

The NES Soil regulations and District Plan consider issues relating to land use and the protection of human health while the Regional and Unitary Plans have regard to issues relating to the protection of the general environment, including ecological receptors.

6.2.1 NES Soil

The NES Soil, which came into effect on 1 January 2012, provides national planning controls that direct the requirement for consent or otherwise for activities on contaminated or potentially contaminated land. All territorial authorities (district and city councils) are required to give effect to and enforce the requirements of the NES in accordance with their functions under the Resource Management Act (RMA) relating to contaminated land. As a result the NES now prevails over the rules in the District Plan, except where the rules permit or restrict effects that are not dealt with in the NES. An assessment of the proposed redevelopment at the site against relevant clauses of the regulations is provided below.

6.2.1.1 Regulation 5

Regulation 5 of the NES sets out when the regulations would apply to a piece of land and/or proposed activity. An assessment of the proposed activity at the site is summarised below.

Regulation (sub clause)	Summary description	Commentary/Assessment
		Development of site for new school
5(1)a	NES applies when a person wants to do an activity described in 5(2) to 5(6) on a piece of land described in subclause (7) or (8)	NES would apply because the activity involves disturbing soil and changing landuse on a piece of land that a HAIL activity or industry has been undertaken.
5(1)b	NES does not apply when a person wants to do an activity described in 5(2) to 5(6) on a piece of land described in subclause (9)	NES does not apply because measured contaminant levels at the site are within background concentrations (refer regulation 5 subclause (9) and Appendix E).

Regulation (sub clause)	Summary description	Commentary/Assessment
		Development of site for new school
5(2)	Removing a fuel storage system	Not relevant
5(3)	Sampling soil	Not relevant
5(4)	Disturbing soil	Applicable
5(5)	Subdividing land	Applicable
5(6)	Changing landuse	Applicable
5(7)	A HAIL activity or industry is more likely than not or is being or has been undertaken on the piece of land	The site has been subject to direct and in-direct exposure to agrichemicals which is a HAIL activity.
5(8)	A piece of production land that meets subclause (7) and subdividing or changing land use would cause the piece of land to stop being production land	Land will cease to be production land when the new school is built.
5(9)	NES does not apply to land described in 5(7) or 5(8) which a detailed site investigation exists that demonstrates that any contaminant in or on the piece of land are at, or below background concentrations	This report constitutes a detailed site investigation and shows that the measured contaminant concentrations are all below background concentrations (refer to Appendix E).

The assessment above shows that the NES regulations do not apply to the activity proposed on the site.

No further assessment against other clauses in the NES is required for the proposed activity.

6.2.2 District Plan

The NES Soil regulations now prevail over the rules in the District Plan, except where the rules permit or restrict effects that are not dealt with in the NES.

As the rules in the District Plan do not deal with any effects that are not dealt with in the NES Soil regulations we therefore consider that the NES supersede these rules in their entirety. On this basis the provisions of the District Plan have not been considered further in this assessment.

6.2.3 Regional and Unitary Plans

The Auckland Council Regional Plan: Air Land and Water (Regional Plan) includes a series of rules related to contaminated sites. However, based on the current testing data, the site does not meet the definition of a contaminated site. All contaminant concentrations comply with the permitted activity acceptance criteria, for ground disturbance, of both the Regional and Unitary Plans. Therefore the proposed development should be able to be undertaken as a permitted activity for disturbance of land under the rule related to contaminated sites in the Regional Plan.

6.3 Implications for site works and soil disposal

This investigation has identified contaminant concentrations at levels that are consistent with published background concentrations at the site. Published background concentrations are generally used as surrogate criteria for disposal of soil to cleanfill sites. Therefore, if offsite disposal is required as part of development works, the site soils are likely to be suitable for disposal as cleanfill.

7 Conclusions

This ground contamination investigation was undertaken to confirm what current and historic activities have occurred at the site, and whether the activities have resulted in ground contamination. The investigations have been undertaken in general accordance with the requirements for both a PSI and a DSI, as described in the NES for Assessing and Managing Contaminants in Soil Users Guide (2012).

The key findings of the desk study and intrusive investigations are that:

- The site has been used for agricultural purposes for more than 60 years. This assessment identified use of agrichemicals, and possible use of ACM as potential HAIL activities at the site.
- No visual or olfactory evidence of contamination, building or waste materials was identified within soils recovered from boreholes or test pits undertaken at the site.
- Laboratory analytical testing showed that contaminant concentrations were reported below all acceptance criteria and within the published background concentrations and therefore:
 - the NES Soil does not apply to the site in accordance with Clause 5 (9);
 - the potential for human health risk during and following the proposed redevelopment work is considered to be negligible;
 - the potential for risk to the surrounding environment is considered to be negligible;
 - the proposed development should be able to be undertaken as a permitted activity for disturbance of land under the provisions of both the contaminated land regulations of the Regional and Unitary Plans; and
 - if offsite disposal is required as part of development works, site soils are likely to be suitable for disposal as cleanfill.
- Given the results of the investigation, the proposed school development is not considered to require contaminated land consents under either the NES Soil or the applicable rules in the Regional Plan or the Unitary Plan.

8 Applicability

This report has been prepared for the benefit of Ministry of Education with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Recommendations and opinions in this report are based on exploratory data. The nature and continuity of subsoil away from the exploratory holes are inferred and it must be appreciated that actual conditions could vary from the assumed model.

The persons undertaking, managing reviewing and certifying this assessment are suitably qualified and experienced practitioners as defined in the NES Soil regulations.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

Authorised for Tonkin & Taylor Ltd by:



Alex Davies-Colley

Environmental Scientist

pp 

Chris Freer

Project Director

Technical Review carried out by:



Chris Bailey

Senior Environmental Engineer

ajdc

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Appendix A: Figures



MURPHYS ROAD

FLAT BUSH SCHOOL ROAD

SCALE 1:2,500
0 50 100 150 (m)

Aerial photo and boundaries sourced from Auckland Council GIS Website



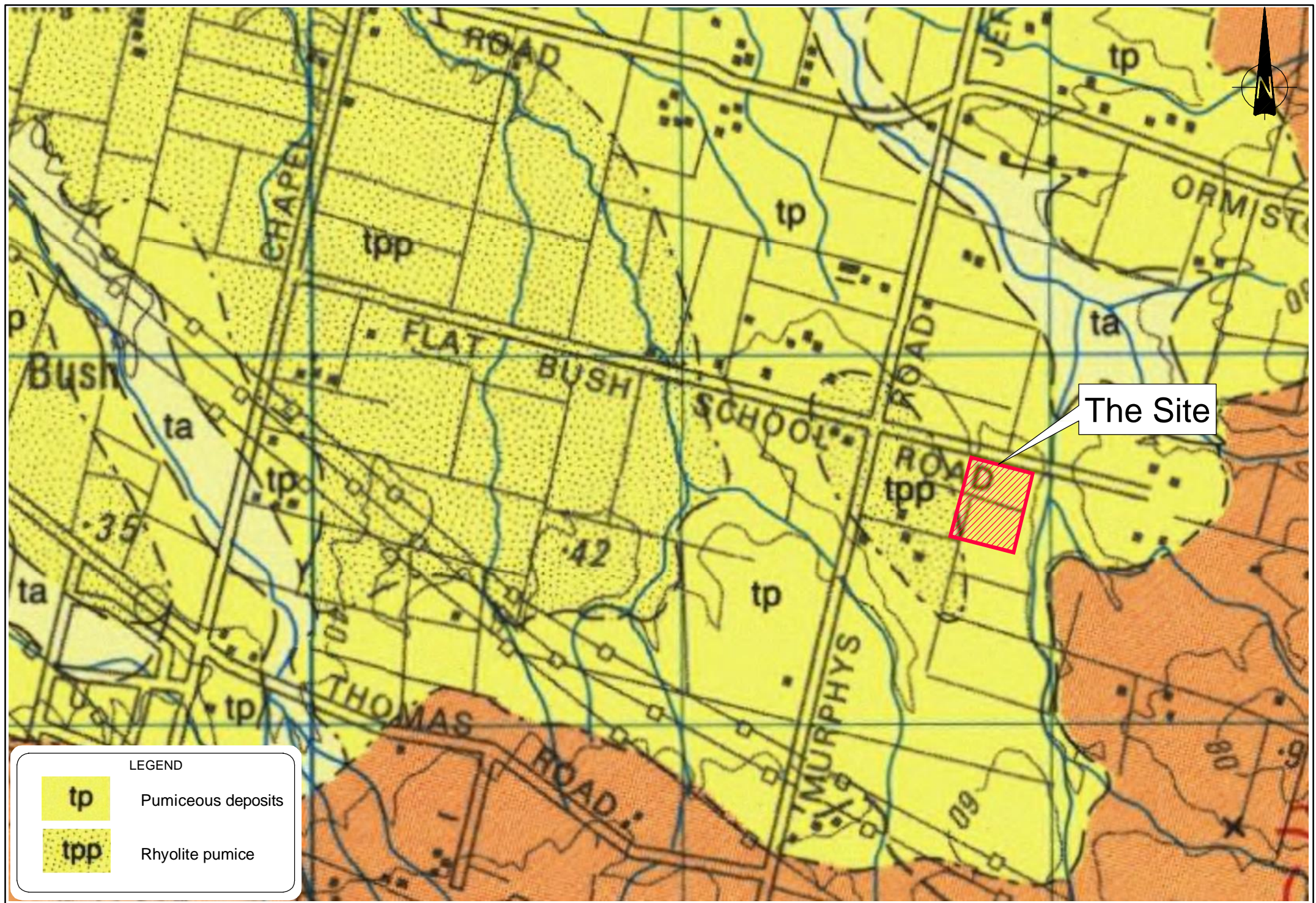
Tonkin & Taylor
Environmental and Engineering Consultants
105 Carlton Gore Road, Newmarket, Auckland

DRAWN	RBS	Sep.14
DRAFTING CHECKED		
APPROVED		
CADFILE : 30393-GCA-F2.dwg		
SCALES (AT A4 SIZE)		
1:2500		
PROJECT No. 30393		

MINISTRY OF EDUCATION
GROUND CONTAMINATION ASSESSMENT
187 FLAT BUSH SCHOOL ROAD, FLAT BUSH
Site Plan

FIG. No. Figure 2	REV. 0
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L:\30393\WorkingMaterial\CAD\FIG\30393-GCA-F2.dwg 29/10/2014 11:13:37 a.m.



Appendix B: Plan provided by Frequency Project Management

NOTES:
AREAS AND DIMENSIONS ARE SUBJECT TO FINAL SURVEY.
BOUNDARIES HAVE BEEN DERIVED FROM FLAT BUSH STRUCTURE PLAN & A/C GIS DEPARTMENT
SITE IS SUBJECT TO PROPOSED O&M - AUCKLAND PIPELINE - 941631.1"

Site Access

Gate

PROPOSED
ROAD
WIDENING

PT SEC. 2
SO 462574

PT SEC 3
SO 462574

2.339ha

$$3.7050 \text{ ha}^2$$

9607m2 /

7601m²

PROPOSED
ROAD
WIDENING

DP 101816

EASEMENT A

26.0333 Ha

PT LOT 2
DP 48950

7
11.6038 Hz

4
8693m²

2
DP 54832

2
DP 166735



3
7783m²

DP 16673¹

MCQUOIDS ROAD

REV	DESCRIPTION	APPRD	DATE
A	INDICITIVE ROADS ADDED		27/11/13
B	AREAS UPDATED		3/04/14

Candor
ENGINEERING FOR LIFE

PROJECT
187 FLAT BUSH SCHOOL ROAD
LAND TAKE PLAN
SHEET 2 OF 3

AUCKLAND COUNCIL

DESIGN	AW	SCALE	DATE ISSUED
DRAWN	AS	1:2500 @ A3	26/11/2013
CHECK			
APVD			
PROJECT NO.		REVISION	
9202		SP001 (B)	

Appendix C: Site photographs

Photograph 1

Date: 9/10/2014

Site; looking north.



Photograph 2

Date: 9/10/2014

Site; looking south-west from stockpile. Showing farm track (centre) and trees along stream (left).



Photograph 3

Date: 9/10/2014

Stockpile in southern portion of site, looking west along Flat Bush School Road.



Photograph 4

Date: 9/10/2014

Farm track (covered in grass), looking north.



Photograph 5

Date: 9/10/2014

Typical soil profile beneath farm track. Showing TP 1.



Photograph 6

Date: 9/10/2014

Open shallow drain in eastern portion of the site, looking east towards vegetated gully area.



Photograph 7

Date: 9/10/2014

Stream located in western portion of site, looking north.



Photograph 8

Date: 9/10/2014

Evidence of weed spraying along northern boundary of site. Looking west along Flat Bush School Road.



Photograph 9

Date: 9/10/2014

Water filled holes (possible soak holes) adjacent to the farm track in the southern portion of the site.



Appendix D: Council contamination enquiry

30 September 2014

Tonkin & Taylor Limited
PO Box 5271
Wellesley Street
Auckland 1141

Attention: Chris Baily / Betsy Gillies

Dear Chris and/or Betsy

Site Contamination Enquiry – 187 Flat Bush School Road, Flat Bush - PT LOT 2 DP 48950

This letter is in response to your enquiry requesting available site contamination information for the above site. The following details are based on information available from the former Auckland Regional Council records system and information currently held by the Auckland Council Natural Resources and Specialist Input Unit. The details provided below exclude any property information held by the former district/city councils.

The table(s) below outlines the reference for the site files and pollution incident files available for the subject site:

File Reference		N/A		
File Name		187 Flat Bush School Road		
Pollution	Date	13/10/08	Comment	Rural – Spray drift (incident # 08/3444)
Pollution	Date	07/10/09	Comment	Rural – Spray drift (incident # 09/2881)
Pollution	Date	12/03/13	Comment	Open Burning (incident #13/1141)

The general catchment file and site visit file for the catchment (6-02 and 6-02-SV respectively) were not searched. These files contain pollution incidents where the source of pollution was not traced to a particular site, site visits where no follow-up correspondence was required and some information from archived files.

If the above site is coastal or beside a river, it is possible that historic, unconsented reclamation may have occurred. The Auckland Council, Natural Resources and Specialist Input, Coastal Team may be able to provide further information.

The records reviewed as part of this Site Contamination Enquiry search do not identify individual horticultural sites in the region. However, there is a possibility that horticultural activities may have occurred at the site. The local Auckland Council customer service centre, specific to the area of the site may be able to provide relevant information where former horticultural sites have been mapped.

If you are concerned that a historic land use (such as filling) may have caused the underlying soils to become contaminated, it is recommended that you obtain an independent environmental assessment of the site. Staff from the Auckland Council Earthworks and Contaminated Land Team can provide advice on the results of any evaluation in terms of site remediation and/or potential consent requirements.

The former Auckland Regional Council and current Natural Resources and Specialist Input Unit databases were searched for records of landfill, bore, air discharge, industrial and trade process consents, contaminated site discharge consents, and environmental assessments within approximately 200 metres of the site. Relevant details of the identified consents are appended to this letter (Attachment A).

The details provided are in accordance with the obligation to make information publicly available upon request. While the Auckland Council has carried out the search using its best practical endeavours, it does not warrant its completeness or accuracy and disclaims any responsibility or liability in respect of the information. If you or any other person wishes to act or to rely on this information, or make any financial commitment based upon it, it is recommended that you seek appropriate technical and/or professional advice.

In addition, it is recommended that you contact the local customer service centre of the Auckland Council, specific to the site being investigated: Ground Floor, Kotuku House, 4 Osterley Way, Manukau Central as they also may hold files with relevant information.

I trust that this answers your query. If you wish to discuss the matter further, please contact Andrew Kalbarczyk on 301 0101. Should you wish to request any of the files listed above for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice to ensure files will be available).

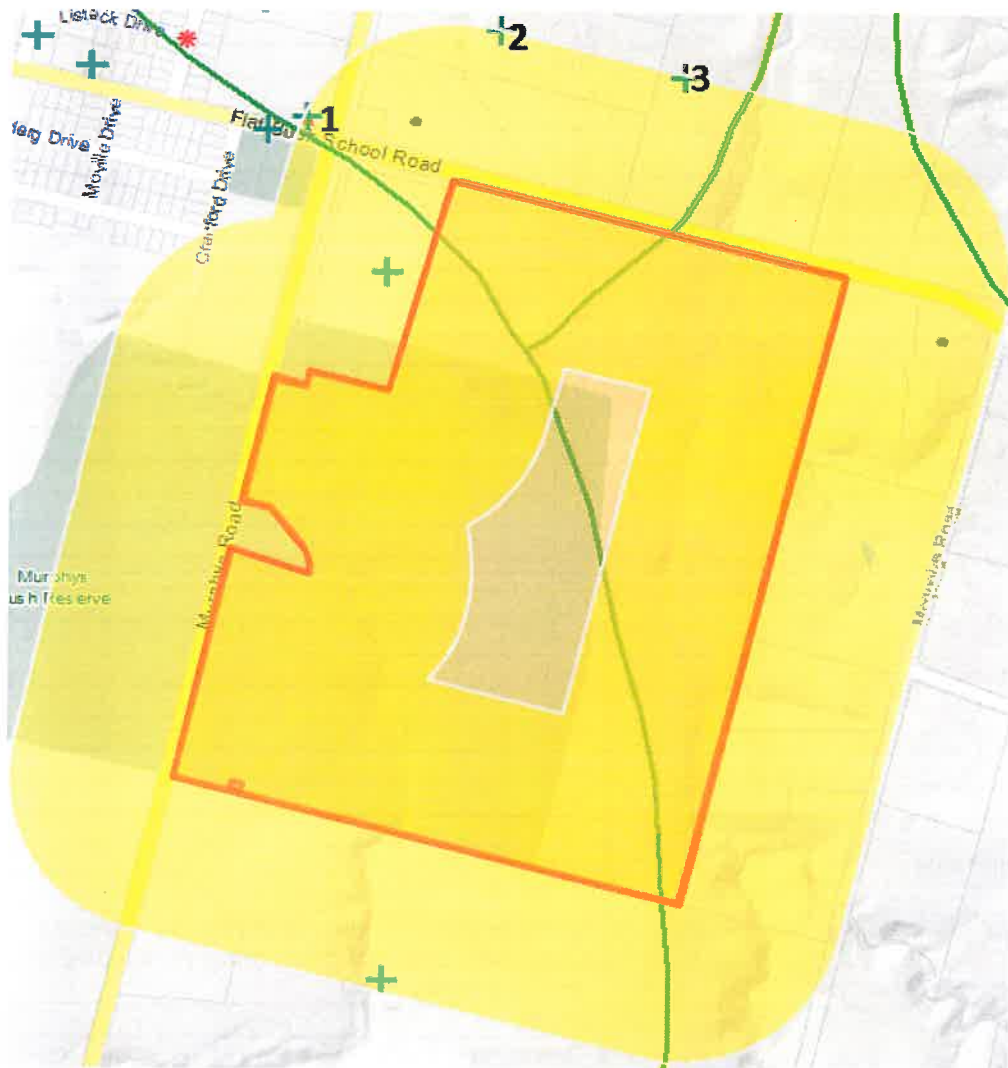
Please note: the Auckland Council cost recovers officer's time for all site enquiries. A basic enquiry takes approximately 1 - 2.5 hours to search the files and databases in which information is held. As such an invoice for the time involved in this enquiry will follow shortly.

Yours sincerely



David Hampson
Team Leader - Earthworks and Contaminated Land
Natural Resources and Specialist Input

Attachment A:



1. ACTIVITY DESCRIPTION:	Drilled pre-1987 for AUCK. CHRISTIAN SCHOOLS by LES KARL.
ACTIVITY STATUS:	Drilled
ALW PLAN:	Null
AQUIFER:	East Tamaki Waitemata
AQUIFER TE:	Null
BORE ID:	2847
BORE LOG:	Y
BORE USE:	Null
CASING DIA:	100
CASING FROM:	0
CASING TO:	24
CASING TYPE:	Null
CONSENT HOLDER:	Null
CONSENT NUMBER:	0
CONSENT STATUS:	Null
CONSULTANT:	Null
CONTRACTOR:	Null
DATE DRILL:	20000101
DIAMETER:	100

DIAMETER F:	0
DIAMETER T:	57
EASTING:	1771100
ENVIRONMENT:	Null
EXPIRY DATE:	Null
FILE REFERENCE:	Null
GRANTED DATE:	Null
GROUND ELE:	Null
HYDSYS NUMBER:	Null
LAND USE:	Null
LAND USE U:	Null
LAND USE N:	Null
LOC TYPE:	Point
MAIN AQUIFER:	Waitemata
NORTHING:	5906200
PROCESSING OFFICER:	Null
PROPERTY ADDRESS:	Null
PURPOSE:	Null
REVIEW DATE:	Null
SCREEN FROM:	Null
SCREEN TO:	Null
SCREEN TYPE:	Null
SITE DESCRIPTION:	Null
SITE NAME:	Null
STATIC WAT:	Null
SUB AQUIFER:	Null
TLA:	Null
TOTAL DEPT:	57
WORKS DESCRIPTION:	Null

2. ACTIVITY DESCRIPTION:	Contaminated site discharge relating to the bulk earthworks and vegetation removal including silt and sediment control.
ACTIVITY ID:	21450
ACTIVITY STATUS:	Occurring
ACTIVITY TYPE:	Contaminated Site Discharge
CONSENT HOLDER:	Ivan Frisken Estates Limited
CONSENT NUMBER:	42455
CONSENT STATUS:	Issued
DATE CREATE:	29/09/2014 7:20:46 p.m.
EXPIRY DATE:	20181130
FILE REFERENCE:	24229
GRANTED DATE:	20131219
LOC TYPE:	Point
PROCESSING OFFICER:	Samuel Woolley
PROPERTY ADDRESS:	217 Murphys Road Flat Bush Manukau
PURPOSE:	To discharge contaminants to land or water from land undergoing remediation and the disturbance of a site where activities on the hazardous activities and industries list have been undertaken.
REVIEW DATE:	Null
SITE DESCRIPTION:	Null
SITE NAME:	217 & 221 Murphys Rd & 208 Flat Bush School Rd
WORKS DESCRIPTION:	Null

3. ACTIVITY DESCRIPTION:	Contaminated site discharge relating to the bulk earthworks and vegetation removal including silt and sediment control.
ACTIVITY ID:	21450
ACTIVITY STATUS:	Occurring
ACTIVITY TYPE:	Contaminated Site Discharge
CONSENT HOLDER:	Ivan Frisken Estates Limited
CONSENT NUMBER:	42455
CONSENT STATUS:	Issued
DATE CREATE:	29/09/2014 7:20:46 p.m.
EXPIRY DATE:	20181130
FILE REFERENCE:	24229
GRANTED DATE:	20131219
LOC TYPE:	Point
PROCESSING OFFICER:	Samuel Woolley
PROPERTY ADDRESS:	217 Murphys Road Flat Bush Manukau
PURPOSE:	To discharge contaminants to land or water from land undergoing remediation and the disturbance of a site where activities on the hazardous activities and industries list have been undertaken.
REVIEW DATE:	Null
SITE DESCRIPTION:	Null
SITE NAME:	217 & 221 Murphys Rd & 208 Flat Bush School Rd
WORKS DESCRIPTION:	Null

Appendix E: Summary soil results

Table E1: Summary of analytical results

	Acceptance Criteria				Maximum																			
	Human Health	Regional/Unitary Plan Permitted Activity Soil Acceptance Criteria ^{2,3}	Disposal			HA2/0.0	HA3/0.0	HA4/0.0	HA5/0.0	HA6/0.0	HA7/0.0	HA8/0.0	HA9/0.0	HA10/0.0	HA11/0.0	HA12/0.0	HA14/0.1	HA15/1.0	20QC101	TP1	TP2	TP3	TP4	
Location	NES SCSs ¹ for		Example Managed Fill Acceptance Criteria	Cleanfill (non-volcanic background)		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	0.5	1.0	0.1	0.1	0.1	0.1	0.1	
Depth (m bgl)	rural residential use					9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014
Date Sampled						Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Topsoil (Silt)	Stockpiled topsoils	Stockpiled topsoils	Basecourse	Basecourse	Basecourse	Basecourse
Lithological unit																								
Metals and Metaloids (totals)																								
Arsenic	17	100	30	12	3	< 2	< 2	3	2	< 2	2	3	< 2	< 2	< 2	3	3	-	-	-	-	-		
Cadmium	1	7.5	10	0.65	0.47	0.31	0.28	0.37	0.29	0.33	0.33	0.2	0.27	0.32	0.15	0.47	0.28	-	-	-	-	-		
Chromium	290 ⁴	400 ⁵	400	55	36	13	17	36	18	23	22	17	18	16	18	13	18	23	-	-	-	-		
Copper	>10,000	325	325	45	11	7	6	10	6	6	5	5	11	4	4	4	6	6	-	-	-	-		
Lead	160	250	250	65	14.7	9.3	9.5	14.5	8.6	9.9	9.6	11.6	14.7	10.4	9.3	14.7	11.1	10.6	-	-	-	-		
Nickel	400 ⁶	105	250	35	14	7	6	14	6	9	9	4	7	4	4	2	6	8	-	-	-	-		
Zinc	7,400 ⁶	400	1,160	180	37	31	21	37	24	25	19	20	35	19	18	24	32	24	-	-	-	-		
Asbestos						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Organochlorine Pesticides Screening in Soil																								
Aldrin	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
alpha-BHC	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
beta-BHC	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
delta-BHC	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
gamma-BHC (Lindane)	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
cis-Chlordane	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
trans-Chlordane	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Total Chlordane [(cis+trans)*100/42]	90 ⁶	-	-	< LOR	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	-	-	-	-		
2,4'-DDD	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
4,4'-DDD	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
2,4'-DDE	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
4,4'-DDE	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
2,4'-DDT	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
4,4'-DDT	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
DDT + DDD + DDE	70	12	-	< LOR	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	-	-	-	-		
Dieldrin	2.6	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Aldrin + Dieldrin	6 ⁶	-	-	< LOR	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	-	-	-	-		
Endosulfan I	270 ⁶	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Endosulfan II	270 ⁶	2.15	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Endosulfan sulphate	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Endrin	10 ⁶	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Endrin aldehyde	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Endrin ketone	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Heptachlor	10 ⁶	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Heptachlor epoxide	-	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Hexachlorobenzene	6 ⁶	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		
Methoxychlor	300 ⁶	-	-	< LOR	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-		

Notes:
All units in mg/kg
ND - Not detetcted
- no recommended guideline / criteria and/or not analysed
< LOR indicates acceptance criteria is less than the laboratory level of reporting
¹ National Environmental Standard for Assessing and Managing Contaminants in Soil. Criteria for non-priority contaminants selected in accordance with MfE Hierarchy
² Regional Plan: Schedule 10 - Permitted activity soil acceptance criteria (Discharges)
³ Unitary Plan: Chapter 4.5, Table 1: Permitted activity soil acceptance criteria
⁴ Criteria for Cr6+
⁵ Criteria for Cr3+
⁶ NEPC, 2013, Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater: Table 1A(1). Residential B land use.

Appendix F: Laboratory analytical reports and chain of custody documentation



BULK SAMPLE IDENTIFICATION CERTIFICATE

Job Number: 14-002411 Certificate Issue Date: 16/10/2014

Date Bulks Received: 15/10/2014
No of Samples: 20

Sampled By: Client
Obtained: Submitted by client

Date Analysed: 16/10/2014
Analyst: Shelley Bullen, Ian Little, Emrhys Sheldon
Method: AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples

Client: Tonkin & Taylor Ltd - Hamilton
Client Address: PO Box 9544, Hamilton 3240

Client Ref No: 30393
Contact: Alex Davies-
Site Address: 0

We examined the following sample(s) using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including Dispersion Staining Techniques. The result(s) in this certificate relate(s) to the sample(s) as received.

GLOSSARY

CHRYSTOLE (WHITE ASBESTOS) - CROCIDOLITE (BLUE ASBESTOS) - AMOSITE (BROWN ASBESTOS) - TREMOLITE, ANTHOPHYLLITE & ACTINOLITE (LESS COMMON ASBESTOS FIBRE TYPES)

Where non-asbestos fibres and the product type are listed, this is to help in the interpretation of results and are the opinion of the analyst only.

Where the sampling is not conducted by Dowdell & Associates Ltd, the information indicated is that supplied by the client. Dowdell & Associates Ltd cannot be held responsible for sampling errors where the sample is taken by others.

NOTE: This report must not be altered, or reproduced except in full.



Analyst: *S Bullen* *I Little* *E Sheldon*

Name: Shelley Bullen, Ian Little, Emrhys Sheldon

Approved By:

Name: Rob Nicholson

**14-002411 Results**

Laboratory Reference	Sample Ref / Description	Sample size as received	Sample Weight Analysed	Result	Comments
9877	1 TP1/0.1 Soil	61.6g	61.6g	No Asbestos detected	n/a
9878	2 TP2/0.1 Soil	36.1g	36.1g	No Asbestos detected	n/a
9879	3 TP3/0.1 Soil	71.8g	71.8g	No Asbestos detected	n/a
9880	4 TP4/0.1 Soil	88.1g	88.1g	No Asbestos detected	n/a
9881	5 HA1/0.0 Soil	78.1g	78.1g	No Asbestos detected	n/a
9882	6 HA2/0.0 Soil	73.7g	73.7g	No Asbestos detected	n/a
9883	7 HA3/0.0 Soil	52.6g	52.6g	No Asbestos detected	n/a
9884	8 HA4/0.0 Soil	69.8g	69.8g	No Asbestos detected	n/a
9885	9 HA5/0.0 Soil	42.0g	42.0g	No Asbestos detected	n/a
9886	10 HA6/0.0 Soil	40.4g	40.4g	No Asbestos detected	n/a
9887	11 HA7/0.0 Soil	65.7g	65.7g	No Asbestos detected	n/a
9888	12 HA8/0.0 Soil	75.7g	75.7g	No Asbestos detected	n/a
9889	13 HA9/0.0 Soil	51.4g	51.4g	No Asbestos detected	n/a
9890	14 HA10/0.0 Soil	48.1g	48.1g	No Asbestos detected	n/a
9891	15 HA11/0.0 Soil	62.9g	62.9g	No Asbestos detected	n/a
9892	16 HA12/0.0 Soil	57.3g	57.3g	No Asbestos detected	n/a

14-002411 Results

Laboratory Reference	Sample Ref / Description	Sample size as received	Sample Weight Analysed	Result	Comments
9893	17 HA13/0.0 Soil	72.2g	72.2g	No Asbestos detected	n/a
9894	18 HA14/0.1 Soil	73.9g	73.9g	No Asbestos detected	n/a
9895	19 HA15/1.0 Soil	54.8g	54.8g	No Asbestos detected	n/a
9896	20 QC101 Soil	52.2g	52.2g	No Asbestos detected	n/a



ANALYSIS REPORT

Page 1 of 3

Client:	Tonkin & Taylor	Lab No:	1337442	SPV1
Contact:	A Davies-Colley	Date Registered:	10-Oct-2014	
	C/- Tonkin & Taylor	Date Reported:	21-Oct-2014	
	PO Box 9544	Quote No:		
	HAMILTON 3240	Order No:	30393	
		Client Reference:	30393	
		Submitted By:	A Davies-Colley	

Sample Type: Soil						
Sample Name:		HA2/0.0 09-Oct-2014	HA3/0.0 09-Oct-2014	HA4/0.0 09-Oct-2014	HA5/0.0 09-Oct-2014	HA6/0.0 09-Oct-2014
Lab Number:		1337442.2	1337442.4	1337442.5	1337442.7	1337442.8
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	< 2	< 2	3	3	2
Total Recoverable Cadmium	mg/kg dry wt	0.31	0.28	0.37	0.29	0.29
Total Recoverable Chromium	mg/kg dry wt	13	17	36	18	23
Total Recoverable Copper	mg/kg dry wt	7	6	10	6	6
Total Recoverable Lead	mg/kg dry wt	9.3	9.5	14.5	8.6	9.9
Total Recoverable Nickel	mg/kg dry wt	7	6	14	6	9
Total Recoverable Zinc	mg/kg dry wt	31	21	37	24	25
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
alpha-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
beta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
delta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
2,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Dieldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan I	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan II	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin aldehyde	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin ketone	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Heptachlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Methoxychlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sample Name:		HA7/0.0 09-Oct-2014	HA8/0.0 09-Oct-2014	HA9/0.0 09-Oct-2014	HA10/0.0 09-Oct-2014	HA11/0.0 09-Oct-2014
Lab Number:		1337442.10	1337442.11	1337442.13	1337442.14	1337442.16
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						



Sample Type: Soil						
Sample Name:		HA7/0.0 09-Oct-2014	HA8/0.0 09-Oct-2014	HA9/0.0 09-Oct-2014	HA10/0.0 09-Oct-2014	HA11/0.0 09-Oct-2014
Lab Number:		1337442.10	1337442.11	1337442.13	1337442.14	1337442.16
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	< 2	2	3	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.33	0.33	0.20	0.27	0.32
Total Recoverable Chromium	mg/kg dry wt	22	17	18	16	18
Total Recoverable Copper	mg/kg dry wt	5	5	11	4	4
Total Recoverable Lead	mg/kg dry wt	9.6	11.6	14.7	10.4	9.3
Total Recoverable Nickel	mg/kg dry wt	9	4	7	4	4
Total Recoverable Zinc	mg/kg dry wt	19	20	35	19	18
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
alpha-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
beta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
delta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
2,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
4,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Dieldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan I	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan II	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin aldehyde	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Endrin ketone	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Heptachlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Methoxychlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sample Name:		HA12/0.0 09-Oct-2014	HA14/0.1 09-Oct-2014	HA15/1.0 09-Oct-2014	QC1 09-Oct-2014	
Lab Number:		1337442.17	1337442.20	1337442.23	1337442.32	
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	< 2	3	3	< 2	-
Total Recoverable Cadmium	mg/kg dry wt	0.15	0.47	0.28	0.27	-
Total Recoverable Chromium	mg/kg dry wt	13	18	23	16	-
Total Recoverable Copper	mg/kg dry wt	4	6	6	6	-
Total Recoverable Lead	mg/kg dry wt	14.7	11.1	10.6	9.9	-
Total Recoverable Nickel	mg/kg dry wt	2	6	8	7	-
Total Recoverable Zinc	mg/kg dry wt	24	32	24	22	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
alpha-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
beta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
delta-BHC	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-

Sample Type: Soil						
Sample Name:		HA12/0.0 09-Oct-2014	HA14/0.1 09-Oct-2014	HA15/1.0 09-Oct-2014	QC1 09-Oct-2014	
Lab Number:		1337442.17	1337442.20	1337442.23	1337442.32	
Organochlorine Pesticides Screening in Soil						
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
4,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
4,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
2,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
4,4'-DDT	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Dieldrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Endosulfan I	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Endosulfan II	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Endrin	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Endrin aldehyde	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Endrin ketone	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Heptachlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-
Methoxychlor	mg/kg dry wt	< 0.010	< 0.010	< 0.010	-	-

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
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%.	-	2, 4-5, 7-8, 10-11, 13-14, 16-17, 20, 23, 32
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg dry wt	2, 4-5, 7-8, 10-11, 13-14, 16-17, 20, 23, 32
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082).. Tested on dried sample	0.010 - 0.04 mg/kg dry wt	2, 4-5, 7-8, 10-11, 13-14, 16-17, 20, 23
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	2, 4-5, 7-8, 10-11, 13-14, 16-17, 20, 23, 32

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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Peter Robinson MSc (Hons), PhD, FNZIC
Client Services Manager - Environmental Division



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