BEFORE THE WAIPĀ DISTRICT COUNCIL AND WAIKATO REGIONAL COUNCIL

TOKANUI HOSPITAL DEMOLITION, REMEDIATION AND LANDFILL UPGRADES

Under the	Resource Management Act 1991
In the matter of	resource consent applications by Toitū Te Whenua Land Information New Zealand under section 88 of the Act for demolition and remediation works, and landfill upgrades, in respect of the former Tokanui Hospital site.

STATEMENT OF EVIDENCE OF SEAN MATTHEW FINNIGAN (ENGINEERING, CONTAMINATED LAND AND ENVIRONMENTAL EFFECTS) ON BEHALF OF THE APPLICANT

Dated: 12 September 2025

BUDDLE FINDLAY

Barristers and Solicitors
Wellington

Solicitor Acting: **David Allen / Esther Bennett**
Email: david.allen@buddlefindlay.com / esther.bennett@buddlefindlay.com
Tel 64 4 462 0423 Fax 64 4 499 4141 PO Box 2694 DX SP20201 Wellington 6011

EXECUTIVE SUMMARY

1. My full name is **Sean Matthew Finnigan**.

2. I am a Director of Environmental Engineering at Fraser Thomas.

3. I have prepared this statement of evidence on behalf of Toitū Te Whenua Land Information New Zealand (**LINZ** or **Applicant**) in respect of two resource consent applications for remediation and demolition works to return the former Tokanui Psychiatric Hospital Site (**Site**) to land suitable for rural and rural residential activities (**Remediation Application**) and a discrete package of works to the closed landfill on the Site allowing for the disposal of contaminated soil from the Site alongside a range of upgrade and repair works (**Landfill Application**) (together, the **Applications**). Together, the Applications relate to, and seek consents enabling, the **Project**.

4. My evidence covers the environmental, contamination and engineering aspects of both applications.

5. The Tokanui Hospital essentially formed its own self-contained village, with 84 buildings spread out over a relatively wide area, with extensive roading and services including its own steam heating system for Site buildings, and its own landfill (**Disposal Site**).

6. The proposed remediation works involve the removal of all vertical infrastructure (primarily buildings) and the majority of horizontal infrastructure down to 800mm depth for pipes and ancillary structures down to 1m depth.

7. Extensive investigations have been undertaken across the site since 2017 by multiple parties to determine the horizontal and vertical extent of any soil contamination at the Site. These investigations have found that overall, the Site indicates is generally **not contaminated**. The principal contamination issues are limited to asbestos and lead from building materials in localised areas around building halos and some additional, localised non-building areas, all of which can readily be remediated or managed.

8. The contaminated soil has been classified as low-moderate level. This soil has a very low risk to human health and the environment, based on the soil sampling and leaching testing undertaken. It is proposed to transfer these soils to the onsite Disposal Site and place them in the northern Disposal Site area, in a landfill cell above the groundwater table, and with encapsulation

under a low permeability cover. In addition, cleanfill soil removed to create this cell will be transferred to the hospital for use as backfill material.

9. Collectively the hospital remediation works will restore the Site to farmland, in pasture, and with a reasonable network of gravel access tracks. The Site will be fit for purpose for future rural residential and productive land use, including growing up to 25% of your own produce for personal consumption.

10. The existing Disposal Site has been found to have some significant issues, including some areas with non-compliant capping, no leachate collection system, groundwater ingress, an old large culvert (culvert 3) that passes directly through it, while the Disposal Site is subject to flooding in severe storm events.

11. Proposed Disposal Site repair and upgrade works comprise:

    (a) improved capping of the entire landfill; removal of Culvert 2 downstream of the landfill to reduce the flood risk to the landfill;

    (b) transfer of low/moderate level contaminated soil from hospital demolition works into the northern area as explained above;

    (c) isolated medical waste removal; shifting of fill/refuse material from a small area located on AgResearch land into the main body of the landfill;

    (d) shifting of fill/refuse material from an area close to the stream into the main body of the landfill;

    (e) grout filling of Culvert 3, plus a new shorter culvert running to the northwest and stream reinstatement, with a new embankment on the eastern side of the stream to separate the reclaimed area from existing landfill area;

    (f) installation of a groundwater diversion drain; and

    (g) maintain the existing southern farm track crossing embankment, raising it slightly to assist with flood mitigation.

12. Collectively these works will ensure that the Disposal Site is upgraded to a high standard and will effectively eliminate the risk of Culvert 3 failure, whilst significantly reducing landfill flooding risks, and further reducing potential human health and environmental risks. These risks are already low, and in

relation to leachate volumes, boron and other contaminant levels, are all estimated to decrease further, by somewhere in the range of 72-92%, with these reductions taking between just over one month and seven years to be reflected in stream water quality improvements.

13. Post-works, LINZ retains responsibility for the landfill in perpetuity and new landfill resource consents will be in place, replacing the existing consents. The Closed Landfill Aftercare and Monitoring Plan submitted with the Landfill Application sets out ongoing inspection and monitoring requirements for the landfill. No other post-works monitoring is proposed across the rest of the Site.

14. Overall, I consider that the Disposal Site repair and upgrade works will go a long way to making the landfill safe and secure for many decades into the future. Without them, there are significant environmental risks, whilst similar works to what have been proposed will likely be required within the next 10 years in any case, due to the current landfill consents coming up for renewal in 2035.

INTRODUCTION

15. My full name **Sean Matthew Finnigan**.

16. I am a Director of Environmental Engineering at Fraser Thomas. I have held this role for over thirteen years, since April 2012. Prior to this, I was employed by Fraser Thomas as a Senior Environmental Engineer.

17. I am authorised to give this evidence on behalf of the Applicant.

QUALIFICATIONS AND EXPERIENCE

18. I have the following qualifications and relevant experience:

    (a) Bachelor of Chemical & Materials Engineering with First Class Honours from the University of Auckland (1987);

    (b) Master of Engineering Science degree from The University of New South Wales (2002) with a focus on waste management and hydrology/water resources;

    (c) Doctor of Philosophy degree specialising in membrane filtration from the University of Bath (1990);

(d) I have worked in the Environmental Engineering section of Fraser Thomas Ltd since 1996 and have 29 years' experience in land development, stormwater, water, wastewater, solid waste and contaminated site investigations; and

(e) I am a Chartered Professional Engineer, a Certified Environmental Practitioner in Contaminated Land and I specialise in Environmental Engineering and Contaminated Land.

19. I have specialist skills and considerable experience in:

(a) Land development and three waters (stormwater, water, wastewater) infrastructure covering both greenfield and brownfield developments ranging from small to large scale projects. This includes particular expertise in hydrology/stormwater projects, covering catchment management planning, stormwater design and modelling, assessment of environmental effects, expert witness, peer reviews, and associated reporting.

(b) New, operational and closed landfill projects, covering investigation, design, consenting, compliance monitoring, remedial works, expert witness and peer reviews.

(c) Contaminated land projects, covering preliminary and detailed site investigations, planning and implementation of remedial works, site validation, consenting, expert witness and peer review.

20. I am a member of:

(a) Engineering New Zealand Te Ao Rangahau since 2005 (chartered member);

(b) Waste Management Institute since 2002;

(c) Engineers for Social Responsibility since 1998; and

(d) Australasian Land & Groundwater Association.

CODE OF CONDUCT

21. While this is a Council hearing, I have read the Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2023, and I agree to comply with it. Unless I state otherwise, I confirm that the issues addressed in this statement of evidence are within my area of expertise, and

I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

PROJECT INVOLVEMENT

22. My involvement in the Project began in October 2022.

23. The key site visits and hui I have attended or been involved in are well described in the Iwi Engagement Report (Table 3 and Appendix B).

24. I prepared and/or was involved in the preparation of the following technical reports, drawings and plans that were appended to the Assessment of Environmental Effects for the Remediation Application (**Remediation AEE**) and/or the Assessment of Environmental Effects for the Landfill Application (**Landfill AEE**):

Demolition related works:

(a) Horizontal Infrastructure Assessment Report (Appendix I to the Remediation AEE);

(b) Draft Demolition, Deconstruction and Remediation Management Plan (Appendix P to the Remediation AEE);

(c) Draft Erosion and Sediment Control Plan (ESCP) (Appendix Q to the Remediation AEE);

(d) Horizontal Infrastructure Demolition Plans (Appendix H1 to the Remediation AEE);

(e) Draft ESCP Plans (Appendix H8 to the Remediation AEE);

(f) Coal Tar Investigation Report (Appendix J to the Remediation AEE);

(g) Coal Tar Drawings (Appendix H3 to the Remediation AEE);

(h) Culvert 2 drawings (Appendix H4 to the Remediation AEE);

(i) Pipelining plans (Appendix H7 to the Remediation AEE);

Contaminated soil related works:

(j) Addendum Detailed Site Investigation (ADSI) (Appendix K3 to the Remediation AEE);

(k) Remedial Options Report (Appendix K5 to the Remediation AEE; jointly prepared with HAIL Environmental);

(l) Remedial Action Plan (Appendix K6 to the Remediation AEE);

(m) Remediation Action Plan Drawings (Appendix H2 to the Remediation AEE).

Landfill Repair and Upgrade Works:

(n) Intrusive Investigation Report (Appendix C.1 to the Landfill AEE);

(o) Flood Risk and Mitigation Assessment (Appendix M to the Remediation AEE and Appendix I to the Landfill AEE);

(p) Existing Disposal Site Repair and Upgrade Works Report (Appendix B to the Landfill AEE);

(q) Draft ESCP (Appendix D to the Landfill AEE);

(r) Fish Passage;

(s) Aftercare and Monitoring Plan (Appendix Q to the Landfill AEE);

(t) Landfill Upgrade and Repair Plans (Appendix A to the Landfill AEE); and

(u) Culvert 3 plans (Appendix H6 to the Remediation AEE).

25. In addition, I reviewed and/or approved the following plans, drawings or reports prior to finalisation:

(a) Water Quality Monitoring 2022, 2023 and 2024 (Appendices O.1, O.2 and O.3 to the Landfill AEE).

26. I also prepared, reviewed and/or approved the following supplementary reports and memoranda in response to queries raised by Waipā District Council (**WDC**) and Waikato Regional Council (**WRC**) (together, the **Councils**) and various submitters or due to new information:

(a) FTL Memo (12 March 2025), Draft Pumping/Dewatering Plan;

(b) FTL Memo (26 June 2025), Effect of Changes in Impervious areas from Hospital Demolition Works on Stream Flows;

(c) FTL Memo (11 August 2025), Comparative Water Quality Standards for Boron;

(d) FTL Memo (12 August 2025), Additional Structures Memo;

(e) FTL Memo (20 August 2025), Estimated Effect of Landfill Upgrade Works on Boron Discharges;

(f) FTL Memo (21 August 2025), Evaluation of Fish Passage for Proposed Culvert 3;

(g) FTL Landfill Repair and Upgrade Works Drawings – Issue Set 6 (20 August 2025). These drawings replace the landfill repair and upgrade plans (Appendix A of Landfill AEE) and the culvert 3 plans (Appendix H of Remediation AEE); and

(h) FTL Report (12 September 2025), Addendum Targeted Detailed Site Investigation Report – Agresearch Area, Tokanui);

Item (a) was submitted to Council during the Section 92 process. Items (b) – (h) have been attached to my evidence as appendices for completeness and are referred in relevant paragraphs of my evidence.

27. In preparing my evidence I have reviewed various materials, including:

(a) the application documents for the Project including the Remediation AEE, the Landfill AEE, and the accompanying technical reports;

(b) the documents circulated between the Applicant and the Councils as part of the section 92 (further information request) process;

(c) the Councils' section 42A reports prepared by Ceri Hills on behalf of Waikato Regional Council and by Hayley Thomas on behalf of Waipa District Council; and

(d) the seven submissions received on the Applications, including:

(i) the submission received on behalf of Te Nehenehenui Trust (**Trust**); and

(ii) six submissions received from individuals[1] expressing concerns relating to the engagement/consultation process, adverse cultural

[1] Robert John Muraahi (in relation to regional consents only), Niketi Toataua, Samuel Roa, Gordon Thompson, Nigel Ngahiwi and Yvonne Waho.

effects, and various environmental effects (including in relation to the Wharekōrino Stream (**Stream**), the landfill, and contaminated soil, among others).

28. In preparing this evidence I have considered and been informed by the draft evidence of Matthew Bradley (Project overview), Kim Wepasnick (Engagement and environmental effects) and Emily Buckingham (Planning).

SCOPE OF EVIDENCE

29. My statement of evidence provides an overview of the Project's demolition, remediation and landfill works, including in light of potential environmental effects associated with contaminated land, soil disturbance, horizontal infrastructure removal, water quality, stream flows, flood risk, erosion and sediment control, airborne contaminants and leachate.

30. Unless specifically raised by a submitter or in one of the section 42A reports, my evidence does not address these potential environmental effects in detail and instead refers to and relies on the Remediation AEE, Landfill AEE and technical reports as relevant.

31. Accordingly, my evidence addresses:

    (a) a description of the existing Site and its surrounds, including the buildings, horizontal infrastructure, closed landfill (Disposal Site – see above) and other key natural and/or geographical characteristics, including waterways and soils;

    (b) my involvement in the addendum DSIs;

    (c) an overview of the Project's proposed:

        (iii) demolition works;

        (iv) remediation works;

        (v) landfill works;

        (vi) monitoring processes;

    (d) an assessment of the Project's actual and potential effects on the environment in terms of:

        (vii) contaminated land;

(viii) erosion and sediment effects;

(ix) dust, noise and vibration;

(x) effects on hydrological systems, including the Wharekōrino Stream (**Stream**) flows; wetlands; and aquifers;

(xi) flood risk and mitigation; and

(xii) landfill and leachate generation;

(e) responses to submissions; and

(f) responses to section 42A reports.

32. I address each of these points in my evidence below.

SITE DESCRIPTION

Overall Description

33. The Site is located at 149 Te Mawhai Rd, Tokanui, approximately 14 kilometres southeast of Te Awamutu, Waikato. The Site was developed in 1912, and operated through to 1998. The Site is approximately 79ha in size and contains 84 buildings/structures, a now decommissioned wastewater treatment plant (**WWTP**), a swimming pool, eight substations, substantial underground services, a closed landfill and substantial roading infrastructure. The **Site** is shown in **Figure 1**.

Figure 1: Site location and extent

34. The Wharekōrino Stream transects the eastern portion of the Site flowing in a south to north direction. It flows into the Pūniu River which then flows into the Waipā River. The closed landfill from when the hospital was operational is located on the eastern side of the Wharekōrino Stream. The Wharekōrino Stream is culverted where it passes through the southern part of the landfill area, referred to as Culvert 3, and then runs in an open natural stream channel along the western side of the landfill until passing through Culvert 2. The stream then passes under Te Mawhai Road through Culvert 1.

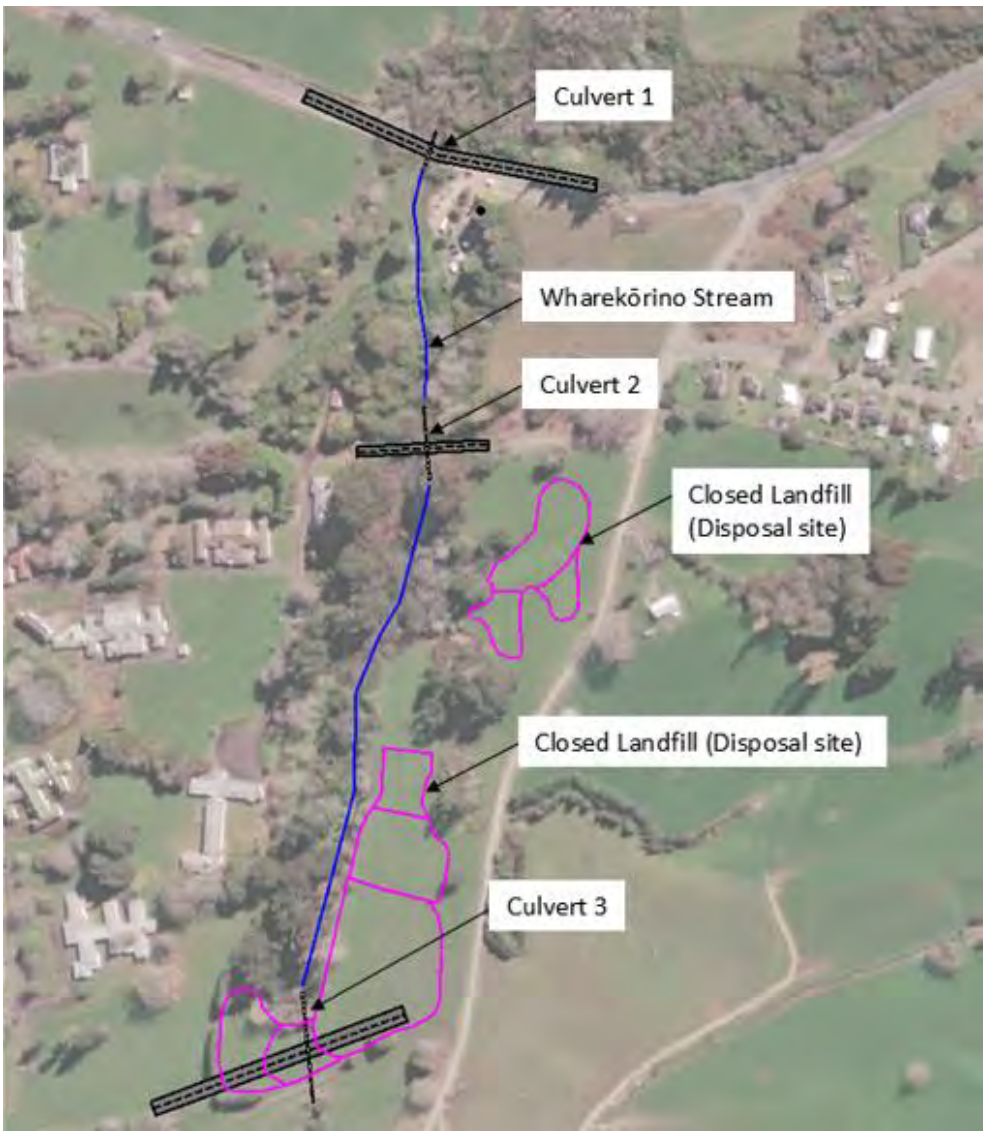


Figure 2: Culverts along the Wharekōrino Stream and Disposal Site outline

35. The land within the Site boundary is presently in a degraded state, arising from contamination over time from the hospital buildings and associated infrastructure still present on it. Many of the former Tokanui Hospital buildings remain, and these buildings are generally in very poor condition.

Horizontal infrastructure

36. The hospital essentially functioned as a self-contained village and, as determined by desktop and site investigations over the 2023-25 period, was served by an extensive infrastructure network, comprising:

    (a) 8.8km long and 6.3ha area of internal access roading and associated paved areas;

    (b) 80m long road embankment across the Wharekōrino Stream, providing an alternative access off Farm Road;

(c) 2.94km of concrete ducting heating system, comprising steam delivery pipes and condensate return pipes housed in concrete ducts with access chambers at regular intervals;

(d) 2.97km of ductile iron and 4.18km of asbestos cement water supply pipes;

(e) 1.77km of stormwater trunk mains and 4.46km of smaller stormwater pipes;

(f) 4.91km of wastewater reticulation pipes and its own now decommissioned WWTP;

(g) 7.32km of underground and 1.37km of above ground power supply and 8 sub-stations;

(h) 4.63km of underground telecom cables; and

(i) 633 associated surface features (manholes, catchpits, fire hydrants, valve boxes, etc.)

Disposal Site

37. While the hospital was operational, it had its own Disposal Site comprising two separate areas, located off Farm Road (private road), directly east of the Wharekōrino Stream located within the Site boundary. The landfill was closed in 2000 and is authorised by the WRC under the existing Disposal Site consents numbered 102269.01.01, 102270.01.01 and 102271.01.01.

38. Site investigations over the period 2022-2025 determined that the Disposal Site occupies an estimated area of 1.92ha and contains an estimated volume of 26,240-29,590m^3 of variable landfilled materials, comprising a mix of soil with construction and general waste, burnt material, inferred boiler ash, and some asbestos and medical waste.

Natural and/or Geographical Characteristics, including Waterways

39. The Site is located in a predominantly undulating area, with some hills and gullies. The elevation ranges between 29m and 46m above sea level.

Soil map

40. The Manaaki Whenua Landcare Research ‘Soils Map Viewer’ (Manaaki Whenua Landcare Research, 2022) identifies two main soil types underlying

the Site, primarily Orthic Gley soils (below in blue) and to a lesser extent Orthic Allophanic soils (below in grey), as shown in **Figure 3**. However, GHD & HAIL Environmental in their 2023 investigations described later in my evidence found that the allophanic soils appear to reach further north into the site than indicated by the published soil data.

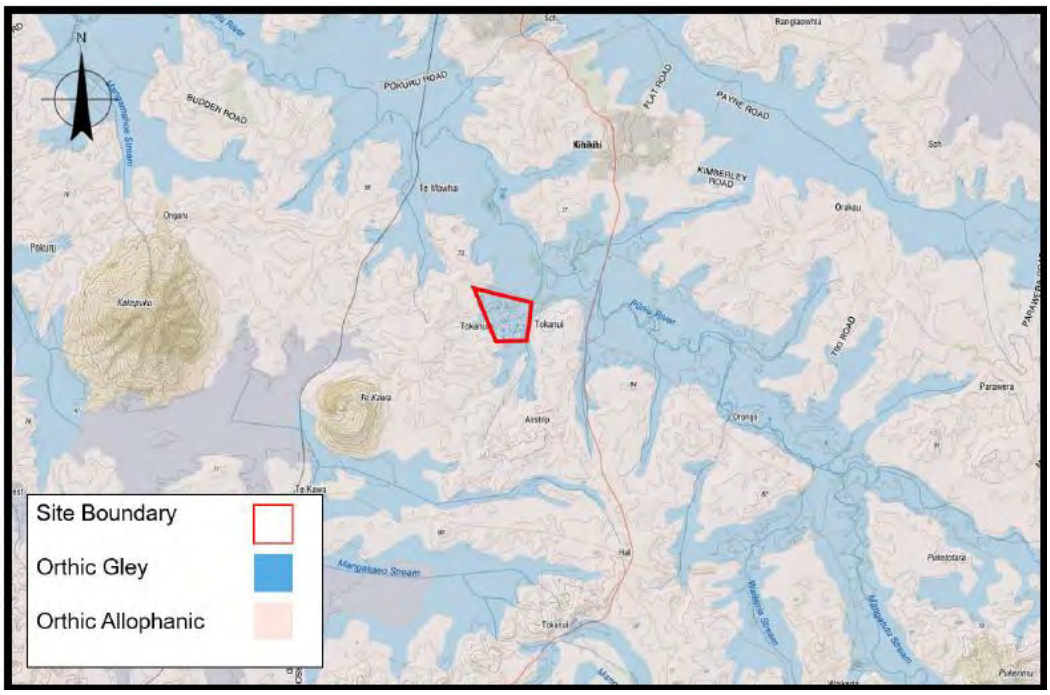


Figure 3: Published soil map (Source: GHD, PSI, May 2022)

*Land use capability (**LUC**) maps*

41. LUC maps (refer **Figure 4**) indicate that most of the Site falls under LUC Class 2 which is defined as "very good multiple-use land, slight limitations, suitable for cropping, viticulture, berry fruit, pastoralism, tree crops and forestry". However, Dr Scott Fraser, a specialist consultant in soils and LUC classification, has advised that the LUC maps do not accurately reflect the presence of the hospital on the Tokanui Village land in the 1980s, which will have affected the LUC.

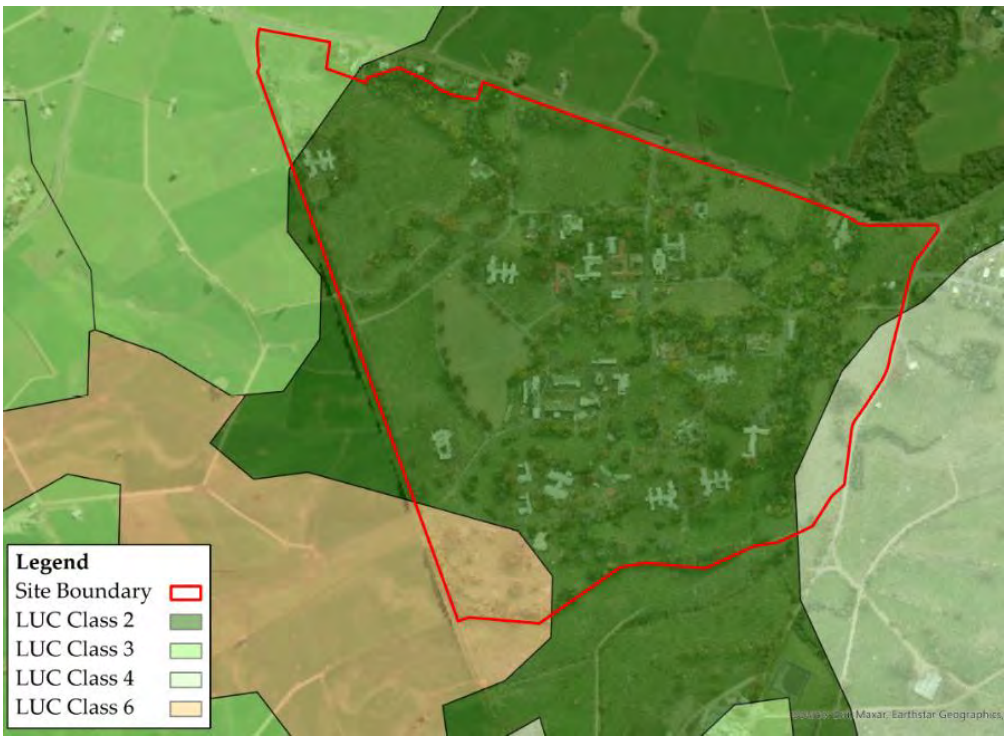


Figure 4: Land Use Capability Map – Tokanui Hospital Site (source: Manaaki Whenua, Landcare Research)

Geology Maps

42. The Institute of Geological and Nuclear Sciences geological web map (NZ 1:250,000) indicates that the site is predominantly underlain by middle Pleistocene to late Pleistocene River deposits consisting of locally derived pumiceous clays, sandy clays and gravels of the Tauranga Group. A small portion of the Site is underlain by early Pleistocene to middle Pleistocene River and igneous deposits consisting of alluvium dominated by primary and reworked, non-welded ignimbrite of the Walton Subgroup, which is part of the Tauranga Group. **Figure 5** below shows the underlying geology of the area.

Figure 5: Published Geology Map (source: GHD, PSI, May 2022)

Aquifer maps

43. The Waikato Regional Plan defines the Waikato Region's aquifers. They are typically based on catchments rather than on hydro-stratigraphy (distinct hydrogeological units). The Site is located within the area classified by WRC as the Waipa Aquifer under Section 3.3 of the Waikato Regional Plan (Map 11) (WRC, 2012). This aquifer underlies an area of approximately 1,420km^2 within the Waikato Region and is considered to be a regional aquifer, comprising groupings of multiple units of undifferentiated unconfined and leaky aquifers (GHD, 2022).

Groundwater bore maps

44. An Environment Waikato database search was done for all groundwater bores within 1km radius of the landfilling area, the results of which are shown on **Figure 6**. This search showed there are six groundwater bores within 1km of the site, of which only one is located downgradient (north) of the landfill. This bore (Bore 72, Station 10906) was formerly used by Pūniu River Care for irrigation of their nursery operation, but they have advised by email from Shannon Te Huia (8 August 2024) that they no longer use this bore, but instead have a water surface take from the Wharekōrino Stream as described further below and illustrated in **Figure 10**.

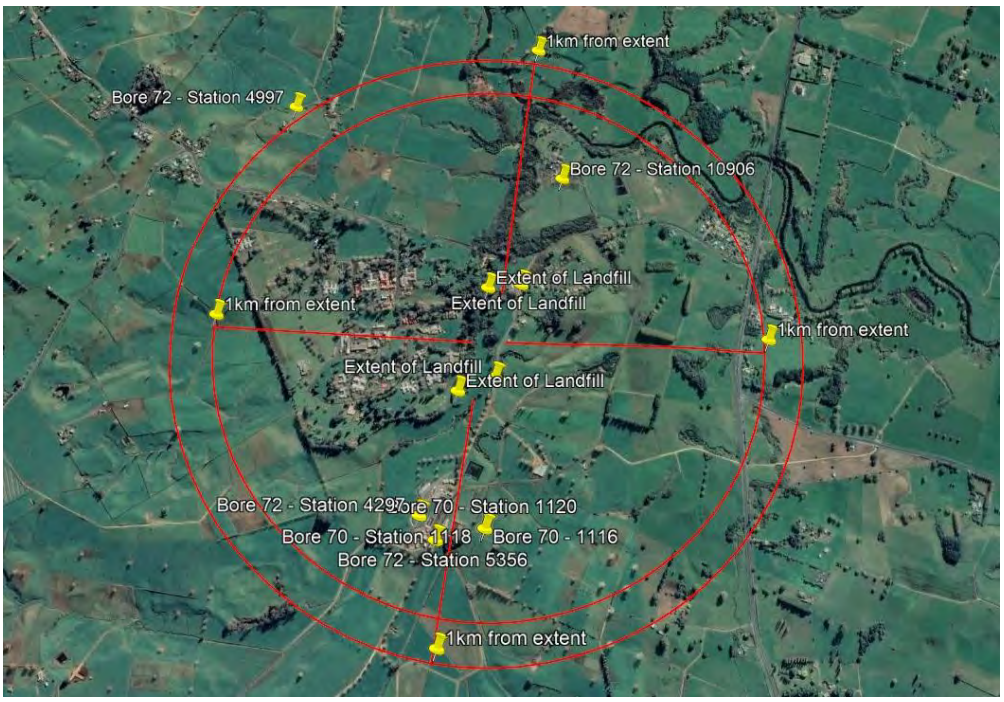


Figure 6: Environment Waikato Groundwater Bore Database Search Results

Waterway / Swamp maps

45. CFG Heritage Ltd (**CFG**) (July 2024) refer to the Site being located at the junction of three waterways, noted in ML 6748 drawn in 1889 as Makaroa, Tarutahi and Wharekōrino Swamps as shown in **Figure 7**.

Figure 7: Tokanui Hospital Site – Historical Plan showing former swamps (from CFG, July 2024)

46. Of these swamps, the Wharekōrino Stream is still present and flows through the Site from south to north, separating the hospital area from the historical Disposal Site area, which is located on the eastern portion of the Site. This stream includes swamp-like features, while the Tarutahi Swamp appears to be part of the Wharekōrino Stream above the Site, and the Makaroa Swamp is no longer present.

Stormwater maps

47. Investigation of the Site's stormwater system has found that runoff from upgradient farmland to the west of the Site has been piped through the Site as shown in **Figure 8** below, meaning these historical watercourses have been infilled and realigned as the stormwater pipe system alignment differs from the historical swamp/watercourse alignment.

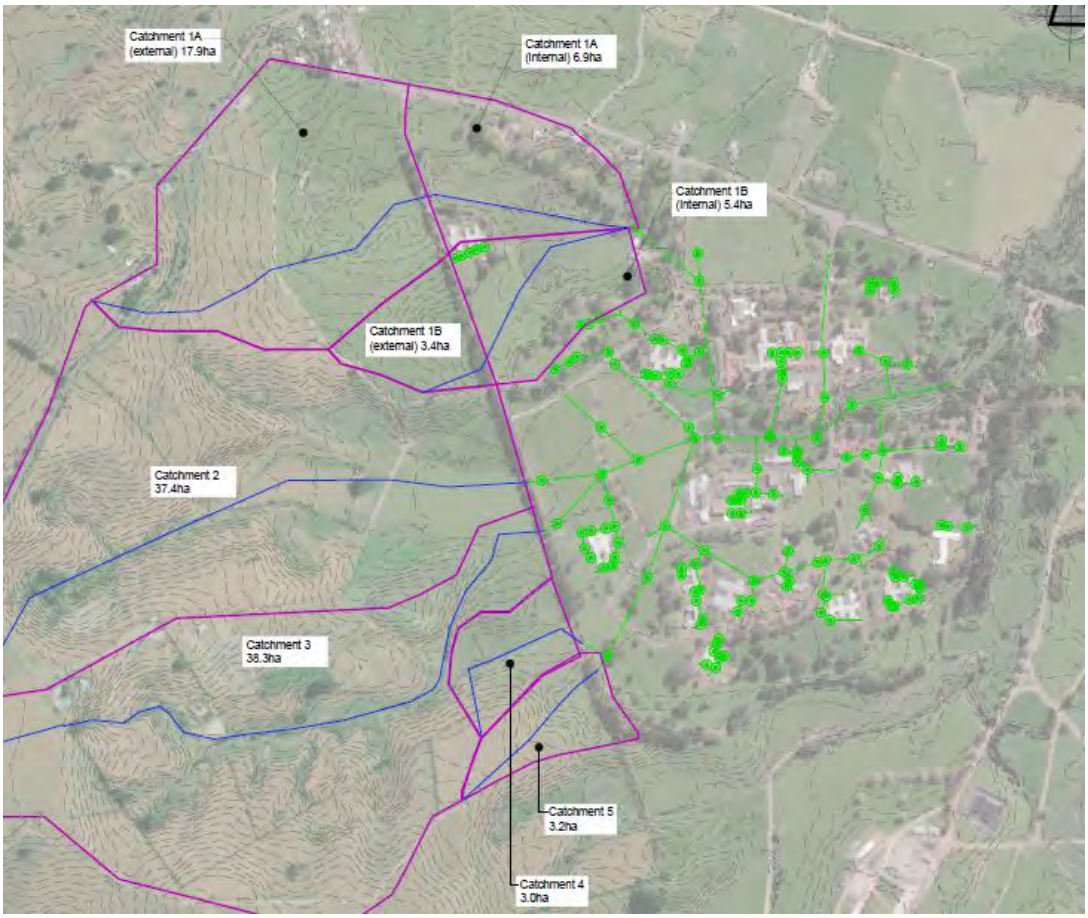


Figure 8: Tokanui Hospital Site – Upgradient catchments that drain through hospital Site via Trunk Stormwater Reticulation

Wetlands map

48. Wetlands identified on the site from the ecological investigation (SLR, 2024), taking into account the latest definition of what is a natural inland wetland

from the National Policy Statement for Freshwater Management 2020 (amended October 2024) are shown in **Figure 9**.

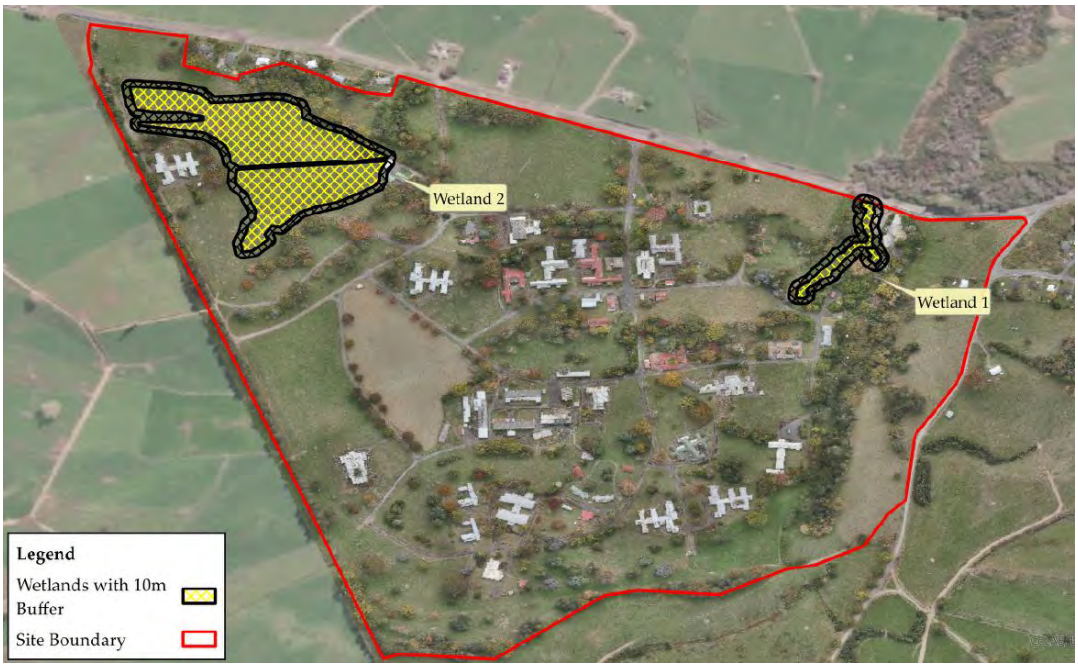


Figure 9: Tokanui Hospital Site – Natural Wetland Extents from SLR Ecological Assessment

Water Take Consent

49. Pūniu River Care holds resource consent AUTH144702.01.01 (valid until October 2037) to take water from the Wharekōrino Stream for irrigation of a 3ha plant nursery during September-March inclusive, based on a daily maximum take of 100m^3 and total annual take of not more than 10,000m^3. The inlet structure is located on the Wharekōrino Stream at the location of the red dot shown below in **Figure 10**, with the disused groundwater bore (Bore 72, Station 10906) indicated by a yellow dot. The water take location is approximately 550m below the Site's northern boundary.

Figure 10: Pūniu River Care Surface Water Take Inlet Location (red dot) on Wharekōrino Stream; yellow dot is location of their bore which is no longer used

SITE INVESTIGATIONS UNDERTAKEN

Fraser Thomas Ltd (FTL) Horizontal Infrastructure Investigation (2023)

50. FTL undertook an investigation and assessment of the condition and extent of all existing "horizontal infrastructure" on the Site. This comprised of:

    (a) all roading and associated paved areas;

    (b) one retaining wall;

    (c) water, stormwater and wastewater reticulation;

    (d) building heating system, comprising an underground concrete ducting system, with steam and condensate pipes that were formerly used to heat the Site buildings; and

    (e) utilities – power and telecom.

51. This investigation involved a desktop review of available information and comprehensive site investigations, including site walkovers, pavement test pits and deflection measurements, CCTV (closed circuit television) and underground services detection, hydro excavation and topographical survey, followed by compiling updated horizontal infrastructure plans and assessment of materials quantities.

52. Multi-criteria assessment and costing of remedial options was undertaken for each type of horizontal infrastructure, leading to selection of a preferred option for each infrastructure type. Final options were confirmed following engagement with iwi and approved by joint-Ministers (refer LINZ Iwi Engagement report, November 2024).

53. This work is reported on in the Horizontal Infrastructure Assessment Report (Appendix I to the Remediation AEE).

54. Supplementary investigations undertaken of the internal roading network found coal tar present across the entire roading network. Most contamination, in terms of areal coverage, was in the surface pavement layers, decreasing in the basecourse and further decreasing in the subbase. The total volume of roading materials containing coal tar was estimated to be 4,177m^3.

55. This work is documented in the Coal Tar Investigation Report (Appendix J to the Remediation AEE) and shown on the Coal Tar Drawings (Appendix H3 to the Remediation AEE).

PSI & DSI Investigations by Others

56. A number of contaminated land investigations have been undertaken on the Site in recent years by various parties, including the following:

    (a) Opus Ltd (2015a) – Tokanui Psychiatric Hospital Site Scoping, Contaminated PSI Report;

    (b) Opus Ltd (2015b) – Tokanui Hospital Demolition Waste Management Plan;

    (c) Opus Ltd (2015c) – Tokanui Building Inspection Reports;

    (d) AECOM (2018a) – Tokanui Hospital Environmental Compliance Observations;

    (e) AECOM (2018b) – AST Removal and Mechanical Pit Dewatering;

    (f) AECOM (2018c) – UPSS Removal Former Tokanui Hospital;

    (g) AECOM (2018d) – PSI Gap Assessment;

    (h) AECOM (2018e) – UPSS Decommissioning at Tokanui Hospital;

(i) AECOM (2018f) – Tokanui Hospital Site Remediation: Options Description and Cost Estimation;

(j) AECOM (2019a) - Tokanui Hospital Site Remediation: Onsite Land Disposal Feasibility Study;

(k) AECOM (2019b) – Tokanui Hospital: Detailed Site Investigation (draft);

(l) AECOM (2019c) – Tokanui Hospital Site Remediation – (refined) Detailed Options Assessment;

(m) WSP (2019a) – Tokanui Village and Hospital Wastewater Upgrade DSI Investigation; and

(n) 4Sight Consulting Ltd (2023) – Asbestos and Lead Paint Building Investigations.

57. The relevance of these reports to FTL's investigations is summarised in Section 4.1 of the FTL Remedial Action Plan (RAP). In summary:

(a) Most of these reports were completed over the 2015-19 period for preliminary investigation and assessment purposes.

(b) These reports collectively provide initial Preliminary Site Investigations (PSI) and Detailed Site Investigation (DSI) of the Site, including its history to understand likely HAIL (Hazardous Activities and Industries List) activities at the Site, identified key Areas of Concern (AoC) and likely Contaminants of Potential Concern (CoPC) arising from the identified HAIL activities, a Conceptual Site Model (CSM) looking at source-pathway-receptor risks, and initial soil sampling.

(c) These reports included building inspection reports, assessing lead paint and asbestos risks, and developed preliminary estimates of demolition materials and contaminated soil quantities.

(d) They include some specific reports addressing the successful removal, remediation and validation of a number of underground fuel tanks and associated infrastructure eliminating any potential ongoing contamination issues from these sources.

(e) The reports include options assessments for site remediation and associated costings, based on available information at that time.

58. Following this initial work, a number of more detailed investigations were undertaken, the most relevant of which are briefly summarised below:

    (a) 4Sight Consulting Ltd (2023) – "Asbestos and Lead Paint Building Investigations" report comprises a comprehensive assessment of all buildings at the Site for Asbestos containing materials (ACM) and lead-based paint to better quantify the location, extent and magnitude of hazardous building materials across the site. Plans of individual buildings showing their findings, along with supporting spreadsheets, are included in this report.

    (b) GHD undertook a PSI of the entire Site in order to comply with Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMGs). This built on the earlier work by others, closing out identified data gaps, identifying all potential HAIL activities, and refining the conceptual site model developed by AECOM to reflect their findings and to inform further soil sampling across the site. The PSI identified a total of 43 locations where HAIL activities potentially or actually occurred on-site.

    (c) GHD then undertook a DSI of the Site during 2023. This involved soil sampling at 192 locations and sediment sampling in nine locations. Overall, 329 samples were collected from across the Site, with the majority of these being tested for appropriate contaminants based on the identified HAIL activities across the Site. As part of this work, HAIL Environmental Ltd (HAIL Environmental) undertook X-Ray Fluorescence (XRF) analysis on 95 transects and individual sampling points, and composite samples from 10 areas of the Site. A combined XRF and leachate analysis was undertaken in the halos of three buildings. These results are discussed and interpreted in the HAIL Environmental Site-Specific Risk Assessment (SSRA) Report referred to in para 60 of my evidence.

FTL/HAIL Environmental Investigations

59. Following review of the combined AECOM and GHD soil sampling locations and results, FTL and HAIL Environmental undertook a supplementary investigation to address identified gaps, covering the following:

    (a) additional XRF transects around building perimeters (halos) with a relatively low sampling density;

(b) additional asbestos sampling around building halos with a relatively low sampling density;

(c) leachability testing of selected samples to assess potential environmental effects if these soils are left onsite, and potential leachability if disposed off-site to landfill; and

(d) investigation of other specific areas of interest – namely Area I (suspected fill area) and the Culvert 2 embankment.

60. These investigations are documented in the Addendum Detailed Site Investigation (DSI) (Appendix K3 to the Remediation AEE). These results are discussed and interpreted in the SSRA report, summarised below in para 60 of my evidence.

61. HAIL Environmental undertook a Site-specific Risk Assessment (**SSRA**), that established remedial standards in accordance with the Deed of Settlement. The standards define a "rural residential remediation standard" for 85% of the Site and "managed remediation standard" for no more than 15% of the Site. Specifically, the remedial standards have been designed to pose minimal risk to food production, to people living on the land, and to soil quality. In relevant parts of the block, the standards also seek to protect water quality, wetland values and associated mahinga kai (traditional value of food resources and their ecosystems). The resulting remedial standards are set out in **Table 1** below.

Table 1: Site-specific Soil Contaminant Remedial Standards

Scenario	Wetland[1]	Rural residential[1]	Managed[1]
Arsenic	9	9	70
Cadmium	0.3	0.9	10
Chromium	100	150	150
Copper	50	280	280
Lead	70	120	460
Mercury	3	3	3
Zinc	150	350	450
DDT[2]	1	2	2
ACM[2]	0.01 %	0.01 %	0.01 %
AF/FA[2]	0.001 %	0.001 %	0.001 %
Fuels and Oils	No odour or staining	No LNAPL[2]	No LNAPL[2]
Benzene	0.11	0.11	0.11*
BaP_{eq}[2]	6	6	35
Hazardous Wastes	Absent	Absent	-

Notes:
All concentrations milligrams per kilogram dry weight, except asbestos % weight for weight, fuels/oils and hazardous wastes.
DDT, dichlorodiphenyltrichloroethane, is an insecticide banned in the 1970s. ACM refers to fragments of asbestos-containing materials, up to 7 mm in size. AF/FA is asbestos fines (AF) and fibrous asbestos (FA). BaP_{eq} is a way of expressing the toxicity-weighted concentration of a group of chemicals called polycyclic aromatic hydrocarbons (PAHs) that are formed by incomplete burning of organic materials. LNAPL (light non-aqueous phase liquid) is a groundwater contaminant such as petrol, diesel or oil that is less dense than water and not very soluble in water.
***Only within 100 m of surface water.**

62. The SSRA also reviewed and interpreted the sampling data collected in all previous investigations referred to above. It identified sources of soil contamination on the Site to include:

    (a) 55 buildings that had asbestos cement roofs or cladding panels, and/or had been painted with lead-based paints, resulting in localised contamination of the building halos.

    (b) A number of localised hotspots associated with non-building areas, including:

        (i) greenhouse/shed footprints in part of the agricultural area in the north of the land, between buildings B34 and B35;

        (ii) historical debris/waste around a substation (building S2) and around building B26 (rubble and other fill material, brick and wire), resulting in contamination with heavy metals and asbestos (S2);

(iii) surface waste and dirt on hard standing near B66 contained asbestos, lead and zinc above managed remedial criteria, as well as substantially elevated arsenic and boron;

(iv) area I: localised fill area, with some construction and demolition waste and asbestos contamination;

(v) Culvert 2 embankment: localised pockets of construction and demolition waste within existing compacted soil embankment across the Wharekōrino Stream;

(vi) localised area with slightly elevated arsenic levels within the WWTP compound; and

(vii) some suspected fill pockets (11 total) around the site, referred to as non-building areas (**NBAs**).

63. The building IDs are shown on the RAP drawings, with drawings R02 and R03 being the most relevant drawings to refer to. The figures attached to the ADSI summarise the combined sampling results from all the investigations undertaken on the Site. Figure 2 of the ADSI in particular gives an overview of the extent of soil contamination across the Site relative to the adopted guidelines, as shown by the orange and red coloured circles. This figure is reproduced below as **Figure 11**.

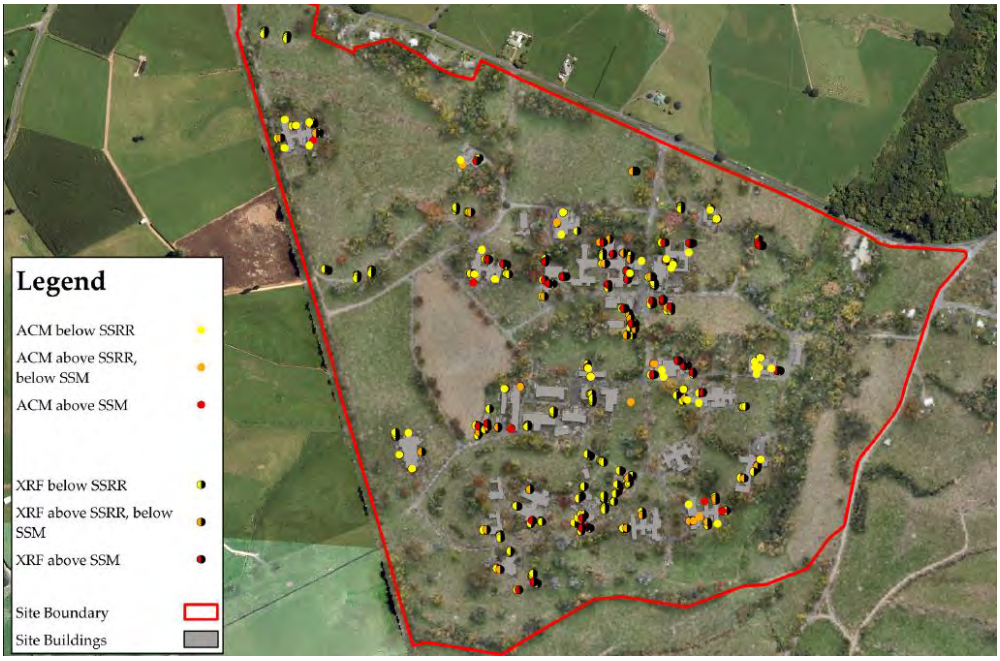


Figure 11: Extent of Soil Contamination from all soil sampling undertaken on site (from ADSI, Figure 2).

64. Overall, the soil sampling undertaken across the Site indicates that it is generally **not contaminated**, as shown on **Figure 11**. The principal contamination issues are limited to asbestos and lead from building materials in localised areas around building halos. Investigations to date have identified nothing likely to compromise the Settlement Deed; the contaminants identified are limited in extent and can readily be remediated or managed. Soils around the buildings listed above will require some remediation to meet the adopted standards, and limited remediation or management is required in the localised hotspot areas referred to above.

65. Furthermore, there were a large number of potential HAIL activities from the GHD PSI that were confirmed to not be an issue. These include the dental building, laundry, morgues, potential sheep dip, sportsfields, substations, wastewater treatment plan, swimming pool and fire station.

66. One additional memo (FTL, 12 August 2025) was prepared post-lodgement of the application to investigate a historical bowling green and small toilet block not covered by the preceding investigations. Results were similar to previous investigations around other structures, except that a localised area of soil around the toilet block contained high level zinc contamination. That soil will need to be mixed with other 'less contaminated soils' and moved into the existing Disposal Site, if consent is granted or taken offsite. The associated additional volumes of contaminated soil were estimated to be 15m^3 from the toilet block and 172m^3 from the bowling green. This Memo is attached as **Appendix SF1**.

FTL Landfill Intrusive Investigation Report (2024) and Agresearch Area Report (2025)

67. FTL undertook an intrusive investigation of the existing landfill site. This involved determining the horizontal and vertical extent of the landfilled area, the nature and estimated depth/volume of the deposited fill materials, overlying cap and topsoil details and key issues and risks. This was done to inform a long-term management strategy for the Disposal Site and to identify potential repair and upgrade works required to address identified compliance issues with current consent conditions.

68. The investigation found a number of issues with its current condition that have the potential to result in adverse human health or environmental effects. These include:

(a) Some areas have non-compliant capping (ie inadequate thickness and/or permeability) and/or topsoil cover in relation to the approved resource consent for the Disposal Site. This will tend to increase leachate generation from direct rainfall onto the landfill while also increasing the risk of some buried material becoming exposed. This represents a potential human health threat.

(b) The landfill has no leachate collection system, so the leachate will flow through the landfill to the groundwater table. The absence of landfill base and side liners and of groundwater subsoil drainage also allows groundwater to come into direct contact with buried refuse in some locations. As a result, groundwater passing through the landfill contains some elevated contaminants from direct refuse contact and leachate ingress, with the groundwater flowing into the Wharekōrino Stream. Elevated boron levels are present in the groundwater and stream. These levels occurred into 2024, albeit within Australian and New Zealand Environment and Conservation Council (**ANZECC**) guideline for protection of 95% of aquatic freshwater species (0.37g/m^3) and long-term irrigation trigger values (0.50g/m^3). This is shown in **Figure 12**.

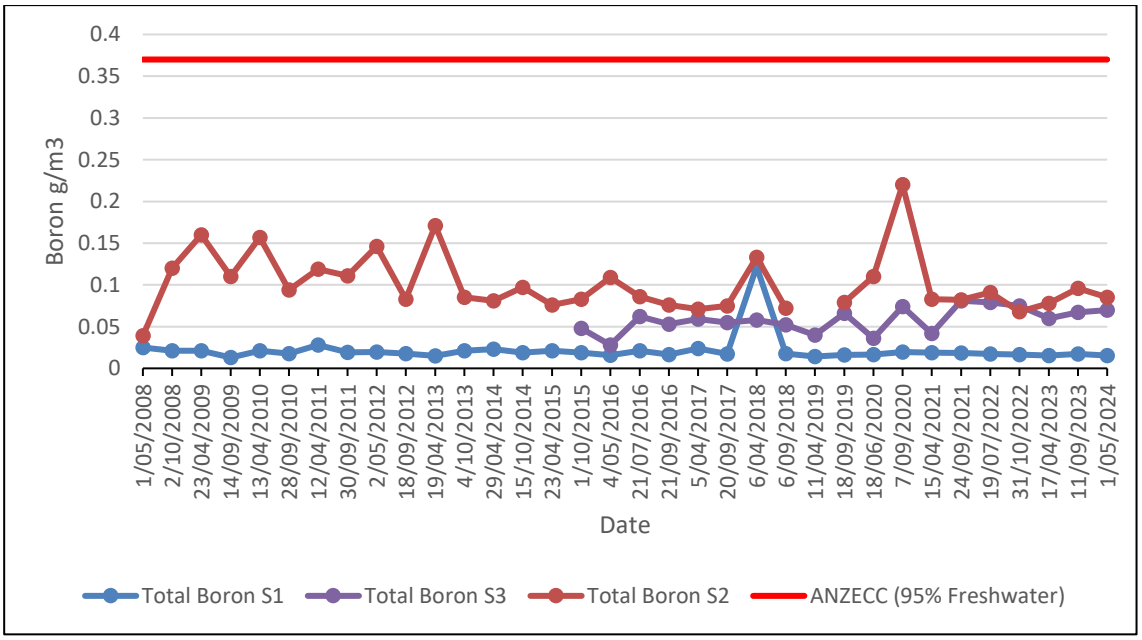


Figure 12: Long-term total boron levels (g/m3) upstream (S1), midstream (S3), and downstream (S2) of the landfill in comparison to the ANZECC (2000) 95% freshwater protection guidelines.

(c) It is important to note that the ANZECC 95% protection guideline for boron was revised upwards in 2021 to 0.94g/m^3 based on errors

identified in the 2000 derivation and new data becoming available. The new guideline is 2.5 times higher than the previous guideline and indicates that the boron risk to aquatic freshwater species is significantly less than indicated by the monitoring data collected to date.

The long-term irrigation use guideline applies to the potential effect of irrigation over up to a 100-year period on the plants being irrigated. All of the monitoring data is well below this guideline.

The stream water is not used for drinking water by any party. However, if it was, the drinking water maximum allowable value for boron is 2.4g/m^3, which is over 10 times higher than the maximum boron concentration measured in the stream to date. Hence, potential effects on human health from drinking stream water are considered negligible.

The criteria listed above are summarised in the File Note attached to my evidence as **Appendix SF2**.

(d) Culvert 3 (1350dia) pipes the Wharekōrino Stream through Area A2/H of the landfill. This culvert is estimated to be between 44 and 65 years old and may be affected by differential settlement from landfill activity, causing leaking joints and potential pipe failure. The landfill areas A2/H are both outside the landfill extent referred to under the existing resource consent. Pipe failure could result in fill/refuse washout down the stream, representing an adverse long-term human health and environmental risk.

(e) Flood modelling of the Wharekōrino Stream has shown that the landfill areas A1, A2, B, C, G and H as shown in **Figure 13** are currently likely to be inundated to varying extents during a 1% annual exceedance probability (**AEP**) storm event, particularly if the two downstream culverts on the stream are blocked or become blocked during the storm. These effects are predicted to worsen with climate change. Areas D, E and F have been found unlikely to be affected by flooding. Flooding of landfill areas could cause scour/erosion of landfill side slopes and possible exposure of refuse, potentially causing downstream pollution and contamination.

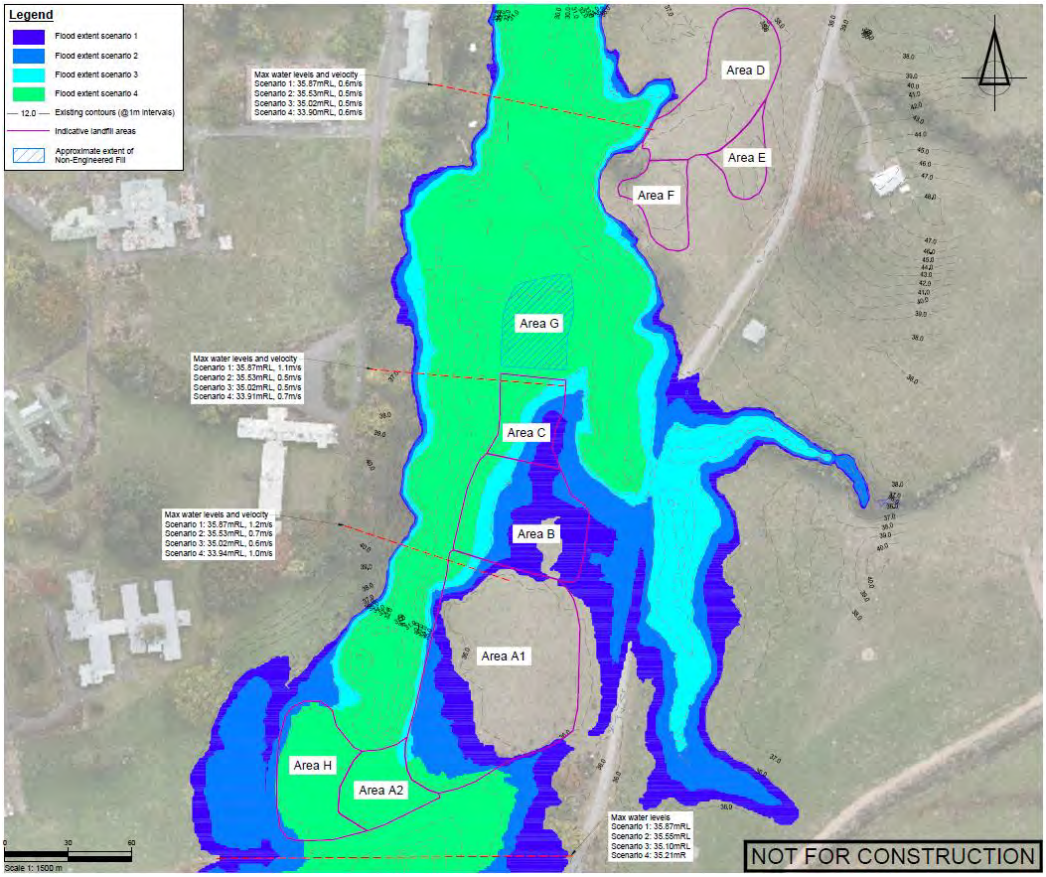


Figure 13: Flood Scenario Modelling Results

Scenario 3 = 1% AEP storm event, all culverts operational (light blue)

Scenario 2 = 1% AEP + climate change event, all culverts operational (medium blue)

Scenario 1 = 1% AEP + climate change event, all culverts blocked (dark blue)

Scenario 4 = 1% AEP + climate change event with culvert 2 and associated embankment removed (green)

(source: FTL (2024) Existing Disposal Site Repair and Upgrade Works report)

69. An additional targeted DSI was undertaken post-lodgement in 2025 of a portion of the existing Disposal Site that was found to be located on land owned and operated by AgResearch Limited (FTL, 2 September 2025). These works found a range of contaminants were present in fill material in this area including heavy metals, boron, polycyclic aromatic hydrocarbons (**PAHs**) and asbestos. It was recommended that landfill remedial works include the relocation of an estimated 373m^3 of contaminated soil and fill materials from this area into the existing disposal site, effectively eliminating this contamination from the AgResearch land. This report is attached as **Appendix SF3**.

OVERVIEW OF PROJECT WORKS

Demolition Works

70. The demolition works are described in the Draft Demolition, Deconstruction and Remediation Management Plan (Appendix P to the Remediation AEE), while demolition plans for the horizontal infrastructure demolition plans are in Appendix H1 of the Remediation AEE.

71. Other relevant reports and drawings comprise the following:

    (a) Draft ESCP (Appendix Q to the Remediation AEE);

    (b) Draft Erosion and Sediment Control Plans (ESCP) (Appendix H8 to the Remediation AEE);

    (c) Culvert 2 drawings (Appendix H4 to the Remediation AEE); and

    (d) Pipe lining plans (Appendix H7 to the Remediation AEE).

72. Proposed demolition works cover the following items:

    (a) **"Vertical building structures":** All above-ground built structures within Areas 2, 3 and 4 of the Site, including associated footings/foundations. This includes historic demolition debris buried around specified buildings that is inferred to come from historic building renovation, demolition and/or extension works; and

    (b) **"Horizontal infrastructure":** Partial removal of the roading, accessways, and site services, as described further below:

        (i) Removal of 3.49ha roading/paving and up to 4,180m^3 of associated coal tar roading materials and reinstatement with cleanfill. The residual 3.5km of roading is to be retained, with the asphalt surface removed and then converted to hardfill farm access track standard.

        (ii) Removal of a redundant road embankment crossing over the Wharekōrino Stream (approximately 6800m^3) including the associated estimated 1350mm dia culvert and reinstatement of the stream, including riparian planting. Almost all of the removed soil is suitable for use as cleanfill for backfilling excavation cavities from hospital demolition works.

(iii) Removal of the entire concrete ducting heating system, including all internal pipes.

(iv) Removal of 4.18km of asbestos cement water supply pipes and removal of an estimated 2.22km of ductile iron water pipes down to 800mm depth.

(v) Removal of an estimated 0.54km of 100-375mm diameter stormwater pipes down to 800mm depth. The trunk stormwater lines are to remain in place as these serve upgradient farmland. These pipes will be lined post-demolition and remediation works to extend their lifetime.

(vi) Removal of an estimated 1.04km of wastewater reticulation pipes down to 800mm depth.

(vii) Removal of 7.32km of underground and 1.37km of above ground power supply and 4.63km of underground telecom cables by direct pulling, or other approved method.

(viii) Removal of 633 associated surface features (manholes, catchpits, fire hydrants, valve boxes, etc.) down to 1m depth.

(ix) Backfilling of excavation cavities with backfill material and reinstatement to pasture, except for part of the roading network, as explained above.

(x) Removal of remaining WWTP infrastructure, grit chamber, inlet pipe and footbridge, trickling filter and stone media, UV treatment system, flow meter and outlet pipe.

Contaminated Soil Remediation Works

73. The contaminated soil remediation works are described in the Remedial Action Plan (Appendix K6 of the Remediation AEE) and in the associated drawings (Appendix H2 of the Remediation AEE). The Remedial Acton Plan was developed from the preferred option identified in the Remedial Options Report (Appendix K5 to the Remediation AEE).

74. The contaminated soil has been classified into the following different categories as set out in the RAP:

(a) **Low Level** contamination: exceeds the Site-Specific Rural Residential (SSRR) Remedial Standard but not the Site-Specific Managed (SSM) Remedial Standard;

(b) **Moderate Level** contamination: exceeds the SSM Standard; and

(c) **High Level** contamination: exceeds Class B criteria for asbestos contamination and Class 1 landfill TCLP[2] criteria for other contaminants and adopted SPLP criteria for the Disposal Site.

The RAP also added remediation criteria based on the removal of fill material containing more than 5% construction and demolition (C&D) waste materials to either the existing Disposal Site or off-site to an approved landfill.

75. Hospital contaminated soil remediation works involve the removal of low and moderate level contaminated soil from around the perimeters (halos) of many buildings on-site, comprising almost entirely allophanic topsoil (based on site observations), and containing primarily lead or asbestos contaminants, plus other non-building areas with localised pockets of fill containing construction and demolition debris and some heavy metal, hydrocarbon and/or asbestos contamination.

76. Provisional allowances for additional contaminated soil removal have been allowed from the following locations:

(a) Soil scrape across the subfloor space of all buildings excluding those with concrete floor slabs, post-demolition and post-contaminated soils removal comprising building footprint areas x 150mm depth.

(b) Soil scrape around all buildings, post-demolition and post-contaminated soils removal, comprising 1m wide strip x 100mm deep, excluding areas already remediated (**Halo Scrape**) as a conservative safety measure. This soil is not expected to be contaminated at all.

(c) Removal of assumed asbestos contaminated soil from an estimated average 100mm wide ring of soil around the asbestos watermains.

[2] TCLP (toxicity characteristic leaching procedure) testing is used to check for leaching under typical municipal solid waste landfill conditions (more acidic environment) as part of landfill waste acceptance procedures, while SPLP (synthetic precipitation leaching procedure) testing is used to check for leaching under normal rainfall conditions (less acidic environment). The latter is considered more applicable to checking for potential environmental effects from the transfer of contaminated soil from the hospital to the Disposal Site and was added to the "high level" contamination definition as part of the Addendum DSI for the Agresearch portion of land within the Disposal Site.

(d) Contingency allowance for unexpected contaminated soil discoveries.

77. Estimated contaminated soil removal quantities are summarised in **Table 2**.

Table 2: Tokanui Hospital Site Remediation: Estimated Contaminated Soil Volumes (solid measure)

Contamination Level Classification	Contaminated Soils Description	Source	Estimated Volumes (m^3)
Low Level	Exceeds site specific rural residential soil remedial standard but not the managed remedial standard.	Near Buildings	**934**
		Other Areas[1]	**1,047**
Moderate Level	Exceeds site specific managed remedial standard.	Near Buildings	**1,363**
		Other Areas[1]	**50**
		TOTAL	**3,394**
PROVISIONAL ALLOWANCES			
Estimated halo scrape post-building demolition		Some	**594**
Estimated building subfloor space scrape, post-building demolition		Some	**1,930**
Inferred asbestos contaminated soil around asbestos watermains		Likely	**319**
Contingency		Some Likely	**1,400**
		TOTAL INCLUDING PROVISIONAL ALLOWANCES	**7,637**
		(Rounded)	**(7,700)**

Notes:

1. **Other areas comprise Area I, Culvert 2 embankment, WWTP, Agricultural Area and Demolished Structure area and Area North of B26.**
2. **Additional 152m^3 from bowling green and 15m^3 from toilet block**

Landfill Repair and Upgrade Works

78. Proposed landfill repair and upgrade works were developed through a high-level assessment of options to repair and/or upgrade the existing Disposal Site.[3]

79. The preferred option identified through this process comprises the following:

(a) improved capping of the entire landfill;

[3] This work is reported on in the Existing Disposal Site Repair and Upgrade Works Report (Appendix B to the Landfill AEE).

(b) removal of Culvert 2 (under horizontal infrastructure above) to reduce the flood risk to the landfill;

(c) transfer of low and moderate level contaminated soil from hospital demolition works into Area E/F and isolated medical waste removal, with excavated material from this area being used as backfill in the demolition works;

(d) shifting of fill/refuse material from the south-eastern corner of Area A1 that is located on AgResearch land (Section 3 SO 534156), outside of the subject site, into the A1 area within the subject site;

(e) shifting of fill/refuse material from Areas A2/H into Area A1 and grout filling of Culvert 3, plus a new shorter culvert running to the NW and stream reinstatement, with a new embankment on the eastern side of the stream to separate the reclaimed area from existing landfill area A1;

(f) installation of a groundwater diversion drain; and

(g) maintain existing southern farm track crossing embankment, raising it slightly to assist with flood mitigation.

80. These works were shown on the Landfill Upgrade and Repair Plans (Appendix A to the Landfill AEE) and the Culvert 3 plans (Appendix H6 to the Remediation AEE). The plans have gone through several iterations since then and the latest engineering plans are Issue Set 6 (20 August 2025), which supersede the earlier drawings. These are attached to my evidence for completeness as **Appendix SF4**. I have also attached a Schematic, that provides an overview of the proposed landfill upgrade and repair works, to my evidence as **Appendix SF5**.

Monitoring Processes

81. Comprehensive monitoring will be undertaken during the works, including:

(a) pre-works and post-works external road dilapidation surveys for Te Mawhai Road 500m either side of the main site entrance and at the Te Mawhai Road intersection with SH3 will be undertaken by a contractor to check for any damage to this roading network that may be attributed to the demolition and remediation works traffic, with any confirmed damage being repaired by the contractor;

(b) pre-works and post-works CCTV survey of the trunk stormwater system to check for any damage to this network that may be attributed to the demolition and remediation works, with any confirmed damage being repaired;

(c) air monitoring for asbestos fibres around specific buildings (Class A works), while air monitoring for Class B and below will be at the discretion of the asbestos assessor;

(d) validation sampling post-removal of contaminated soil from remediation areas to confirm that site remediation has been successful, with additional soil being removed if necessary to achieve this, based on validation sampling results;

(e) regular inspections of all erosion and sediment controls, including after significant rainfall events, and water quality monitoring of discharges from any decanting earth bunds and sediment removal ponds;

(f) water quality monitoring in the Wharekōrino Stream for pH and conductivity to check for changes in stream water quality, by comparison with baseline monitoring undertaken pre-works. The latter is in progress, with six sampling rounds collected to date; and

(g) ongoing routine landfill visual inspections and groundwater and stream water quality sampling in accordance with the existing landfill resource consent requirements.

82. Protocols have also been established for the following:

(a) archaeological accidental discoveries; and

(b) contaminated soil accidental discoveries.

83. Post-works, LINZ retains responsibility for the landfill in perpetuity and new landfill resource consents will be in place, replacing the existing consents. The Closed Landfill Aftercare and Monitoring Plan submitted with the Landfill Application (Appendix Q to Landfill AEE) sets out ongoing inspection and monitoring requirements for the landfill. No other post-works monitoring is proposed across the rest of the Site.

ASSESSMENT OF ACTUAL AND POTENTIAL EFFECTS ON THE ENVIRONMENT

Vertical Infrastructure

84. All vertical infrastructure is to be removed from the hospital site and either reused, recycled or disposed of off-site to an appropriate disposal facility. This includes all buildings, including their foundations and footings.

85. None of the associated demolition materials are to disposed to the existing Disposal Site.

86. Demolition cavities from buildings foundations and footing removals will be backfilled with appropriate materials, and then retopsoiled and grassed, along with other disturbed areas, and returned to pasture.

Horizontal Infrastructure (applies to Remediation Application)

87. The removal of all horizontal infrastructure to 800mm bgl (below ground level) for all pipes (to top of pipe), ducting and cables, and associated structural components down to 1000mm bgl, followed by backfilling with appropriate clean soils and crushed concrete (in appropriate locations) will ensure that the Site is remediated to be suitable for future rural residential and productive land use.

88. The retention of the trunk stormwater lines and their rehabilitation by lining will ensure that the existing stormwater system will continue to provide for the conveyance of runoff from upgradient rural areas via multiple inlets and pipe reticulation under the Site and from catchpits serving a number of flood detention basins within the Site, to the Wharekōrino Stream by a single outlet.

Contaminated Land (applies to Remediation Application)

89. Currently, the Site has a relatively small volume (considering the scale of the site) of identified soil contamination, classified as being low-moderate level. This is primarily located around buildings, along with a number of non-building areas. The main contaminants are asbestos and lead (and to a lesser extent zinc and some other heavy metals).

90. It is important to understand the nature of the “contaminated soil”. It comprises:

(a) 100% soil except for some isolated areas which may contain up to 5% of inert C&D materials (eg brick fragments).

(b) It contains low-moderate level heavy metal (primarily lead) and low level asbestos contamination (generally <0.001% but with some areas above this (<0.01% fibrous asbestos/asbestos fines and <1% ACM)). For the main metal contaminant (lead), any soil with a lead concentration greater than 120mg/kg has been classified as contaminated. This rural residential site-specific standard is 1.33 times stricter than the National Environmental Standard: Contaminated Soils Guideline of 160mg/kg for rural residential land use with 25% produce consumption. The 160mg/kg standard means that you could eat 25% of your produce grown in soil with this lead concentration over a very long time period before you had any adverse effects on your human health. If the land was instead in agricultural use (no produce consumption), then this guideline increases to 250mg/kg[4]. Hence, more soil has been classified as contaminated than would have occurred if less strict standards had been adopted. Conversely, the contaminated soil that is being shifted to the landfill has a very low risk to human health.

(c) It does not include refuse or any other hazardous materials.

91. Furthermore, leachability testing has shown a low potential for the lead and zinc contamination to leach and hence there is a low potential for the soil contamination to affect surface and ground water, meaning the environmental risk from this soil is also very low.

92. This is explained further in the FTL Addendum DSI and the Addendum DSI (Agresearch Area) and summarised here. SPLP testing of soil around the most impacted buildings with high lead paint found that for the average total lead concentration of 455mg/kg, the SPLP leachability was predicted to be 0.01mg/L, while the worst-case leachability was around 0.055mg/L. The SPLP testing results are shown in **Figure 14** below.

[4] See Ministry for the Environment *NESCS Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health*, (June 2011) at Table 54.

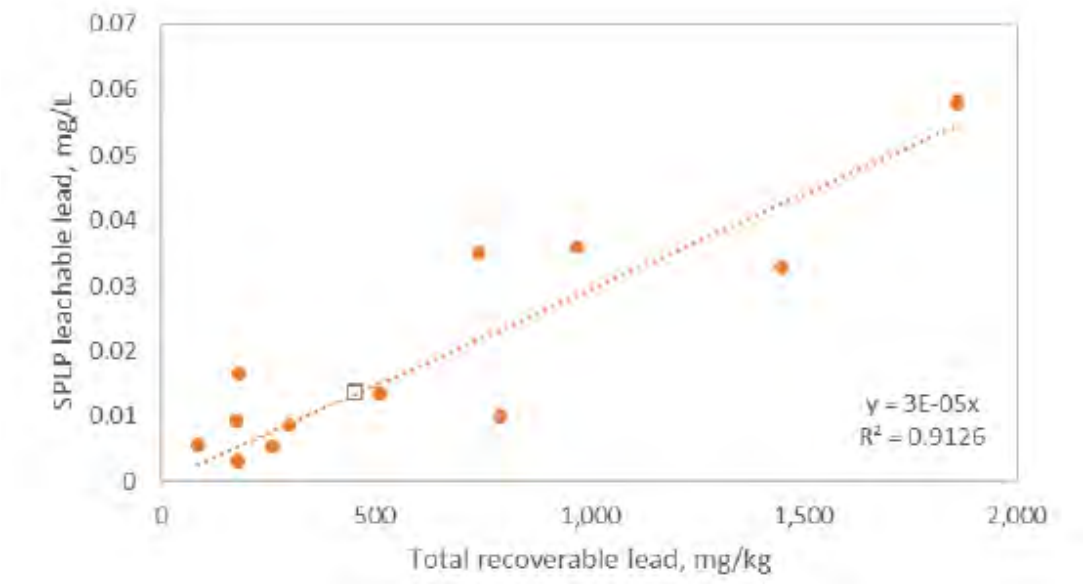


Figure 14: SPLP Test Results for Most Impacted Buildings with High Lead Paint

93. The results of this analysis were compared with a target leachate concentration value, which was derived by multiplying the current Drinking-Water Standards for New Zealand (DWSNZ) (2022) value for lead and the ANZECC aquatic protection values (95% Level of protection in Freshwater Species) lead value, by their respective dilution and attenuation factors (DWSNZ = 20x, ANZECC = 100x), as per the methodology outlined in the WasteMINZ Technical Guidelines for Disposal to Land (Revision 3.1 – 2023) for Class 3 landfills, which is the best fit to the existing Disposal Site. This gave a worst-case target SPLP concentration of 0.34mg/L, which is 34 and 6 times higher than the average and worst case SPLP test result shown in **Figure 14** above. This means that all low-moderate level lead-contaminated soil can be safely disposed to the Disposal Site without any significant leaching occurring that might pose a human health and environmental risk.

94. Similar testing for zinc leaching found that SPLP leaching was typically not more than 0.1mg/L in all samples tested, except for one at 0.5mg/L. The corresponding WASTEMINZ Class 3 landfill SPLP target for zinc is 0.8mg/L, which is readily complied with.

95. Furthermore, this testing was done on the worst impacted buildings and hence is representative of worst-case conditions. The majority of the contaminated soil being shifted to the Disposal Site will have lower lead concentrations, while zinc was only an issue in a limited number of samples. Hence, the overall average SPLP leaching from this material for lead, zinc

and other heavy metals is expected to be significantly less than the SPLP results reported on here.

96. The proposed remedial works will address soil contamination issues, eliminating contamination sources through removal of the hospital buildings and associated infrastructure, making the Site fit for purpose for future rural residential and productive land use.

97. All confirmed low-moderate level contaminated soil and any additional low-moderate level contaminated soil found during the remediation works will be removed and transferred to the existing Disposal Site, where it will be placed, compacted and then capped with a low permeability cover.

98. These works will mean that all contaminated soils on the Site will be effectively encapsulated in one place in an engineered landfill cell within the existing Disposal Site and managed in perpetuity by LINZ.

99. Collectively, these works should ensure that the post-remedial human health and environmental effects of the contaminated soils on-site contained in the Disposal Site are less than minor – ie you could eat at least 25% of your produce intake on this land for or grow animal fodder crops or graze animals on this land without adverse effects on human and animal health and on crop growth and crop and animal edibility, while any leaching from the deposited soils is unlikely to have any adverse effects on the environment.

Erosion and Sediment Effects (applies to both Applications)

100. Erosion and sediment effects will be addressed during the demolition, remediation and landfill repair/upgrade works through the implementation of best practice erosion and sediment control devices complying with Waikato region requirements.

101. These measures are set out in the Draft ESCP (Appendix Q to the Remediation AEE) and associated drawings (Appendix H8 to the Remediation AEE); and the Draft ESCP (Appendix D to the Landfill AEE).

Dust, Noise and Vibration (applies to both applications)

102. Standard dust control measures will be used to control dust at the Site, generally following the procedures set out in *Good Practice Guide for Assessing and Managing Dust* (Ministry for the Environment, 2016). Appropriate measures to manage and mitigate dust effects will be selected

by the contractor from a “toolbox”, as set out in the Remediation and Landfill ESCPs. These measures include transporting all contaminated soil in covered trucks and regular wetting of internal Site roading, as required, to mitigate dust generation and release.

103. Airborne contaminants relate primarily to any contaminants entrained with dust and asbestos fibres. Dust is expected to be very minor and will be managed by the dust controls described above. Asbestos will be managed by industry standard procedures for the relevant asbestos class and by air monitoring for asbestos fibres in appropriate locations.

104. All works will be undertaken in accordance with the requirements of *NZS 6803: 1999 Acoustic – Construction Noise* and any relevant resource consent conditions, including restrictions on working hours and on acceptable noise limits at specified locations.

105. Any effects of vibration will be temporary, limited to the duration of construction works and controlled by following relevant measures from *DIN 4150-3:1999 Structural Vibration – Part 3 Effects of Vibration on Structures*.

Effects on Hydrological Systems, including the Wharekōrino Stream (Stream) Flows; Wetlands; and Aquifers (applies to both applications)

Stream Effects

106. The application included an assessment of the proposed works on hydrological systems. Additional assessment was undertaken post-lodgement in response to queries raised by various parties. These issues primarily related to the effects on stream low flows and ecological effects, including adequate provision for fish passage.

107. Stream low flows are expected to be similar, or slightly higher than, existing. This is because the removal of approximately 6.2ha of impervious area, of which 2.7ha of existing roading will be converted to farm gravel tracks, is expected to result in a small increase (up to 5%) in base flows (low flows) in the stream (FTL Memo, 26 June 2025). This memo is attached to my evidence as **Appendix SF6**.

108. Conversely, the proposed works are estimated to result in small decreases in stream flows and volumes at Te Mawhai Road for storm events, ranging from up to 2.5-3% for an 8-month storm event to up to 0.8-1.5% for 2-100 year

storm events, due to the same reduction in impervious area (FTL Memo, 26 June 2025; **Appendix SF6**).

109. Works within the Wharekōrino Stream are limited to the removal of Culvert 2 and the associated road embankment, the construction of the new Culvert 3, including inlet gabions and riprap, the grout filling and sealing of the existing Culvert 3; and removal of the footbridge and grit chamber associated with the decommissioned WWTP.

110. The grit chamber and footbridge can be removed without interrupting stream flows.

111. For the culverts, the majority of these works can be undertaken with normal stream flows being maintained through the existing culverts. It is only the final stage of works that would involve temporary, short-term damming of the works area and a pipe or pump diversion of stream flows around the works area, still maintaining normal stream flows except for within the works areas themselves. These works are proposed to be undertaken during times of low-flow and completed as quickly as possible, with an expected duration of 2-4 weeks each.

112. Design changes made to the landfill works post-lodgement primarily relate to reducing the amount of refuse material requiring transfer, increased naturalisation of the stream and improved provision of fish passage. This has been achieved by:

    (a) shifting the proposed new culvert further to the north-west and installing a long new stream channel section (approx. 105m) to reduce disturbance to existing landfilled materials;

    (b) embedding the proposed 1350mm diameter culvert by 340mm, which is an approved method of providing for fish passage, from the NIWA Fish Passage Guidelines; and

    (c) modifying the stream design: adding a gentle meander, naturalisation using 150-300mm deep pools, rocks and logs; low flow channel; riparian planting; and resting pools at the culvert inlet and outlet, with the outlet pool also functioning as an energy dissipation basin for storm events. Collectively, these features together with the culvert embedment should ensure that fish passage along the new stream and Culvert 3 is possible under most conditions, except during certain storm events, which will be of short duration.

The fish passage assessment is reported on in the FTL Memo dated 21 August 2025, attached to my evidence as **Appendix SF7**.

113. The proposed contaminated soil remediation works will also significantly reduce the already low potential for leaching of heavy metals from contaminated soil within the Site by removal of these materials from the site and their encapsulation within a landfill cell on the Disposal Site.

North-western wetland

114. Demolition works in the north-western wetland comprise the following:

    (a) Removal of an above ground wastewater reticulation network comprising 150-160mm diameter pipework, with concrete supports and thrust blocks at regular intervals.

    (b) Removal of a below ground electrical supply cable, that runs to sub-station S7. This is likely to be a 11kV line and may be either direct buried or ducted in steel pipes. Site investigations found that most electrical pipes were on average 0.9m deep.

    (c) Removal of the garage associated with the Doctor's Flats (Building B76).

115. The proposed methodology for removal of these items is set out in Section 15.1 of the Draft Demolition, Deconstruction and Remediation Management Plan and is designed to minimise damage to the wetland, while any damaged vegetation areas will be reinstated post-works.

North-eastern wetland

116. Demolition works within or close to the north-eastern wetland area relate to completing removal of remaining WWTP items. Of these works, the following involve works either within the wetland or within the wetland 10m buffer:

    (a) Item 4 – outfall pipe removal (~7m within wetland buffer zone);

    (b) Item 6 – removing edging around former humus tank (within buffer);

    (c) Item 7 – removing trickling filter and media (partly in buffer area);

    (d) Items 8-11 – removing grit chamber, wastewater inlet pipe and footbridge (within wetland); and

(e) Item 13- removing wastewater pipes down to 800mm depth out to the boundary with the road reserve and remove the short length of 380OD stormwater pipe and associated three wastewater manholes (partly within wetland buffer area).

117. The proposed methodology for removal of these items is set out in Section 15.2 of the Draft Demolition, Deconstruction and Remediation Management Plan and is designed to minimise damage to the wetland, while any damaged vegetation areas will be reinstated post-works.

Aquifers

118. The proposed hospital demolition and remediation works are not expected to impact any groundwater aquifers in this area. They are likely to have a small beneficial benefit on shallow groundwater flows (interflow) to the Wharekōrino Stream, as a result of an approximately 5.1% decrease in impervious area within the hospital site (refer FTL Memo, 26 June 2025).

119. The works will also further decrease the already low risk of heavy metals leaching from contaminated soils due to their transfer and encapsulation within the Disposal Site.

Flood Risk and Mitigation (applies to Landfill Application)

120. Flood modelling has been undertaken to assess potential flood mitigation options and other repair/upgrade works that will reduce flood water levels, reducing the landfill area exposed to potential flooding.

121. Overall, Culvert 2 must be removed to have any significant effect on reducing flooding effects on the landfill from the Wharekōrino Stream.

122. Removal of the existing Culvert 3 and replacement with a shorter new culvert and associated raised southern embankment over it is also generally beneficial for flooding.

123. Modelling of more regular flood events (2-to-20 year storm events) showed the works, particularly removal of Culvert 2, will have a minor effect on Te Mawhai Road in more frequent storms, causing no overtopping of the road in the 2 year (with and without climate change) and 5 year storms (no climate change) and only slightly more “nuisance” flooding in the 20 year storm (with and without climate change) and the 5 year storm with climate change (5-

20cm increase), but no significant increased adverse effects in terms of flood hazards compared with the existing situation.

124. For a 1% AEP storm event, with or without climate change, flood levels and hazard across Te Mawhai Road will increase by an estimated 9cm and 30cm without and with climate change. However, the increase would only last for a short duration (likely not more than one hour), while the total flooding duration is predicted to decrease from 15.7h to 14.3h. Emergency access/egress is maintained for all residents living either side of the road from Te Awamutu in this scenario. On this basis, it was considered that installing a second culvert under Te Mawhai Road is not required. These findings were discussed with WDC and accepted by them.

Landfill and Leachate Generation (Landfill Application)

125. During the landfill repair and upgrade works, appropriate measures will be put in place to ensure that potential human health and environmental impacts are minimised, particularly in relation to contact with any hazardous fill materials, leachate and stormwater management and erosion and sediment control. These include:

    (a) strict controls on access;

    (b) worker personal protective equipment and strict hygiene protocols;

    (c) use of decanting earth bunds and proprietary sediment removal devices, including flocculation dosing if required;

    (d) dust control;

    (e) setting up temporary diversions during stream works; and

    (f) strict quality assurance controls on landfill capping works.

126. Ongoing long-term consent compliance water quality monitoring has found that there are elevated dissolved boron levels within groundwater that passes through the landfill, leading to increased boron concentrations in the stream. However, stream boron levels are well within ANZECC 2000 95% freshwater trigger levels (0.37g/m^3 limit), the relevance of which has been explained in paragraph 68 of my evidence. The current situation is shown in **Figure 15**.

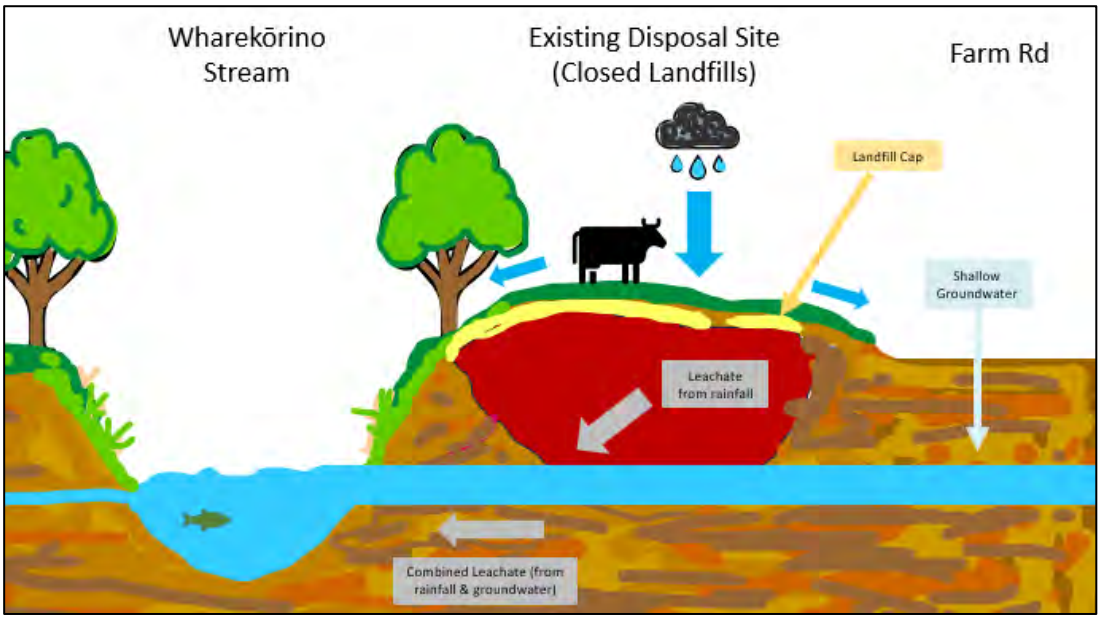


Figure 15: Current Boron Leaching Pathways to Stream

127. The landfill repair and upgrade works will ensure that the entire landfill is capped with an appropriate low permeability cap, designed and installed to a high standard. Further, a groundwater intercept trench will be installed on the eastern side of the southern landfill to divert shallow clean groundwater around the landfill (avoiding it from becoming potentially contaminated. Groundwater flows under the northern landfill area deeper and generally do not intercept buried fill material. The capping works are expected to significantly reduce the amount of rainfall that infiltrates through the landfill cap, while groundwater passage through existing landfilled material should virtually be eliminated. The future situation is shown in **Figure 16**.

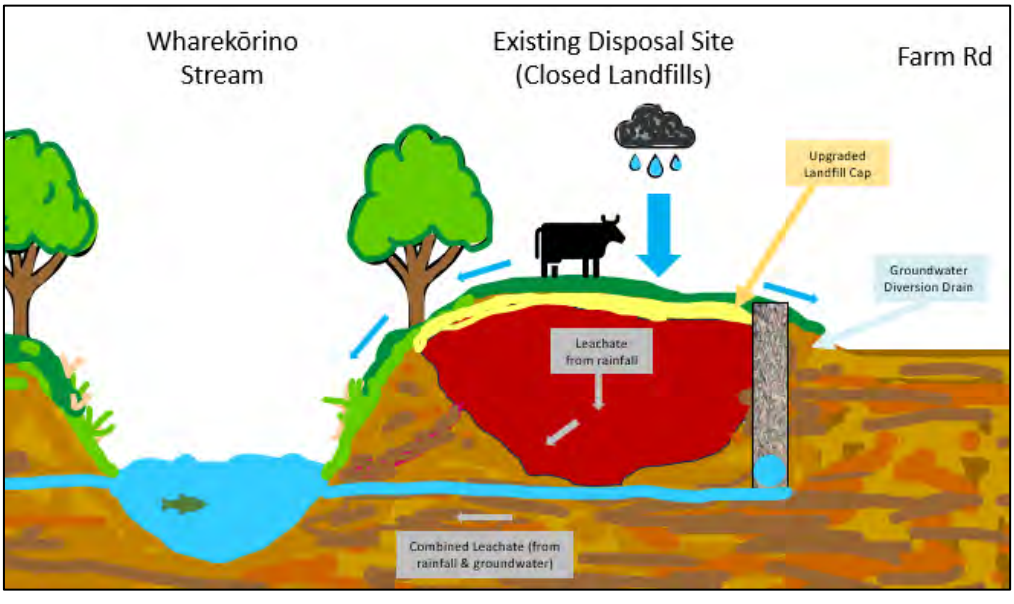


Figure 16: Post-Upgrade Works, Reduced Boron Leaching Pathways to Stream

128. Our assessment estimates these measures should reduce leachate volumes and boron discharges to the Wharekōrino Stream by an estimated 72-92%, as shown in **Figure 17**. This should lower boron concentrations measured at the downstream sampling location from their current annual average level of 0.0957g/m^3 to within the range of 0.00082-0.0227g/m^3. However, it may take between just over one month and seven years for the landfill upgrade and repair works to be reflected in corresponding reductions in boron concentrations reaching the stream based on estimated groundwater travel times. It is expected that similar reductions of other contaminants would also occur, based on the estimated reduction in leachate volumes. This is reported on in the FTL Memo dated 20 August 2025, attached to my evidence as **Appendix SF8**.

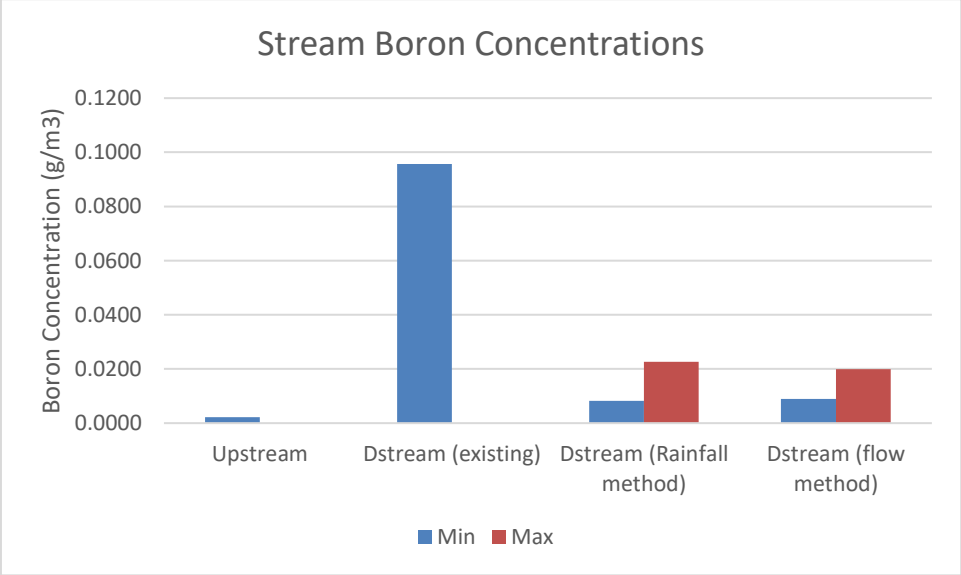


Figure 17: Estimated Downstream Boron Concentrations in Stream (rainfall and flow methods) compared with Existing Situation (Upstream and Downstream)

129. During consultation with Te Nehenehenui Trust, they raised a query about the potential effects of the boron levels in the stream on the irrigation of plants at the Pūniu River Care nursery, which takes water from the Wharekōrino Stream for nursery irrigation purposes, approximately 550m downstream of the Site. My comparison found that the ANZECC (2000) 95% freshwater protection species limit (0.37g/m^3) was stricter than corresponding short- and long-term irrigation limits (0.50g/m^3) that apply to sensitive plants. This means that as boron levels in the stream are well within the ANZECC 95% criteria, use of stream water for nursery irrigation is unlikely to have any adverse effects on the plants (refer attached File Note in **Appendix SF2**).

130. This assessment was limited by a lack of specific data on boron tolerance for nursery plants. However, research shows that boron tolerance varies by species and depends on factors such as growth medium and management practices. For example, plants grown in bags are typically in the nursery for a short period, much shorter than the 20 years used to derive short term irrigation use guideline referred to above. New seedlings brought into the nursery would be in new planter bags containing fresh soil. For such practices, the plants are likely to be able to more tolerant of boron, further supporting the use of stream water for irrigation purposes is unlikely to adversely affect nursery plants.

131. In my opinion, elevated boron levels in the Wharekōrino Stream waters are unlikely to detrimentally affect nursery plants at present and any effect is expected to significantly reduce in the future.

132. Conversely, any plants planted as seeds on the Site or Disposal Site are unlikely to be affected by boron levels as the elevated boron is associated with coal ash buried within in the landfill, which will be encapsulated under the proposed improved landfill cap.

RESPONSES TO SUBMISSIONS

Contaminated Soils and Leachate Generation

Mitigated option

133. Te Nehenehenui Trust's submission has raised concerns about the landfill works. They support a negotiated, mitigated option, where:

    (a) the landfill upgrade application stands and is implemented;

    (b) low level waste from the hospital is disposed of on-site within the existing disposal site;

    (c) long term monitoring is agreed; and

    (d) off-site disposal is used only for the most offensive material.

134. In my opinion, the proposed landfill repair and upgrade works complies with all these criteria as explained in my evidence above.

Legacy contamination issues

135. Te Nehenehenui Trust's submission has raised concerns that ongoing monitoring requirements need to be carefully considered to ensure any legacy contamination issues associated with leachate are quickly identified and addressed.

136. The draft Landfill Aftercare and Monitoring Plan sets out ongoing inspection and monitoring requirements, which are generally in line with current consent requirements (annual visual inspection, six monthly ground and surface water sampling and analysis, and annual reporting to WRC).

137. FTL has been providing monitoring services to LINZ for the Tokanui landfill since 2022 and has also reviewed historical annual reports prepared by others, dating back to 2016. In my opinion the current system works well and the monitoring frequency is reasonable, particularly taking into account the estimated slow travel time for any leachate from the landfill to reach the stream – from one month to seven years (refer paragraph 128). In my opinion the draft Landfill Aftercare and Monitoring Plan inspection and monitoring requirements will ensure that legacy contamination issues will be appropriately monitored.

Coal ash and slab and contaminants from leachate discharge

138. Gordon Thompson's submission raises concerns about the historical burning of rubbish and coal ash and slag being later poured over the rubbish, leading to potential leaching from the largest dump site (southern landfill).

139. Yvonne Waho's submission refers to the risk of contaminants entering groundwater and surface water via leachate discharge.

140. In response, these issues are addressed in paragraphs 125-131 of my evidence. The proposed works are estimated to reduce leachate volumes, boron and other contaminant discharges to the Wharekōrino Stream by an estimated 72-92%. It is estimated this reduction will be realised over a period of one month to seven years, based on the relatively slow travel time of groundwater laterally through the earth to the Stream.

Effects on hydrological systems

Wharekōrino Stream flows

141. Relevant submissions on this topic are:

(a) Te Nehenehenui Trust's submission seeks assurance and associated consent conditions which address the potential for net flow reduction in the Wharekōrino Stream. They advise that this may require monitoring of baseline stream flows and monitoring to ensure additional sediment load and contaminants are not entering the stream as a result of the works.

(b) Nigel Ngahiwi's submission raises concerns about disruption to the natural flow of the awa and potentially increasing the risk of flooding both upstream and downstream, and compromising the mauri of the Wharekōrino Stream through the discharge of stormwater and leachate to it.

(c) Sam Roa's submission refers to significant environmental impacts on Te Taiao surrounding the Wharekōrino Stream.

(d) Yvonne Waho's submission raises concerns relating to stream diversion and long-term disruption to the hydrological system, including the Wharekōrino Stream, wetlands and aquifers.

142. I consider the potential for a net flow reduction in the Wharekōrino Stream to be **low** (as explained in paragraphs 106-110 and summarised here). Baseflows are estimated to increase by up to 5%, while low flows will be maintained in the stream during the works, with "pump-overs" only required for short periods of time (maximum 2-4 weeks and typically less). Effects on stream flow will be monitored by testing treated stormwater discharges from any sediment retention ponds, decanting earth bunds and mobile treatment devices, and by ongoing monitoring of stream pH and conductivity below the works area, with these results being compared with pre-works baseline monitoring.

143. Potential wetland and aquifer effects are addressed in paragraphs 114-117 and 118-119 respectively of my evidence.

Protection of ecological restoration work

144. Te Nehenehenui Trust's submission raises concerns about the protection of completed ecological restoration work on the Wharekōrino Stream and Pūniu River due to earthworks, diversion activities and sediment retention structures, potentially altering downstream hydrological regimes, affecting fish passage and compromising habitat stability in the Wharekōrino Stream. They also refer to Pūniu River Care holding a water take consent to supply

irrigation to the nursery operation, which is dependent on flows from the Wharekōrino Stream.

145. In response, the effects of earthworks, diversion activities and sediment retention structures are expected to be minimal, short term and potential effects on stream hydrology and completed ecological restoration work will be mitigated through implementation of proposed erosion, sediment and diversion controls. Fish passage has been provided for in the design and should be enhanced compared with the existing situation. Habitat stability will likely be improved through incorporation of resting pools, logs, rocks and other natural features in the new stream reach, while the stream hydrological flow regime is not expected to be altered. Furthermore, the proposed works will create approximately 145m of new stream, this being a benefit of the proposed works.

Flood risk and mitigation

146. Gordon Thompson's submission raises concerns about the Wharekōrino Stream being prone to flooding. This affects approximately 5ha of their land on the west side of the Stream and the consequential effects of silt, debris, and other contaminants rendering this poor grazing land.

147. In response, our flood modelling has predicted an increase in peak flows and water levels below Te Mawhai Road, resulting in a predicted 16% increase in the flood area extent for the 100-year storm with climate change. However, the flood maps provided (drawings 33097/M08 and M09, attached to my evidence in **Appendix SF9A** and **SF9B**) show that the increased flood flows are contained within the bush area either side of the stream and do not affect the Marae or any farmland, including Mr Thompson’s land on the western side of the stream.

148. Our review of available flood modelling information shows that flooding of farm land on the western side of the Wharekōrino Stream is more likely due to flooding from the Pūniu River itself, as this has a relatively extensive floodplain and causes water to flow back up the Wharekōrino Stream and into adjacent farm land on the western side of the Stream. Predicted flooding from the WRC Regional Scale Flood Hazard mapping for the Pūniu River is shown in **Figure 17** below.

Figure 17: Flood extent elevation for Regional Scale Flood Hazard – Pūniu River

Traffic, Noise and Air Quality Effects

149. Gordon Thompson's submission raises concerns about the effects of truck movements from the hospital site, noise and dust, including the potential for asbestos fibres and other potential contaminants becoming airborne, leading to health concerns.

150. Truck movements to the Disposal Site are proposed to be via the road over Culvert 2, rather than Te Mawhai Road, which means there will be no or very few vehicle movements associated with the transfer of low-moderate level contaminated soil from the hospital to the landfill. These movements are expected to have a less than minor effect on the public road network.

151. Noise and dust and associated airborne contaminants are addressed in paragraphs 102-105 of my evidence.

Erosion, Sedimentation and Subsidence Effects

152. Yvonne Waho's submission refers to potential erosion and sedimentation effects from earthworks and cleanfill.

153. In response, erosion and sedimentation effects are addressed in paragraphs 100-101 of my evidence. In my opinion, potential adverse erosion and sedimentation effects are appropriately managed through best practice erosion and sediment controls as proposed in the draft ESCP.

154. Te Nehenehenui Trust's submission refers to ongoing monitoring requirements being carefully considered to ensure any legacy contamination issues associated with subsidence are quickly identified and addressed.

155. In response, subsidence is checked for as part of current and proposed visual landfill inspections. Subsidence is generally associated with landfill settlement, which is often complicated. Settlement occurs as a result of consolidation and decomposition of refuse and consolidation of any underlying alluvial materials and decreases over time. If the landfill consent is granted, then the cap of the old landfill will be upgraded and levelled. This will address subsidence issues to date and the new cap will be less prone to subsidence in the future.

156. For the Disposal Site, it is expected that the majority of expected settlement will have occurred, given the age of the landfill and the lack of biodegradable organic matter within the landfill, based on anecdotal information that most refuse was burnt and site observations from our intrusive investigations. This is consistent with FTL not having found any significant subsidence issues since it started doing the annual landfill visual inspections in 2022.

RESPONSE TO SECTION 42A REPORTS

Regional Council

157. I agree with most of the commentary in WRCs section 42A report, including:

    (a) Mr Evans landfill contamination review that the approach taken for the landfill upgrade and monitoring is appropriate.[5]

    (b) Mr Pearce's ESCP review[6] that the ESCPs provided for each application are considered a baseline approach, theoretically appropriate for the works, and that final ESCPs and full methodology should be provided and approved prior to works commencing, with all works being undertaken in accordance with the Regional Council (2009) Erosion and Sediment Control Guidelines.

    (c) WRCs assessment that their freshwater ecology review shows that the proposed works to remove Culvert 2 will not have a detrimental effect on hydrology effects; with the works reinstating the natural flow of the

[5] Waikato Regional Council *Section 42A report* (**WRC section 42A** report) at page 43.
[6] WRC s42A report at page 44.

Wharekōrino Stream at this location and that the relocation of Culvert 3 will reduce the risk of contaminants from the landfill entering the Stream by providing separation from the existing landfill cells.[7]

(d) WRCs assessment that the proposed landfill upgrade will deliver "an improvement of the existing landfill management and the resulting leachate discharge.[8]"

158. A number of the Figures referenced (ie Figures 2 and 7) are older and up-to-date figures are provided in **Appendix SF10**.

159. There are a number of incorrect or outdated statements, including:

(a) There is no temporary pump station in the NIW-2 area (page 21).

(b) Topo survey has confirmed the existing Culvert 3 diameter is 1200, rather than 1350mm (page 24).

(c) The new stream length is approximately 105m rather than 75m (page 24).

160. The WRC section 42A report stated "*that contamination in areas not previously identified as part of the "existing disposal sites" has identified elevated levels of arsenic copper, lead, zinc and asbestos. This has not been further discussed by FTL or the applicant. Therefore, specific interactions or concerns (if any) with groundwater leaching contaminants (outside of boron) has not been expanded on.*"[9]

161. I do not agree with the lack of discussion on this issue. The areas referred to are Areas A2 and H. The current stormwater sampling includes two locations downstream of these areas and hence any leaching of contaminants from these areas will be picked up by this monitoring. Hence, the monitoring undertaken under the current consent adequately captures potential water quality effects from the entire landfill, including these two additional areas.

District Council

162. I agree with the majority of the feedback provided by WDC staff who reviewed the application in their respective specialist fields, including:

[7] WRC s42A report at page 45.
[8] WRC s42A report at page 45.
[9] WRC s42A report at page 17.

(a) Mr Jones (Environmental Health Officer) who is satisfied that the environmental effects in regard to Acoustic, Dust, Smoke and Hazardous Material can be mitigated by conditions of consent (page 244).

(b) Mr Gibbins (contaminated soils review) who considered the information reviewed to be sufficiently comprehensive, as it provides a reasonable understanding of the nature and scope of the proposed activity as it relates to the NESCS; the extent and scale of any adverse effects to human health and/or the environment can be assessed; human and/or environmental receptors that may be adversely affected have been identified; and a detailed and comprehensive plan has been provided summarising the remediation rationale, objectives, and methodology (page 244).

163. I note that Mr Gibbins raises a number of specific issues in his review that were not raised with us during the section 92 process. Each of these items are stated and then responded to below.

164. He refers to further contamination delineation being required by completing additional sampling around sample *AECOM5* where benzene was detected at a concentration of 1.5mg/kg above the site-specific remedial standard (0.11mg/kg) (page 244). In response, I think this is an incorrect reference. The correct reference is AECOM4 in the SSRA, which links to AECOM sample TK007 2.0m from a historic tank pull. This sample was collected 7 years ago, so some natural breakdown of the benzene may have occurred since then. Other samples collected from the tank pit were low level or non-detect for hydrocarbons. Groundwater at this location is expected to be 4-5m below ground level (based on the AECOM Tank Pull report), indicating that groundwater interaction with this material is unlikely, while effects on the nearest receiving water body (Wharekōrino stream), approximately 340m west of the sampling location is considered unlikely. Hence, I consider this to be an isolated, localised occurrence and that the potential for associated human health and environmental effects is less than minor.

165. Mr Gibbins refers to further sampling and assessment of the soil around B65 being required to determine the extent of the soil with Benzo-a-pyrene equivalent (BaP Eq.) concentration (7.2mg/kg) exceeding the site-specific remedial standard (6mg/kg) (page 244-245). In response, I consider this is not necessary, as the proposed remediation works for this structure involve

soil removal of 0.1m depth around the perimeter (capturing GHD TP01 location with elevated BaP Eq concentration). In addition, the deeper sample from this location returned a result for BaP Eq that was below lab detection limits, indicating that the contamination is localised and shallow. The shallow elevated sample likely contains asphalt/coal tar, with this causing the elevated concentrations. It is not indicative of more widespread contamination in this area as other sample locations close to TP01 (TP02 & TP03) had much lower results.

166. Mr Gibbins refers to further sampling being required surrounding substations to evaluate whether PCBs have migrated to the surrounding soils via spillage from the substation buildings (page 245). In response, I consider this unlikely to be necessary. The GHD DSI notes that no evidence of staining or odours were noted at any of the substation locations sampled, and no PCBs were detected in lab testing. GHD also collected external samples from Substations 2 and 4 and tested these for PCBs. They noted no evidence of staining or odours at these locations and sample results did not detect any PCBs. If necessary, this can be further checked onsite during the soil remediation works by checking the soils around the substations for signs of staining or odour, with accidental discovery protocols then followed, if found.

167. Mr Gibbins refers to further sampling being required around substation 3 to delineate the extent of demolition waste described in the conclusions of the SSRA (page 245). I consider this not to be necessary. The Substation that has demolition waste present is Substation 2, not 3. This material has been delineated as part of the Addendum DSI, and will be removed during the remedial works as detailed in the RAP.

168. Mr Gibbins refers to further sampling at depth in the area identified as a potential dip/spray area (page 245). In response, this area was assessed as part of the SSRA, and was found to not be of concern.

169. I note that WDCs section 42A report states at paragraph 10.27:

"While I consider the effects of enhancing the state of the existing landfill will be positive, the works themselves are not without environmental effects. However, with the appropriate management and monitoring in place, suitable mitigation will be provided to ensure the physical environmental effects are avoided, remedied or mitigated."

I fully support this statement.

170. I note that WDCs section 42A report for the landfill works goes on to recommend that it be declined based on adverse cultural effects raised in the submissions. While I cannot comment on cultural effects, I repeat my opinion that from an environmental and engineering perspective, the proposed landfill works will enhance the current state of Wharekōrino Stream, reduce leachate from the old landfill and provide a long-term secure landfill site. It also allows for the sealing of Culvert 3 which passes through the landfill, is degraded and no longer fit for purpose and poses a significant environmental risk related to possible leakage or even failure, and associated slow or sudden release of buried refuse and other contaminants into the stream.

171. Furthermore, if the landfill works consent is not granted, this has the following implications for the Remediation application:

    (a) An estimated 3,400-7,700m^3 of contaminated soil will need to be disposed of to alternative disposal site(s), likely a combination of Class 3 and 1 landfills (managed fill and municipal landfills). This would involve an estimated 227-513 truck and trailer movements from the Site to these landfills, with the nearest Class 1 facility being at Hampton Downs, some 96km away. This will have associated traffic and environmental impacts (eg noise, carbon dioxide and particulate emissions).

    (b) Conversely, a corresponding similar amount of clean backfill material, that was to be sourced from the northern part of the Disposal Site, will need to be found elsewhere and imported to the site. This may involve using the same truck and trailer movements on their return trip, but could at worst involve separate additional truck and trailer unit movements.

    (c) All of the risks identified in the FTL Disposal Site investigation summarised in paragraph 68 will remain unaddressed. These risks, particularly the potential failure of Culvert 3, will worsen over time.

    (d) Renewal of the Disposal Site consent in March 2035 would likely require some or all of the proposed repair and upgrade works included in the Landfill Application to be implemented.

COMMENTS ON DRAFT RESOURCE CONSENT CONDITIONS

172. The consultant applicant team and LINZ have already spent a considerable amount of time preparing draft resource consent conditions, which were

considered fit for purpose to manage the works and associated human health and environmental effects.

173. The draft conditions provided by both Councils have made significant changes to these conditions. There has been insufficient time since receiving the section 42A report to go through and comment on each condition and provide alternative wording, plus it was considered unhelpful for the panel at this stage of the process to do so. Instead, it would be more appropriate to provide an updated copy that includes the outcomes of further discussions and responses to submitter evidence. Hence, I have made some general comments below on the overall draft conditions received.

174. Ultimately, the most efficient way to resolve consent conditions may be via a joint workshop process.

WRC Consents

175. My main general comments are:

    (a) All of the consent conditions in WRC Consent 04 are considered excessive for a clean water diversion, particularly conditions 6-8, as by definition only clean water will be diverted. However, conditions 1-4 appear potentially acceptable.

    (b) WRC Consent 05 and Schedule 2 introduces the term encapsulation pit. I would prefer this to refer to the “upgraded Disposal Site” or similar for consistency with the Application documentation.

    (c) WRC Consent 05 also appears to include multiple conditions that are generally applied more to contaminated sites, rather than to landfills.

    (d) The WRC Consent 05 includes requirements for an Ongoing Monitoring and Management Plan and a separate Aftercare Plan (conditions 12-25). It is considered more appropriate that as built information be provided relating to the repaired and upgraded landfill and that the draft Aftercare and Monitoring Plan set out ongoing management and monitoring requirements, post-works. This also applies to WRC Consent 06, conditions 45-48.

    (e) The FTL Pumping and Dewatering Plan submitted during the section 92 process includes a proposed sediment removal device and stream monitoring methodology which has not been referred to in the consent

conditions. I prefer the approach set out in that plan over the proposed consent conditions. In addition, there is inconsistency between different consent conditions in relation to proposed total suspended solids limits, with different concentrations of 25g/m^3 and 80g/m^3 referred to, whilst noting that the Waikato Regional Plan discharge criteria for the "surface waters" classification that applies to the Wharekōrino Stream is not more than 100g/m^3 or an increase of more than 10%. It is also excessive to require sediment retention pond sampling on a minimum monthly basis and also following rainfall events greater than 20mm in the preceding 24 hours. (WRC Consent 01, condition 12; Consent 04, conditions 5, 6-8; Consent 06, conditions 18 and 26-32).

(f) There needs to be consistency across all WRC/WDC consents for the definition of cleanfill.

(g) Te Nehenehenui Trust in their supportive statement of evidence have advised that they prefer that the matters we have been discussing with them are imposed as consent conditions if possible. I agree with this approach and this is commented on further in Ms Buckingham's evidence.

176. My main specific comments are:

(a) It is not considered necessary to provide a Fill Management Plan (WRC Consent 01, conditions 21, 24-29), as the primary reason for the import of any cleanfill material is for use as backfill material in excavation cavities created by the remediation works. The cleanfill import requirements are adequately covered in the DDRMP. Testing of the imported cleanfill material (soils) is however required.

(b) The Applicant needs to be able to do earthworks outside the High-Risk Erosion Area (HREA) during winter, as per our conditions (WRC, Consent 01, conditions 59-61; Consent 06, conditions 63-65).

(c) It is not necessary to record the water take associated with any dewatering works as condition 8 refers to this being a net zero discharge situation. Further, condition 9 refers to measuring TPH concentrations which I understand can only be done in an accredited laboratory. It will take several days to get the results, which is likely

long after the dewatering has finished (WRC Consent 02, conditions 7-9).

(d) The landfill capping requirements in WRC Consent 05, conditions 9-10 can be combined into one condition and should make it clear that the total cap thickness is 150mm bedding/protection layer, GCL, overlain by 150mm protection layer, 300mm topsoil and 150mm topsoil.

(e) A Chemical Treatment Management Plan is only required if bench flocculation testing results shows it to be necessary. WRC Consent 06, condition 20 could be edited to make this clearer.

(f) The FTL Pumping and Dewatering Plan submitted during the Section 92 process includes a proposed sediment removal device and stream monitoring methodology which has not been referred to in the consent conditions. The approach set out in this plan is preferred over the proposed consent conditions. In addition, there is inconsistency between different consent conditions.

(g) It is unnecessary to provide a Fill Management Plan (WRC Consent 06, conditions 34-43) for the landfill works, as the methodology to be followed is already set out in the FTL Landfill Repair and Upgrade Works report and some of the requirements listed are unnecessary in this consent are unnecessary. For example, some existing refuse material is simply to be transferred from one part of the landfill to another without any additional waste acceptance testing, while the contaminant status of the soil to be transferred from the hospital has already been characterised.

(h) Consent 06, condition 53 refers to stabilised areas of the cleanfill as soon as possible following completion. This appears to be covered by other conditions (eg condition 51).

(i) Consent 07, condition 6 – the final design drawings referred to here have already been provided.

(j) Consent 07, condition 7 – most of the culvert installation works can be done off-line, working from bottom to top, and it is only the final stages of culvert installation where works will be required within the stream bed, where this condition applies.

WDC Consents

177. My main comments are:

(a) 2nd consent (no LU number), condition 1 (page 10) to be deleted or significantly amended to reflect my comments on the additional delineation testing recommended by Mr Gibbins in the WDC section 42A report (refer Para 162-167). This also affects condition 6.

(b) 4th consent (no LU number), condition 3 (page 21) – proposed consent condition is not applicable to this consent.

TE NEHENEHENUI TRUST STATEMENT OF EVIDENCE

178. I have read the Te Nehenehenui Trust Statement of Evidence and note that it acknowledges low-moderate level contaminated soil being disposed of to the existing Disposal Site onsite, as is proposed. It also refers to this soil being suitable for commercial or industrial land use. The majority of this soil is in fact suitable for a wider range of land uses, including various rural residential and agricultural land uses. Hence, encapsulating this material onsite is a cautious, conservative approach. Importantly, the proposed cap includes a 600mm depth of "cleanfill" soil over the GCL cap (150mm protective layer, 300mm agricultural layer and 150mm topsoil) so that the actual landfill area can be used for agricultural grazing purposes, as happens currently on the existing landfill.

12 September 2025

Sean Matthew Finnigan

APPENDIX SF1: FTL MEMO (12 AUGUST 2025), ADDITIONAL STRUCTURES MEMO

Fraser Thomas Limited
21 El Kobar Drive : East Tamaki : AUCKLAND 2013
PO Box 204006 : Highbrook : AUCKLAND 2161
NEW ZEALAND
TEL +64 9 278 7078 : E-MAIL sfinnigan@ftl.co.nz

Over 50 Years Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

MEMORANDUM

Date: 12 August 2025 Job no: 33205

From: Sean Finnigan/Elliot Bish

Subject: Former Tokanui Psychiatric Hospital – Additional Structures Memo (V2)

To: Bryan Daly; bdaly@linz.govt.nz

Dear Bryan,

At your request, Fraser Thomas Limited (FTL) has conducted limited sampling and analysis of soils near one existing structure and former feature within the grounds of the former Tokanui Psychiatric Hospital, Te Awamutu (Section 1 SO 44852) ('the site'). The structure was identified as a toilet block, while the feature was identified as a former bowling green. The toilet block is on the northern side of Building 23, surrounded by dense vegetation, while the former bowling green feature is located east of Building 3. The purpose of this assessment was to determine the contamination levels within soils around these structures, which had not been identified or surveyed in previous site investigations due to the dense vegetation and lack of landmarks that made recognition of these features difficult.

Given the identification of the historical bowling green and toilet block on site, potential 'Hazardous Activities and Industries List' (HAIL) activities A10 (*Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds*), and I (*Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment*) may have affected the soils in these areas of the site. Hence, intrusive soil sampling was undertaken, focusing on the potential presence of heavy metals, organochlorine pesticides (OCPs) and asbestos in soil, to check for possible contamination derived from potential historical application of persistent pesticides to the bowling green, and historical use of potentially asbestos containing materials (PACMs) and/or historical application of lead paint in construction of the toilet block structure, now in an aged and deteriorated condition.

This investigation has been undertaken in general accordance with the requirements of the Ministry for the Environment 'Contaminated Land Management Guidelines No.5' (CLMG5) for site investigations and analysis of soils with contamination of this nature based on a feature-based soil sampling approach. Furthermore, this investigation has been managed, reviewed and approved by a Suitably Qualified and Experienced Practitioner (SQEP), as defined in the National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES:CS).

1.0 SITE LOCATION AND BACKGROUND

The former Tokanui Psychiatric Hospital site is approximately 80 hectares (ha) in area and is located roughly 14 km southeast of Te Awamutu, Waikato. The site was developed in 1912 and operated through to 1998. The site contains several significant pieces of infrastructure, including 76 buildings, a

FRASER THOMAS LIMITED
21 El KOBAR DRIVE, EAST TAMAKI
PO BOX 204 006, HIGHBROOK
AUCKLAND 2161. NEW ZEALAND
PHONE: +64 9 278 7078
www.fraserthomas.co.nz

wastewater pump station, a swimming pool, eight substations, a closed landfill, and substantial roading and underground infrastructure and services.

Prior to preparation of this memorandum, several earlier contamination investigations were undertaken with relation to the Tokanui Psychiatric Hospital site structures, including:

- Preliminary Site Investigation (PSI) dated 7th September 2018 and prepared by AECOM, which reviewed an earlier PSI undertaken by Opus International Consultants (Opus) to identify gaps in their investigation that may have led to potentially contaminating historical activities and/or features present on site that were not initially identified;
- Detailed Site Investigation (DSI) dated 9th August 2019 and prepared by AECOM, which assessed the soil contaminant conditions at the site and the associated risk to human health and the environment for a proposed future agricultural land use;
- Asbestos and Lead Paint Demolition Survey Reports dated December 2022 and prepared by 4Sight Consulting (now SLR Consulting), which identified asbestos within the structures/workplaces so that it could be removed safely before commencement of the demolition process, and identified lead paint within the structures/workplaces for waste characterisation and handling purposes;
- PSI dated 6th October 2023 and prepared by GHD Limited (GHD), which reviewed existing reports to identify and close any data gaps, identified HAIL activities and potential sources of contamination for the proposed change of land use from a commercial/industrial hospital site to a grassed site with no buildings, refined the conceptual site model developed by AECOM (2019) to reflect the findings from the PSI, and informed the sampling plan for the future GHD DSI;
- DSI Factual Report dated 19th January 2024 and prepared by GHD, which assessed the soil contaminant conditions at the site and the associated risk to human health and the environment so that these would be known before commencement of the demolition and remediation work, and supported resource consent(s) application(s) for ground disturbance activities associated with the demolition and remediation works;
- Remedial Action Plan (RAP) dated 7th April 2025 and prepared by FTL, which provided the remedial requirements for the demolition and remediation of the former Tokanui Hospital site; and
- The FTL Demolition, Deconstruction and Remediation Management Plan (DDRMP), which outlined requirements for the proposed demolition works, and reviewed material compositions of the above-ground infrastructure on site related to structures where demolition is proposed.

The additional structures, namely the historical bowling green and toilet block, which were not surveyed or sampled in previous investigations of site infrastructure, are located within the north-east portion of the site (see Figure 1 attached to the report). The objective of this assessment was to determine the contamination status of soils within and surrounding these additional structures, which were not visually identified during the previous investigations listed above.

2.0 SITE WALKOVER

To date, two site visits have been undertaken by FTL Environmental Scientists Elliot Bish and Ben Laing-McConnell on the 13th May 2025 and 13th June 2025, which have involved limited sampling of soils within and surrounding the additional site structures. The site was accessed via the main entrance off Te Mawhai Road. The toilet block and bowling green were accessed by following the Tokanui Hospital Road network towards the north-east portion of the site.

The toilet block was observed as a small building hidden within a stand of trees and other vegetation. The structure appeared to be constructed on a concrete base, with a mixture of concrete (lower half) and wooden cladding (upper half), PACM soffits and ceiling panels, with a metal roof. Most materials comprising the toilet block building appeared in an aged but relatively good condition overall. However, the roof and paint coat showed signs of deterioration, while the downpipes had deteriorated completely.

Additionally, a concrete pavement surrounded the base of the toilet block building, with variable extents and conditions at each façade. A small metal fence was also observed adjacent to the southern façade of the toilet block, and another fence comprised of wooden posts and a railing with a metal chain-link was observed along the western façade.

The bowling green was observed as a grassed paddock, with no clear visual signs of the historical feature present, except for some slightly variable topography at the northern boundary of this area.

No other signs of potential contamination were observed during the site walkover of the bowling green and toilet block areas. Site photos have been included as Appendix A.

3.0 SOIL SAMPLING

3.1 Data Quality Objectives & Conceptual Site Model

In accordance with CLMG5, Data Quality Objectives (DQOs) and Conceptual Site Model (CSM) for this investigation are summarized in Table 1.

Table 1: DQOs and CSM

Purpose of Investigation	Assess human health risks associated with soils located in proximity to previously unsurveyed historical site structures within the Tokanui Psychiatric Hospital grounds	
Define boundaries	Investigation focused on soils within the halo of the historical toilet block and soils within the footprint of the historical bowling green on site.	
Develop Conceptual Site Model	Known/possible HAIL land use	*HAIL A10: Persistent pesticide bulk storage or use, including sport turfs, market gardens, orchards, glasshouses, or spray sheds.* *HAIL I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment*
	Contaminants of concern	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), and asbestos
	Distribution of contaminants	Lateral – across the site Vertical – depending on the soil type
	Receptors	Site users (long term), Contractors (short term)

	Potential pathways	Dermal contact, ingestion and inhalation.
	Applicable land use scenario	Commercial/Industrial land use (outdoor worker), and Site-Specific Remedial Standards – Rural-Residential and Managed Recreational

3.2 Evaluation Basis

The sampling results have been compared with:

- Waikato Regional Council upper limit background concentrations for selected elements in soil;
- NES: CS Soil Contaminant Standards (SCS) for Commercial/Industrial land use (outdoor worker);
- Site-Specific Remedial Standards (SSRS) as presented in HAIL Environmental Limited Site-Specific Risk Assessment Report version 3.2, dated February 2024; and
- BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017).

3.3 Methodology

Intrusive sampling of soils located within the footprint of the bowling green and adjacent to the toilet block was undertaken across 2 site visits on the 13th May 2025 and 13th June 2025. A total of 8 boreholes were put down across 8 locations using a 50mm hand auger, with 4 locations located in proximity to each of the additional structures on site. The methodology of sampling and analysis of these features was as follows:

- On the 13th May 2025, 4 samples were collected from 4 locations at a single depth (0-0.15m) from soils within the historical bowling green footprint. Following this, on the 13th June 2025, 12 deeper samples were collected from the original 4 locations at 3 additional depths (0.15-0.3m, 0.3-0.5m & 0.5-0.7m). All 16 individual samples collected from the footprint of the bowling green were analysed for heavy metals, mercury, and OCPs, and a single sample (BG03 0.3-0.5m) was also analysed for PAHs, due to the identification of minor fill. Sample locations are shown in Figure 2.
- On the 13th May 2025, 8 soil samples were collected from 4 locations at 2 depths (0-0.15m & 0.15-0.3m) from soils at the edge of the paving surrounding each façade of the toilet block structure on site. The initial 8 individual samples collected from shallow soils within the halo of the toilet block were analysed for heavy metals and semi-quantitative asbestos in soils. Following this, on the 13th June 2025, 8 deeper samples were collected from the original 4 locations at 2 additional depths (0.3-0.5m & 0.5-0.7m). Based on the results of initial analysis, the 8 deeper samples collected during the June 2025 site visit were analysed for heavy metals. Sample locations are shown in Figure 2-1.

These samples are representative of the soil that might have been impacted by HAIL activities A10 & I and which are likely to be disturbed during the proposed works. The sample breakdown is shown in Table 2 below.

Table 2: Soil Samples Breakdown

Sample ID	Depth (m)	Soil	Test
BG01-BG04	0-0.15m	Topsoil with minor rootlets	Heavy Metals, Mercury & OCPs
	0.15-0.3m	Clayey Silt (Light Brown/Orange) with minor topsoil	
BG01, BG02 & BG04	0.3-0.5m		
BG01-BG04	0.5-0.7m	Silty Clay (Yellow/Light Brown, orange specks)	
BG03	0.3-0.5m	Clayey Silt (Light Brown/Orange), minor topsoil & some fill (black – potentially burned material)	Heavy Metals, Mercury, OCPs & PAHs
TBN 0.5 A	0-0.15m	Topsoil with rootlets & minor organic litter (leaves, bark)	Heavy metals & Semi-Quantitative Asbestos in soil
TBN 0.5 B	0.15-0.3m	Topsoil with minor silty clay & rootlets	
TBN 0.5 C	0.3-0.5m	Clay (Yellow/light brown)	Heavy Metals
TBN 0.5 D	0.5-0.7m		
TBE 0.5 A	0-0.15m	Topsoil with rootlets & minor organic litter (leaves, bark)	Heavy metals & Semi-Quantitative Asbestos in soil
TBE 0.5 B	0.15-0.3m	Topsoil with minor silty clay & rootlets	
TBE 0.5 C	0.3-0.5m	Clay (Yellow/light brown)	Heavy Metals
TBE 0.5 D	0.5-0.7m		
TBS 0.5 A	0-0.15m	Topsoil with rootlets & minor organic litter (leaves, bark)	Heavy metals & Semi-Quantitative Asbestos in soil
TBS 0.5 B	0.15-0.3m	Topsoil with minor silty clay & rootlets	
TBS 0.5 C	0.3-0.5m	Clay (Yellow/light brown)	Heavy Metals
TBS 0.5 D	0.5-0.7m		
TBW 0.5 A	0-0.15m	Topsoil with rootlets & minor organic litter (leaves, bark)	Heavy metals & Semi-Quantitative Asbestos in soil
TBW 0.5 B	0.15-0.3m	Topsoil with minor silty clay & rootlets	
TBW 0.5 C	0.3-0.5m	Clay (Yellow/light brown)	Heavy Metals
TBW 0.5 D	0.5-0.7m		

3.4 RESULTS SUMMARY

The soil sampling results are summarised in Table 3 below. The laboratory certificates are shown in Appendix B.

Former Tokanui Psychiatric Hospital - Toilet Block: Soil Results															
Sample Date	**Background Concentrations [1]**	**NESCS commercial/ industrial outdoor worker (unpaved) [2]**	**Site Specific Remedial Standards - Rural Residential [3]**	**Site Specific Remedial Standards - Managed [3]**	**Waste Acceptance Criteria**			13-May-25		13-Jun-25		13-May-25		13-Jun-25	
Sample Name								TBE 0.5 A	TBE 0.5 B	TBE 0.5 C	TBE 0.5 D	TBW 0.5 A	TBW 0.5 B	TBW 0.5 C	TBW 0.5 D
Sample Depth (m)					**WRC Cleanfill Criteria**	**Envirofill South (Managed Fill)**	**Hampton Downs landfill**	0-0.15m	0.15-0.3m	0.3-0.5m	0.5-0.7m	0-0.15m	0.15-0.3m	0.3-0.5m	0.5-0.7m
Lab Number								3892810.30	3892810.31	3916050.50	3916050.60	3892810.32	3892810.33	3916050.30	3916050.40
Heavy Metals (mg/kg dry weight)	**95% upper limit for background (mg/kg)**														
Arsenic	6.8	70	9	70	17	70	100	4	3	4	8	16	5	4	3
Cadmium	0.22	1,300	0.9	10	0.8	1.2	20	0.27	< 0.10	0.17	< 0.10	0.42	0.26	< 0.10	< 0.10
Chromium	30	6,300	150	150	56	362	100	9	8	7	6	13	8	9	9
Copper	25	>10,000	280	280	120	107	200	18	14	16	9	31	12	16	13
Lead	20	3,300	120	460	78	210	200	33	17.7	24	11.7	250	48	22	19.1
Nickel	7.6	6,000	-	-	33	320	200	4	3	3	2	16	3	4	4
Zinc	53	400,000	350	450	175	1,160	500	103	46	79	47	2,300	1,420	73	53
Asbestos (SQ)					ND	AF/FA Only	AF/FA & ACM	ND	ND	-	-	ND	ND	-	-
AF/FA	ND	< 0.001 [4]	0.001	0.001				-	-	-	-	-	-	-	-
% ACM	ND	< 0.05 [4]	0.01	0.01				-	-	-	-	-	-	-	-

Former Tokanui Psychiatric Hospital - Toilet Block: Soil Results															
Sample Date	**Background Concentrations [1]**	**NESCS commercial/ industrial outdoor worker (unpaved) [2]**	**Site Specific Remedial Standards - Rural Residential [3]**	**Site Specific Remedial Standards - Managed [3]**	**Waste Acceptance Criteria**			13-May-25		13-Jun-25		13-May-25		13-Jun-25	
Sample Name								TBS 0.5 A	TBS 0.5 B	TBS 0.5 C	TBS 0.5 D	TBN 0.5 A	TBN 0.5 B	TBN 0.5 C	TBN 0.5 D
Sample Depth (m)					**WRC Cleanfill Criteria**	**Envirofill South (Managed Fill)**	**Hampton Downs landfill**	0-0.15m	0.15-0.3m	0.3-0.5m	0.5-0.7m	0-0.15m	0.15-0.3m	0.3-0.5m	0.5-0.7m
Lab Number								3892810.34	3892810.35	3916050.70	3916050.80	3892810.36	3892810.37	3916050.10	3916050.20
Heavy Metals (mg/kg dry weight)	**95% upper limit for background (mg/kg)**														
Arsenic	6.8	70	9	70	17	70	100	7	5	2	3	5	4	20	8
Cadmium	0.22	1,300	0.9	10	0.8	1.2	20	0.57	0.33	< 0.10	< 0.10	0.44	0.26	0.14	0.14
Chromium	30	6,300	150	150	56	362	100	10	11	8	7	8	7	11	10
Copper	25	>10,000	280	280	120	107	200	36	25	11	10	23	18	23	15
Lead	20	3,300	120	460	78	210	200	110	84	23	17	53	22	18.6	19.9
Nickel	7.6	6,000	-	-	33	320	200	5	8	3	3	4	5	3	3
Zinc	53	400,000	350	450	175	1,160	500	400	159	43	31	188	72	63	50
Asbestos (SQ)					ND	AF/FA Only	AF/FA & ACM	ND	ND	-	-	ND	ND	-	-
AF/FA	ND	< 0.001 [4]	0.001	0.001				-	-	-	-	-	-	-	-
% ACM	ND	< 0.05 [4]	0.01	0.01				-	-	-	-	-	-	-	-

Notes:

* = Residual concentrations detected

1. Upper limit background concentrations for selected elements in soil of the Waikato region, acid recoverable data, sourced from: https://www.waikatoregion.govt.nz/services/regional-services/waste-hazardous-substances-and-contaminated-sites/contaminated-sites/natural-background-concentrations/

2. Resource Management (National Environmental Standard for Assessing and managing Contaminants in Soil to Protect Human Health) Regulation 2012 (NES:CS) - Soil contaminant standards (SCS) applicable to commercial/industrial land use have been selected.

3. Site Specific Remedial Standards as presented in HAIL Environmental Ltd Site Specific Risk Assessment, Version 3.2, dated Feburary 2024

4. BRANZ 2017 Asbestos in Soil guidelines of 0.05% w/w % ACM or 0.001% w/w for % FA & AF fraction (Commercial/Industrial guidelines applied to assess risk to Remedial workers)

Underlined:	Above background concentrations
Italicised	Above NES:CS / BRANZ Guideline (Commercial/Industrial land use - Outdoor Worker)
RED:	Exceeded SSRA Rural Residential
BOLD:	Exceeded SSRA Managed
ND:	Not detected
-	Not tested for
	Above cleanfill acceptance criteria
	Above managed fill acceptance criteria
	Above Class 1 landfill acceptance criteria
	Exceeds Class 1 Landfill TCLP Limit

Former Tokanui Psychiatric Hospital - Toilet Block: TCLP (Zinc) Test Results			
Sample Date	**Waste Acceptance Criteria**		13-May-25
Sample Name			TBW 0.5 A
Sample Depth (m)	**Landfill (Hampton Downs, TCLP Criteria)**	**Landfill (Hampton Downs, Max Acceptable Value)**	0-0.15m
Lab Number			3892810.48
Heavy Metals (g/m^3)			
Zinc	10	N/L	14.7

Former Tokanui Psychiatric Hospital - Bowling Green: Soil Results															
Sample Date	**Background Concentrations [1]**	**NESCS commercial/ industrial outdoor worker (unpaved) [2]**	**Site Specific Remedial Standards - Rural Residential [3]**	**Site Specific Remedial Standards - Managed [3]**	**Waste Acceptance Criteria**			13-May-25	13-Jun-25			13-May-25	13-Jun-25		
Sample Name								BG01				BG02			
Sample Depth (m)					**WRC Cleanfill Criteria**	**Envirofill South (Managed Fill)**	**Hampton Downs landfill**	0-0.15m	0.15-0.3	0.3-0.5	0.5-0.7	0-0.15m	0.15-0.3	0.3-0.5	0.5-0.7
Lab Number								3892810.38	3916050.9	3916050.10	3916050.11	3892810.39	3916050.12	3916050.13	3916050.14
Heavy Metals (mg/kg dry weight)	**95% upper limit for background (mg/kg)**														
Arsenic	6.8	70	9	70	17	70	100	5	3	3	2	5	4	2	2
Cadmium	0.22	1,300	0.9	10	0.8	1.2	20	0.31	< 0.10	< 0.10	< 0.10	0.23	0.19	< 0.10	< 0.10
Chromium	30	6,300	150	150	56	362	100	9	5	5	5	7	7	6	5
Copper	25	>10,000	280	280	120	107	200	16	9	7	6	16	13	7	5
Lead	20	3,300	120	460	78	210	200	21	16.2	15.7	16.8	18.5	17.3	16.2	15.6
Mercury	0.23	4,200	3	3	1.0	NS	NS	0.12	< 0.10	< 0.10	< 0.10	< 0.10	0.16	0.15	< 0.10
Nickel	7.6	6,000	-	-	33	320	200	4	2	2	2	5	3	3	< 2
Zinc	53	400,000	350	450	175	1,160	500	61	38	31	25	76	49	26	21
OCPs															
Total DDT	-	1,000	2	2	0.5	12	0.7	< 0.09	< 0.08	< 0.08	< 0.09	< 0.09	< 0.09	< 0.08	< 0.08
Dieldrin	-	160	-	-	0.02	0.02	1.3	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015	< 0.013	< 0.013

Former Tokanui Psychiatric Hospital - Bowling Green: Soil Results															
Sample Date	**Background Concentrations [1]**	**NESCS commercial/ industrial outdoor worker (unpaved) [2]**	**Site Specific Remedial Standards - Rural Residential [3]**	**Site Specific Remedial Standards - Managed [3]**	**Waste Acceptance Criteria**			13-May-25	13-Jun-25			13-May-25	13-Jun-25		
Sample Name								BG03				BG04			
Sample Depth (m)					**WRC Cleanfill Criteria**	**Envirofill South (Managed Fill)**	**Hampton Downs landfill**	0-0.15m	0.15-0.3	0.3-0.5	0.5-0.7	0-0.15m	0.15-0.3	0.3-0.5	0.5-0.7
Lab Number								3892810.40	3916050.15	3916050.16	3916050.17	3892810.41	3916050.18	3916050.19	3916050.20
Heavy Metals (mg/kg dry weight)	**95% upper limit for background (mg/kg)**														
Arsenic	6.8	70	9	70	17	70	100	7	4	12	< 2	35	5	6	7
Cadmium	0.22	1,300	0.9	10	0.8	1.2	20	0.3	< 0.10	< 0.10	< 0.10	0.44	0.17	0.22	0.13
Chromium	30	6,300	150	150	56	362	100	8	7	8	3	9	8	9	10
Copper	25	>10,000	280	280	120	107	200	19	9	21	4	23	16	36	21
Lead	20	3,300	120	460	78	210	200	22	15.4	24	10.5	30	19.5	14.8	16.2
Mercury	0.23	4,200	3	3	1.0	NS	NS	0.12	< 0.10	< 0.10	< 0.10	0.11	0.16	0.26	0.17
Nickel	7.6	6,000	-	-	33	320	200	4	3	40	< 2	5	3	4	4
Zinc	53	400,000	350	450	175	1,160	500	68	35	20	12	117	58	94	59
OCPs															
Total DDT	-	1,000	2	2	0.5	12	0.7	< 0.08*	< 0.08	< 0.08	< 0.08	< 0.08*	< 0.09	< 0.10	< 0.09
Dieldrin	-	160	-	-	0.02	0.02	1.3	< 0.013	< 0.013	< 0.013	< 0.012	< 0.014	< 0.014	< 0.016	< 0.014
PAHs															
BAP (Eq)	-	35	6	35	2	35	1	-	-	< 0.031	-	-	-	-	-

Notes:

1. Upper limit background concentrations for selected elements in soil of the Waikato region, acid recoverable data, sourced from: https://www.waikatoregion.govt.nz/services/regional-services/waste-hazardous-substances-and-contaminated-

2. Resource Management (National Environmental Standard for Assessing and managing Contaminants in Soil to Protect Human Health) Regulation 2012 (NES:CS) - Soil contaminant standards (SCS) applicable to commercial/industrial land use have been selected.

3. Site Specific Remedial Standards as presented in HAIL Environmental Ltd Site Specific Risk Assessment, Version 3.2, dated Feburary 2024

Underlined:	Above background concentrations
Italicised	Above NES:CS (Commercial/Industrial land use - Outdoor Worker)
RED:	Exceeded SSRA Rural Residential
BOLD:	Exceeded SSRA Managed
ND:	Not detected
-	Not tested for
*	Residual concentrations detected
	Above cleanfill acceptance criteria
	Above managed fill acceptance criteria
	Above Class 1 landfill acceptance criteria

4.0 DISCUSSION

Analytical results for the bowling green found:

- One or more heavy metal concentrations were elevated above upper limit background levels for soils in the Waikato Region in 8 of the 16 samples analysed;
- In particular, arsenic concentrations in two samples (BG03 0.3-0.5m & BG04 0-0.15m) were in exceedance of the rural-residential SSRS;
- Very low level OCPs (DDE & DDT) were detected in 2 of the 16 samples analysed (BG03 0-0.15m & BG04 0-0.15m);
- PAHs were not detected in the single sample analysed where minor fill was encountered; and
- No exceedances of the NES: CS guidelines were noted.

Analytical results for the toilet block found:

- One or more heavy metal concentrations were elevated above upper limit background levels for soils in the Waikato Region in 11 of the 16 samples analysed;
- In particular, arsenic concentrations in two samples (TBW 0.5A & TBN 0.5 C), lead concentrations in a single sample (TBW 0.5A), and zinc concentrations in a single sample (TBS 0.5A) were in exceedance of the rural-residential SSRS, and zinc concentrations in two samples (TBW 0.5A & TBW 0.5B) were in exceedance of the Managed SSRS;
- No asbestos was detected in any of the 8 samples analysed; and
- No exceedances of the NES: CS guidelines were noted.

Based on analytical results from samples surrounding the toilet block, toxicity characteristic leaching procedure (TCLP) analysis was undertaken on a single sample (TBW 0.5 A) found to contain moderate to high-level zinc contamination. TCLP analysis found that zinc concentrations in the sample were in exceedance of the TCLP waste acceptance criteria (WAC) for a Class 1 Landfill.

Hence, overall, some samples were found to contain contaminant concentrations elevated above the rural-residential and managed SSRS values and/or the Class 1 Landfill TCLP criteria. Soils containing elevated contaminant concentrations are to be managed in accordance with the soil management recommendations below.

5.0 SOIL MANAGEMENT CRITERIA

In accordance with the FTL Remedial Action Plan (RAP) dated April 2025, contamination level classifications have been established to determine the applicable soil management and disposal requirements of the remedial approach for the Tokanui Hospital site. Classifications are defined as:

- Low Level contamination: exceeds the Site-Specific Rural Residential Remedial Standard but not the Site-Specific Managed Remedial Standard;
- Moderate Level contamination: exceeds the Site-Specific Managed Remedial Standard; and
- High Level contamination: exceeds Class B criteria for asbestos contamination and Class 1 landfill TCLP criteria for other contaminants.

6.0 CONCLUSIONS & RECOMMENDATIONS

Based on the soil management criteria above, FTL recommends that:

- Soils from sample locations BG04 (0-0.15m) and BG03 (0.3-0.5m) within the bowling green area that contain low-level arsenic contamination should be excavated and shifted into Area D/E/F of the Tokanui Hospital existing disposal site.
- Soils from sample locations TBS 0.5 A (0-0.15m depth) and TBN 0.5 C (0.3-0.5m) that contain low-level heavy metal contamination should be excavated and shifted into Area D/E/F of the Tokanui Hospital existing disposal site.
- Soils from location TBW 0.5 contain moderate to high-level zinc contamination exceeding the Class 1 Landfill TCLP WAC. Hence, soils from 0-0.3m depth in this location are unsuitable to be moved into Area D/E/F of the Tokanui Hospital existing disposal site in their current form. These soils should be mixed and blended with other 'less contaminated soils', and then moved into the existing disposal site. If this is not possible, these soils will require disposal off-site to an approved facility due to leachability issues, and would require mixing with other soils with lower zinc levels to comply with Class 1 landfill WAC.
- It should be noted that a thick concrete surround was encountered at the toilet block building. Samples were collected at the edge extents of the concrete. However, the remedial volumes below will likely be reduced during remedial works due to reassessment of the area via XRF delineation. Volumes provided below (for toilet block) are therefore provisional and subject to change.
- Estimated volumes of soils to be relocated from the toilet block and bowling green and disposed of within the Tokanui Hospital existing disposal site are:
    - Toilet Block = $15m^3$
    - Bowling Green = $172m^3$

  These volumes will likely be reduced through XRF screening delineation during remedial works.

All other soils assessed can be left undisturbed.

7.0 LIMITATIONS

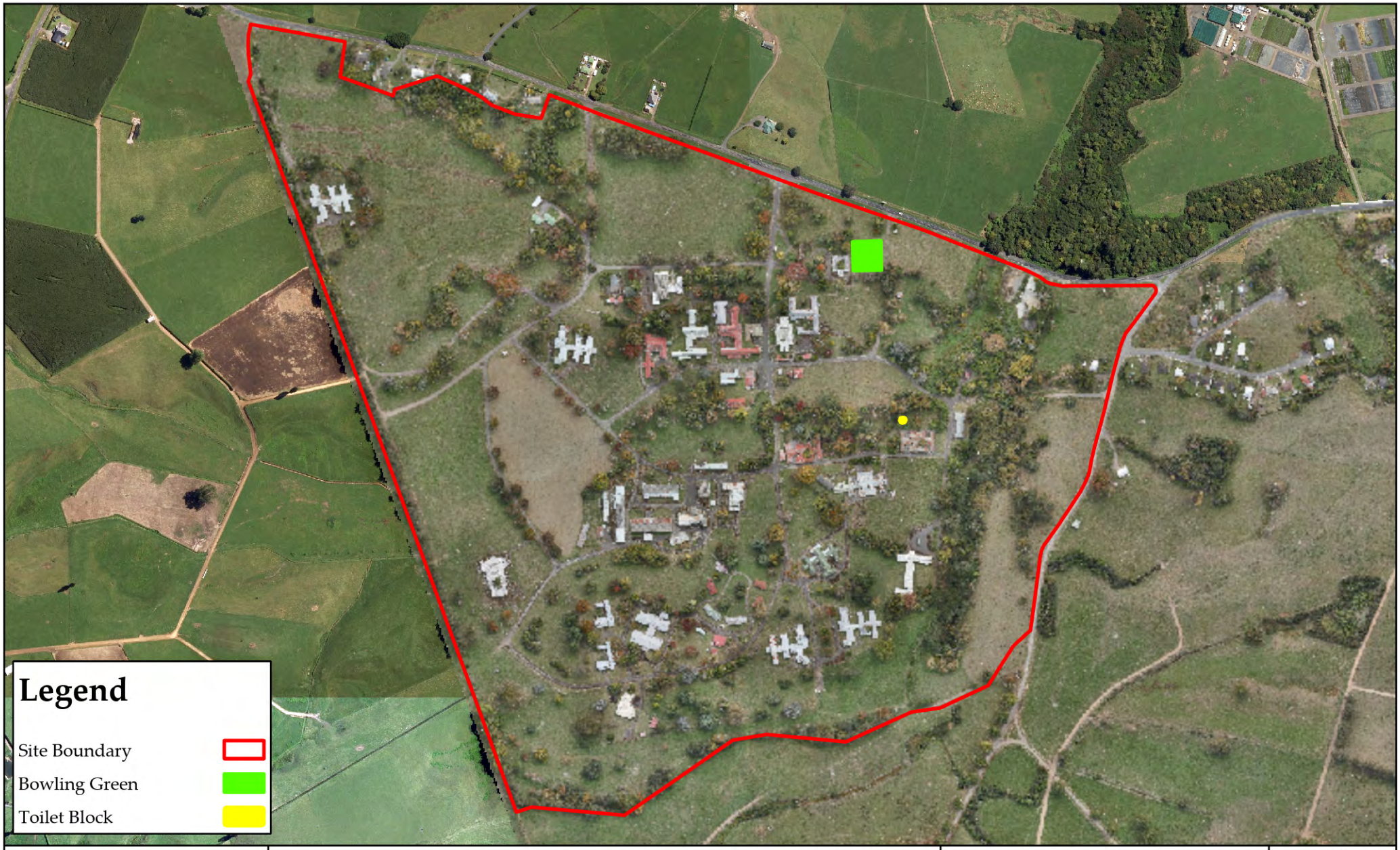
 Limited soil sampling has been undertaken as part of this investigation. The professional opinion expressed herein has been prepared solely for, and is furnished to our client, Toitū Te Whenua – Land Information New Zealand, on the express condition that it will only be used for the works and the purpose for which it is intended. No liability is accepted by this firm or by any principal, or director, or any servant or agent of this firm, in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at its own risk. This disclaimer shall apply notwithstanding that this report may be made available to any person by any person in connection with any application for permission or approval, or pursuant to any requirement of law.

Yours sincerely
FRASER THOMAS LIMITED

Elliot Bish
Senior Environmental Scientist
CEnvP-G

Sean M Finnigan
Director – Environmental
CEnvP-SC

Attached:
Figure 1 – Site Location Plan
Figure 2 – Sample Location Plan – Bowling Green
Figure 2-1 – Sample Location Plan – Toilet Block
Appendix A – Site Photos
Appendix B – Laboratory Transcripts



Fraser Thomas
Over 50 Years
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

Figure 1: Site Location Plan

Toitū Te Whenua Land Information New Zealand
Former Tokanui Hospital Demolition and Remediation Project
Additional Structures Memo
Tokanui, Te Awamutu

Date:	28/07/2025
Figure Reference:	33205/ADM/01
Drawn by:	EB
Reviewed by:	SF
Job Number:	33205

N

0 55 110 220 330 440 550
Meters

Building	Remedial/Management Area	Area (m^2)	Depth (m)	Volume (m^3)
Bowling Green	Low Level Contamination	764	0.15-0.3	172.0
	Can Remain Onsite	773	0.15	115.9
Total Area/Volume		1537	-	287.9

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

Figure 2: Sample Location Plan - Bowling Green

Toitū Te Whenua Land Information New Zealand
Former Tokanui Hospital Demolition and Remediation Project
Additional Structures Memo
Tokanui, Te Awamutu

Date:	31/08/2025
Figure Reference:	33205/ADM/02
Drawn by:	EB
Reviewed by:	SF
Job Number:	33205

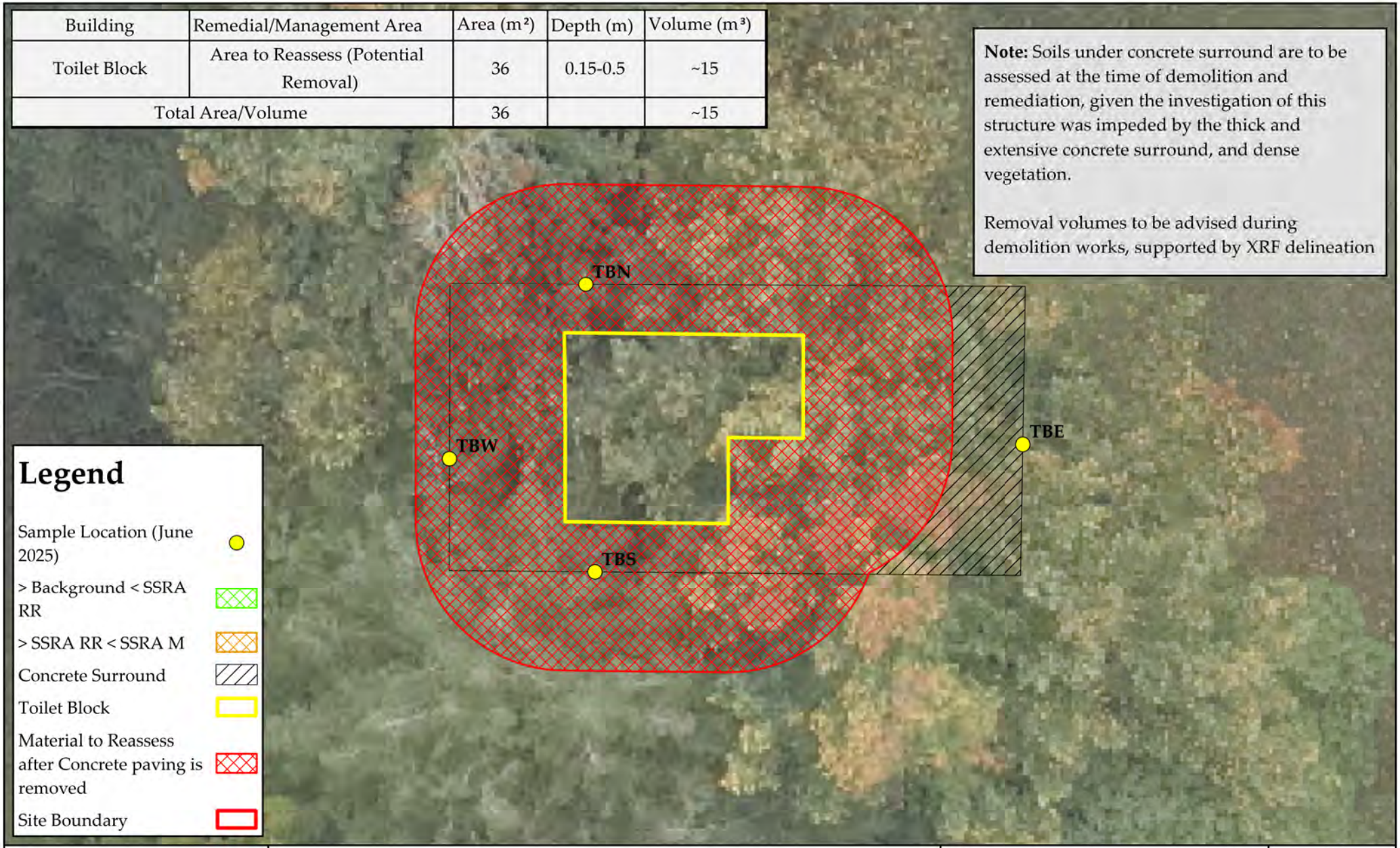
N

0 5 10 20 30 40 50
Meters

Building	Remedial/Management Area	Area (m²)	Depth (m)	Volume (m³)
Toilet Block	Area to Reassess (Potential Removal)	36	0.15-0.5	~15
Total Area/Volume		36		~15

Note: Soils under concrete surround are to be assessed at the time of demolition and remediation, given the investigation of this structure was impeded by the thick and extensive concrete surround, and dense vegetation.

Removal volumes to be advised during demolition works, supported by XRF delineation



Fraser Thomas
Over 50 Years
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

Figure 2-1: Sample Location Plan - Toilet Block

Toitū Te Whenua Land Information New Zealand
Former Tokanui Hospital Demolition and Remediation Project
Additional Structures Memo
Tokanui, Te Awamutu

Date:	8/08/2025
Figure Reference:	33205/ADM/02-1
Drawn by:	EB
Reviewed by:	SF
Job Number:	33205

N

0 0.5 1 2 3 4 5
Meters

North Facade

East Facade

South Facade

West Facade

Toilet Block - Internal

Toilet Block - Internal

Bowling Green Area - Te Mawhai Entrance

Bowling Green Area

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Fraser Thomas Limited	**Lab No:**	3892810	SPv3
Contact:	Elliot Bish	**Date Received:**	20-May-2025	
	C/- Fraser Thomas Limited	**Date Reported:**	27-Jun-2025	**(Amended)**
	PO Box 204006	**Quote No:**	92882	
	Highbrook	**Order No:**	PO001344	
	Auckland 2161	**Client Reference:**	33097	
		Submitted By:	Ben Laing-McConnell	

Sample Type: Soil

Sample Name:		TPAG14B 0-0.15m 12-May-2025	TPAG14B 0.15-0.7m 12-May-2025	TPAG14B 0.7-1.0m 12-May-2025	TPAG14C 0-0.15m 12-May-2025	TPAG14C 0.15-0.45m 12-May-2025
Lab Number:		3892810.1	3892810.2	3892810.3	3892810.4	3892810.5
Individual Tests						
Dry Matter	g/100g as rcvd	77	87	75	77	84
TCLP Weight of Sample Taken	g	-	-	50	-	-
TCLP Initial Sample pH	pH Units	-	-	7.7	-	-
TCLP Acid Adjusted Sample pH	pH Units	-	-	1.7	-	-
TCLP Extractant Type*		-	-	NaOH/Acetic acid at pH 4.93 +/- 0.05	-	-
TCLP Extraction Fluid pH	pH Units	-	-	5.0	-	-
TCLP Post Extraction Sample pH	pH Units	-	-	5.1	-	-
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	4	4	4	5	4
Total Recoverable Boron	mg/kg dry wt	< 20	82	21	< 20	< 20
Total Recoverable Cadmium	mg/kg dry wt	0.17	0.10	0.72	0.26	0.11
Total Recoverable Chromium	mg/kg dry wt	14	24	7	13	23
Total Recoverable Copper	mg/kg dry wt	27	21	27	34	18
Total Recoverable Lead	mg/kg dry wt	29	23	620	54	26
Total Recoverable Nickel	mg/kg dry wt	10	15	4	10	11
Total Recoverable Zinc	mg/kg dry wt	77	76	320	101	67
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	1.3	1.9	< 0.4	2.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.013	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.013	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.013	< 0.012
Acenaphthene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.013	< 0.012
Anthracene	mg/kg dry wt	0.013	0.044	< 0.014	0.035	< 0.012
Benzo[a]anthracene	mg/kg dry wt	0.098	0.156	< 0.014	0.169	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.137	0.153	< 0.014	0.22	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.20	0.23	< 0.032	0.32	< 0.029
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.199	0.23	< 0.032	0.32	< 0.029
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	0.163	0.186	< 0.014	0.26	0.012
Benzo[e]pyrene	mg/kg dry wt	0.080	0.092	< 0.014	0.136	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	0.089	0.090	< 0.014	0.141	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	0.067	0.086	< 0.014	0.101	< 0.012
Chrysene	mg/kg dry wt	0.090	0.138	< 0.014	0.196	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	0.019	0.023	< 0.014	0.033	< 0.012
Fluoranthene	mg/kg dry wt	0.184	0.36	< 0.014	0.36	0.013

Sample Type: Soil						
Sample Name:		TPAG14B 0-0.15m 12-May-2025	TPAG14B 0.15-0.7m 12-May-2025	TPAG14B 0.7-1.0m 12-May-2025	TPAG14C 0-0.15m 12-May-2025	TPAG14C 0.15-0.45m 12-May-2025
Lab Number:		3892810.1	3892810.2	3892810.3	3892810.4	3892810.5
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Fluorene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.013	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.092	0.090	< 0.014	0.140	< 0.012
Naphthalene	mg/kg dry wt	< 0.07	< 0.06	< 0.07	< 0.07	< 0.06
Perylene	mg/kg dry wt	0.032	0.034	< 0.014	0.046	< 0.012
Phenanthrene	mg/kg dry wt	0.057	0.166	< 0.014	0.130	< 0.012
Pyrene	mg/kg dry wt	0.179	0.31	< 0.014	0.34	0.014

Sample Name:		TPAG14C 0.45-0.85m 12-May-2025	TPAG14D 0-0.1m 12-May-2025	TPAG14D 0.1-0.3m 12-May-2025	TPAG14D 0.3-0.55m 12-May-2025	TPAG14E 0-0.15m 12-May-2025
Lab Number:		3892810.6	3892810.7	3892810.8	3892810.9	3892810.10
Individual Tests						
Dry Matter	g/100g as rcvd	75	68	68	74	79
SPLP Sample Weight	g	-	50	-	-	-
SPLP Extractant Type*		-	De-ionised Water, pH 5.8 +/- 0.4	-	-	-
SPLP Final pH	pH Units	-	9.0	-	-	-
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	3	6	9	2	6
Total Recoverable Boron	mg/kg dry wt	< 20	480	2,300	41	33
Total Recoverable Cadmium	mg/kg dry wt	0.25	0.36	0.24	0.21	0.35
Total Recoverable Chromium	mg/kg dry wt	6	13	19	5	13
Total Recoverable Copper	mg/kg dry wt	16	50	41	16	34
Total Recoverable Lead	mg/kg dry wt	71	45	19.8	17.1	62
Total Recoverable Nickel	mg/kg dry wt	3	35	65	3	11
Total Recoverable Zinc	mg/kg dry wt	77	132	230	89	119
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	1.9	< 0.4	< 0.4	3.7
1-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	< 0.014	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	< 0.014	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	< 0.014	0.018
Acenaphthene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	< 0.014	< 0.013
Anthracene	mg/kg dry wt	< 0.013	0.019	< 0.015	< 0.014	0.050
Benzo[a]anthracene	mg/kg dry wt	< 0.013	0.146	< 0.015	< 0.014	0.28
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	0.193	< 0.015	< 0.014	0.34
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.032	0.29	< 0.035	< 0.033	0.51
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.031	0.28	< 0.035	< 0.033	0.51
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.013	0.23	< 0.015	< 0.014	0.41
Benzo[e]pyrene	mg/kg dry wt	< 0.013	0.123	< 0.015	< 0.014	0.21
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	0.130	< 0.015	< 0.014	0.24
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	0.099	< 0.015	< 0.014	0.169
Chrysene	mg/kg dry wt	< 0.013	0.140	< 0.015	< 0.014	0.25
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	0.028	< 0.015	< 0.014	0.052
Fluoranthene	mg/kg dry wt	0.024	0.29	< 0.015	< 0.014	0.61
Fluorene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	< 0.014	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	0.136	< 0.015	< 0.014	0.24
Naphthalene	mg/kg dry wt	< 0.07	< 0.08	< 0.08	< 0.07	< 0.07
Perylene	mg/kg dry wt	< 0.013	0.048	< 0.015	< 0.014	0.072
Phenanthrene	mg/kg dry wt	0.024	0.059	< 0.015	< 0.014	0.166
Pyrene	mg/kg dry wt	0.022	0.29	< 0.015	< 0.014	0.56

Sample Type: Soil						
Sample Name:		TPAG14E 0.15-0.7m 12-May-2025	TPAG14E 0.7-1.0m 12-May-2025	TPAG14E 1.0-1.7m 12-May-2025	TPAG14E 1.7m + 12-May-2025	TPAG14F 0-0.15m 12-May-2025
Lab Number:		3892810.12	3892810.13	3892810.14	3892810.15	3892810.16
Individual Tests						
Dry Matter	g/100g as rcvd	87	76	74	68	76
SPLP Sample Weight	g	-	50	-	-	-
SPLP Extractant Type*		-	De-ionised Water, pH 5.8 +/- 0.4	-	-	-
SPLP Final pH	pH Units	-	8.4	-	-	-
TCLP Weight of Sample Taken	g	-	50	50	-	-
TCLP Initial Sample pH	pH Units	-	8.9	7.8	-	-
TCLP Acid Adjusted Sample pH	pH Units	-	4.1	1.8	-	-
TCLP Extractant Type*		-	NaOH/Acetic acid at pH 4.93 +/- 0.05	NaOH/Acetic acid at pH 4.93 +/- 0.05	-	-
TCLP Extraction Fluid pH	pH Units	-	5.0	5.0	-	-
TCLP Post Extraction Sample pH	pH Units	-	6.8	5.1	-	-
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	4	8	5	3	6
Total Recoverable Boron	mg/kg dry wt	< 20	3,200	139	67	560
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.27	0.62	< 0.10	0.19
Total Recoverable Chromium	mg/kg dry wt	21	23	10	7	19
Total Recoverable Copper	mg/kg dry wt	22	34	20	15	32
Total Recoverable Lead	mg/kg dry wt	22	14.4	4,200	19.2	27
Total Recoverable Nickel	mg/kg dry wt	11	16	6	5	33
Total Recoverable Zinc	mg/kg dry wt	67	31	340	51	98
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	0.6	< 0.4	< 0.4	< 0.4	1.1
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.013	< 0.014	< 0.015	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.013	< 0.014	< 0.015	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.013	< 0.014	< 0.015	< 0.013
Acenaphthene	mg/kg dry wt	< 0.011	< 0.013	< 0.014	< 0.015	< 0.013
Anthracene	mg/kg dry wt	< 0.011	< 0.013	< 0.014	< 0.015	0.014
Benzo[a]anthracene	mg/kg dry wt	0.047	< 0.013	0.015	< 0.015	0.077
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.052	< 0.013	< 0.014	< 0.015	0.102
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.070	< 0.031	< 0.032	< 0.035	0.152
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.069	< 0.031	< 0.032	< 0.035	0.150
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.060	0.016	0.032	< 0.015	0.124
Benzo[e]pyrene	mg/kg dry wt	0.030	< 0.013	0.022	< 0.015	0.066
Benzo[g,h,i]perylene	mg/kg dry wt	0.032	< 0.013	0.015	< 0.015	0.069
Benzo[k]fluoranthene	mg/kg dry wt	0.029	< 0.013	< 0.014	< 0.015	0.050
Chrysene	mg/kg dry wt	0.045	< 0.013	0.034	< 0.015	0.072
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.013	< 0.014	< 0.015	0.015
Fluoranthene	mg/kg dry wt	0.122	0.025	0.037	< 0.015	0.160
Fluorene	mg/kg dry wt	< 0.011	< 0.013	< 0.014	< 0.015	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.031	< 0.013	0.016	< 0.015	0.071
Naphthalene	mg/kg dry wt	< 0.06	< 0.07	< 0.07	< 0.08	< 0.07
Perylene	mg/kg dry wt	< 0.011	0.043	< 0.014	< 0.015	0.025
Phenanthrene	mg/kg dry wt	0.027	0.017	0.021	< 0.015	0.052
Pyrene	mg/kg dry wt	0.108	0.024	0.043	< 0.015	0.152

Sample Name:		TPAG14F 0.15-0.3m 12-May-2025	TPAG14F 0.3-0.5m 12-May-2025	TPAG14G 0-0.15m 12-May-2025	TPAG14G 0.15-0.6m 12-May-2025	TPAG14G 0.6-2.0m 12-May-2025
Lab Number:		3892810.17	3892810.18	3892810.19	3892810.20	3892810.21
Individual Tests						
Dry Matter	g/100g as rcvd	86	74	76	84	77
SPLP Sample Weight	g	50	-	-	-	-

Sample Type: Soil						
Sample Name:		TPAG14F 0.15-0.3m 12-May-2025	TPAG14F 0.3-0.5m 12-May-2025	TPAG14G 0-0.15m 12-May-2025	TPAG14G 0.15-0.6m 12-May-2025	TPAG14G 0.6-2.0m 12-May-2025
Lab Number:		3892810.17	3892810.18	3892810.19	3892810.20	3892810.21
Individual Tests						
SPLP Extractant Type*		De-ionised Water, pH 5.8 +/- 0.4	-	-	-	-
SPLP Final pH	pH Units	9.4	-	-	-	-
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	4	3	4	3	4
Total Recoverable Boron	mg/kg dry wt	640	78	20	< 20	40
Total Recoverable Cadmium	mg/kg dry wt	0.12	0.26	0.15	< 0.10	0.16
Total Recoverable Chromium	mg/kg dry wt	12	6	10	24	8
Total Recoverable Copper	mg/kg dry wt	21	29	21	17	19
Total Recoverable Lead	mg/kg dry wt	53	30	36	17.7	52
Total Recoverable Nickel	mg/kg dry wt	23	4	7	10	6
Total Recoverable Zinc	mg/kg dry wt	84	96	67	63	75
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	0.4	< 0.4	1.0	< 0.3	0.4
1-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.013
Acenaphthene	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.013
Anthracene	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.013
Benzo[a]anthracene	mg/kg dry wt	0.024	< 0.013	0.075	< 0.012	0.028
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.032	< 0.013	0.099	0.018	0.040
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.043	< 0.032	0.146	< 0.028	0.053
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.042	< 0.032	0.144	< 0.028	0.053
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.037	< 0.013	0.118	0.019	0.047
Benzo[e]pyrene	mg/kg dry wt	0.022	< 0.013	0.063	0.013	0.026
Benzo[g,h,i]perylene	mg/kg dry wt	0.025	< 0.013	0.067	0.020	0.032
Benzo[k]fluoranthene	mg/kg dry wt	0.016	< 0.013	0.048	< 0.012	0.019
Chrysene	mg/kg dry wt	0.027	< 0.013	0.071	0.012	0.027
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.013	0.014	< 0.012	< 0.013
Fluoranthene	mg/kg dry wt	0.051	< 0.013	0.152	0.025	0.055
Fluorene	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.025	< 0.013	0.068	0.019	0.030
Naphthalene	mg/kg dry wt	< 0.06	< 0.07	< 0.07	< 0.06	< 0.07
Perylene	mg/kg dry wt	0.018	< 0.013	0.022	< 0.012	< 0.013
Phenanthrene	mg/kg dry wt	0.025	< 0.013	0.040	< 0.012	0.022
Pyrene	mg/kg dry wt	0.055	< 0.013	0.149	0.024	0.057

Sample Name:		TPAG14G 2.0-3.0m 12-May-2025	TPAG15A 0-0.4m 12-May-2025	TPAG15A 0.4m + 12-May-2025	TPAG15B 0-0.1m 12-May-2025	TPAG15B 0.1-0.5m 12-May-2025
Lab Number:		3892810.22	3892810.23	3892810.24	3892810.25	3892810.26
Individual Tests						
Dry Matter	g/100g as rcvd	64	70	75	76	72
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	4	3	4	6	8
Total Recoverable Boron	mg/kg dry wt	62	< 20	< 20	< 20	45
Total Recoverable Cadmium	mg/kg dry wt	0.39	< 0.10	0.29	0.66	0.35
Total Recoverable Chromium	mg/kg dry wt	12	6	8	10	6
Total Recoverable Copper	mg/kg dry wt	30	14	20	32	55
Total Recoverable Lead	mg/kg dry wt	58	14.2	88	142	53
Total Recoverable Nickel	mg/kg dry wt	12	3	4	10	7
Total Recoverable Zinc	mg/kg dry wt	189	37	82	148	81

Sample Type: Soil						
Sample Name:		TPAG14G 2.0-3.0m 12-May-2025	TPAG15A 0-0.4m 12-May-2025	TPAG15A 0.4m + 12-May-2025	TPAG15B 0-0.1m 12-May-2025	TPAG15B 0.1-0.5m 12-May-2025
Lab Number:		3892810.22	3892810.23	3892810.24	3892810.25	3892810.26
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	0.3	0.9	< 0.4
1-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
2-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Acenaphthylene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Acenaphthene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Anthracene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Benzo[a]anthracene	mg/kg dry wt	< 0.016	< 0.015	0.024	0.067	< 0.014
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.016	< 0.015	0.033	0.083	0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.038	< 0.035	0.049	0.124	< 0.033
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.038	< 0.034	0.049	0.122	< 0.032
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.016	< 0.015	0.039	0.102	0.017
Benzo[e]pyrene	mg/kg dry wt	< 0.016	< 0.015	0.021	0.052	< 0.014
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.016	< 0.015	0.024	0.057	< 0.014
Benzo[k]fluoranthene	mg/kg dry wt	< 0.016	< 0.015	0.018	0.042	< 0.014
Chrysene	mg/kg dry wt	< 0.016	< 0.015	0.024	0.063	< 0.014
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Fluoranthene	mg/kg dry wt	< 0.016	< 0.015	0.045	0.146	0.021
Fluorene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.016	< 0.015	0.023	0.055	< 0.014
Naphthalene	mg/kg dry wt	< 0.08	< 0.08	< 0.07	< 0.07	< 0.07
Perylene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	0.018	< 0.014
Phenanthrene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	0.040	0.015
Pyrene	mg/kg dry wt	< 0.016	< 0.015	0.050	0.143	0.023

Sample Name:		TPAG15B 0.5-0.7m 12-May-2025	TPAG15C 0-0.1m 12-May-2025	TPAG15C 0.1-0.3m 12-May-2025	TBE 0.5 A 12-May-2025	TBE 0.5 B 12-May-2025
Lab Number:		3892810.27	3892810.28	3892810.29	3892810.30	3892810.31
Individual Tests						
Dry Matter	g/100g as rcvd	73	87	79	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	-	-	4	3
Total Recoverable Cadmium	mg/kg dry wt	-	-	-	0.27	< 0.10
Total Recoverable Chromium	mg/kg dry wt	-	-	-	9	8
Total Recoverable Copper	mg/kg dry wt	-	-	-	18	14
Total Recoverable Lead	mg/kg dry wt	-	-	-	33	17.7
Total Recoverable Nickel	mg/kg dry wt	-	-	-	4	3
Total Recoverable Zinc	mg/kg dry wt	-	-	-	103	46
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	< 2	5	5	-	-
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.21	0.14	-	-
Total Recoverable Chromium	mg/kg dry wt	7	10	9	-	-
Total Recoverable Copper	mg/kg dry wt	5	22	15	-	-
Total Recoverable Lead	mg/kg dry wt	14.6	73	41	-	-
Total Recoverable Nickel	mg/kg dry wt	2	12	4	-	-
Total Recoverable Zinc	mg/kg dry wt	27	109	76	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.3	< 0.3	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Acenaphthylene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Acenaphthene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-

Sample Type: Soil						
Sample Name:		TPAG15B 0.5-0.7m 12-May-2025	TPAG15C 0-0.1m 12-May-2025	TPAG15C 0.1-0.3m 12-May-2025	TBE 0.5 A 12-May-2025	TBE 0.5 B 12-May-2025
Lab Number:		3892810.27	3892810.28	3892810.29	3892810.30	3892810.31
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Anthracene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.014	0.016	< 0.013	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.032	< 0.028	< 0.030	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.032	< 0.028	< 0.030	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.014	0.018	< 0.013	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.014	0.011	< 0.013	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Chrysene	mg/kg dry wt	< 0.014	0.012	< 0.013	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Fluoranthene	mg/kg dry wt	< 0.014	0.015	0.016	-	-
Fluorene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.014	0.012	< 0.013	-	-
Naphthalene	mg/kg dry wt	< 0.07	< 0.06	< 0.07	-	-
Perylene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Phenanthrene	mg/kg dry wt	< 0.014	< 0.012	< 0.013	-	-
Pyrene	mg/kg dry wt	< 0.014	0.018	0.013	-	-

Sample Name:		TBW 0.5 A 12-May-2025	TBW 0.5 B 12-May-2025	TBS 0.5 A 12-May-2025	TBS 0.5 B 12-May-2025	TBN 0.5 A 12-May-2025
Lab Number:		3892810.32	3892810.33	3892810.34	3892810.35	3892810.36
Individual Tests						
TCLP Weight of Sample Taken	g	50	-	-	-	-
TCLP Initial Sample pH	pH Units	7.2	-	-	-	-
TCLP Acid Adjusted Sample pH	pH Units	1.7	-	-	-	-
TCLP Extractant Type*		NaOH/Acetic acid at pH 4.93 +/- 0.05	-	-	-	-
TCLP Extraction Fluid pH	pH Units	5.0	-	-	-	-
TCLP Post Extraction Sample pH	pH Units	5.1	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	16	5	7	5	5
Total Recoverable Cadmium	mg/kg dry wt	0.42	0.26	0.57	0.33	0.44
Total Recoverable Chromium	mg/kg dry wt	13	8	10	11	8
Total Recoverable Copper	mg/kg dry wt	31	12	36	25	23
Total Recoverable Lead	mg/kg dry wt	250	48	110	84	53
Total Recoverable Nickel	mg/kg dry wt	16	3	5	8	4
Total Recoverable Zinc	mg/kg dry wt	2,300	1,420	400	159	188

Sample Name:		TBN 0.5 B 12-May-2025	BG01 0-0.15m 12-May-2025	BG02 0-0.15m 12-May-2025	BG03 0-0.15m 12-May-2025	BG04 0-0.15m 12-May-2025
Lab Number:		3892810.37	3892810.38	3892810.39	3892810.40	3892810.41
Individual Tests						
Dry Matter	g/100g as rcvd	-	73	69	76	72
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.26	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	7	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	18	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	22	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	5	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	72	-	-	-	-

Sample Type: Soil						
Sample Name:		TBN 0.5 B 12-May-2025	BG01 0-0.15m 12-May-2025	BG02 0-0.15m 12-May-2025	BG03 0-0.15m 12-May-2025	BG04 0-0.15m 12-May-2025
Lab Number:		3892810.37	3892810.38	3892810.39	3892810.40	3892810.41
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	5	5	7	35
Total Recoverable Cadmium	mg/kg dry wt	-	0.31	0.23	0.30	0.44
Total Recoverable Chromium	mg/kg dry wt	-	9	7	8	9
Total Recoverable Copper	mg/kg dry wt	-	16	16	19	23
Total Recoverable Lead	mg/kg dry wt	-	21	18.5	22	30
Total Recoverable Mercury	mg/kg dry wt	-	0.12	< 0.10	0.12	0.11
Total Recoverable Nickel	mg/kg dry wt	-	4	5	4	5
Total Recoverable Zinc	mg/kg dry wt	-	61	76	68	117
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
alpha-BHC	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
beta-BHC	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
delta-BHC	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
cis-Chlordane	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
trans-Chlordane	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
2,4'-DDD	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
4,4'-DDD	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
2,4'-DDE	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
4,4'-DDE	mg/kg dry wt	-	< 0.014	< 0.014	0.013	0.031
2,4'-DDT	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
4,4'-DDT	mg/kg dry wt	-	< 0.014	< 0.014	0.015	0.021
Total DDT Isomers	mg/kg dry wt	-	< 0.09	< 0.09	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Endosulfan I	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Endosulfan II	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Endosulfan sulphate	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Endrin	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Endrin aldehyde	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Endrin ketone	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Heptachlor	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Heptachlor epoxide	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Hexachlorobenzene	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014
Methoxychlor	mg/kg dry wt	-	< 0.014	< 0.014	< 0.013	< 0.014

Sample Type: Aqueous						
Sample Name:		TPAG14B 0.7-1.0m [TCLP extract]	TPAG14E 0.7-1.0m [TCLP extract]	TPAG14E 1.0-1.7m [TCLP extract]	TPAG14E 0.7-1.0m [SPLP extrcat]	TPAG14D 0-0.1m [SPLP extract]
Lab Number:		3892810.42	3892810.43	3892810.44	3892810.45	3892810.46
Individual Tests						
Total Boron	g/m³	-	28	-	16.2	0.33
Total Lead	g/m³	0.081	-	6.2	-	-

Sample Name:		TPAG14F 0.15-0.3m [SPLP extract]	TBW 0.5 A [TCLP extract]
Lab Number:		3892810.47	3892810.48
Individual Tests			
Total Boron	g/m³	0.72	-
Total Zinc	g/m³	-	14.7

Analyst's Comments

Amended Report: This certificate of analysis replaces report '3892810-SPv2' issued on 10-Jun-2025 at 10:46 am.
Reason for amendment: Additional testing added as per clients request.

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 simple 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. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1-10, 12-41
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1-10, 12-29
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-10, 12-29, 38-41
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1-10, 12-29
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1-10, 12-29
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	30-37
Heavy Metals with Mercury, 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	38-41
7 Heavy metals plus Boron	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 - 20 mg/kg dry wt	1-10, 12-29
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	38-41
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.010 - 0.05 mg/kg dry wt	1-10, 12-29
SPLP Profile*	Extraction at 30 +/- 2 rpm for 18 +/- 2 hours, (Ratio 1g sample : 20g extraction fluid). US EPA 1312.	-	7, 13, 17
TCLP Profile*	Extraction at 30 +/- 2 rpm for 18 +/- 2 hours, (Ratio 1g sample : 20g extraction fluid). US EPA 1311.	-	3, 13-14, 32
SPLP Profile			
SPLP Sample Weight	Gravimetric. US EPA 1312.	0.1 g	7, 13, 17
SPLP Extractant Type*	US EPA 1312 (Modified for New Zealand conditions to use De-ionised Water unless otherwise specified).	-	7, 13, 17
SPLP Final pH	pH meter. US EPA 1312.	0.1 pH Units	7, 13, 17
TCLP Profile			
TCLP Weight of Sample Taken	Gravimetric. US EPA 1311.	0.1 g	3, 13-14, 32
TCLP Initial Sample pH	pH meter. US EPA 1311.	0.1 pH Units	3, 13-14, 32
TCLP Acid Adjusted Sample pH	pH meter. US EPA 1311.	0.1 pH Units	3, 13-14, 32
TCLP Extractant Type*	US EPA 1311.	-	3, 13-14, 32
TCLP Extraction Fluid pH	pH meter. US EPA 1311.	0.1 pH Units	3, 13-14, 32
TCLP Post Extraction Sample pH	pH meter. US EPA 1311.	0.1 pH Units	3, 13-14, 32

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Digestion of Extracted Samples*	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	42-48
Total Boron	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.63 g/m^3	43
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.063 g/m^3	45-47
Total Lead	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0021 g/m^3	42, 44
Total Zinc	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.053 g/m^3	48

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

Testing was completed between 23-May-2025 and 27-Jun-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Fraser Thomas Limited	**Lab No:**	3916050 SPv1
Contact:	Elliot Bish	**Date Received:**	13-Jun-2025
	C/- Fraser Thomas Limited	**Date Reported:**	17-Jun-2025
	PO Box 204006	**Quote No:**	118001
	Highbrook	**Order No:**	33205
	Auckland 2161	**Client Reference:**	33205
		Submitted By:	Elliot Bish

Sample Type: Soil

		Sample Name:	TBN 0.5 C 13-Jun-2025	TBN 0.5 D 13-Jun-2025	TBW 0.5 C 13-Jun-2025	TBW 0.5 D 13-Jun-2025	TBE 0.5 C 13-Jun-2025
		Lab Number:	3916050.1	3916050.2	3916050.3	3916050.4	3916050.5
Heavy Metals, Screen Level							
Total Recoverable Arsenic	mg/kg dry wt		20	8	4	3	4
Total Recoverable Cadmium	mg/kg dry wt		0.14	0.14	< 0.10	< 0.10	0.17
Total Recoverable Chromium	mg/kg dry wt		11	10	9	9	7
Total Recoverable Copper	mg/kg dry wt		23	15	16	13	16
Total Recoverable Lead	mg/kg dry wt		18.6	19.9	22	19.1	24
Total Recoverable Nickel	mg/kg dry wt		3	3	4	4	3
Total Recoverable Zinc	mg/kg dry wt		63	50	73	53	79

		Sample Name:	TBE 0.5 D 13-Jun-2025	TBS 0.5 C 13-Jun-2025	TBS 0.5 D 13-Jun-2025	BG01 0.15-0.3 13-Jun-2025	BG01 0.3-0.5 13-Jun-2025
		Lab Number:	3916050.6	3916050.7	3916050.8	3916050.9	3916050.10
Individual Tests							
Dry Matter	g/100g as rcvd		-	-	-	75	74
Heavy Metals, Screen Level							
Total Recoverable Arsenic	mg/kg dry wt		8	2	3	-	-
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Chromium	mg/kg dry wt		6	8	7	-	-
Total Recoverable Copper	mg/kg dry wt		9	11	10	-	-
Total Recoverable Lead	mg/kg dry wt		11.7	23	17.0	-	-
Total Recoverable Nickel	mg/kg dry wt		2	3	3	-	-
Total Recoverable Zinc	mg/kg dry wt		47	43	31	-	-
Heavy Metals with Mercury, Screen Level							
Total Recoverable Arsenic	mg/kg dry wt		-	-	-	3	3
Total Recoverable Cadmium	mg/kg dry wt		-	-	-	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		-	-	-	5	5
Total Recoverable Copper	mg/kg dry wt		-	-	-	9	7
Total Recoverable Lead	mg/kg dry wt		-	-	-	16.2	15.7
Total Recoverable Mercury	mg/kg dry wt		-	-	-	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		-	-	-	2	2
Total Recoverable Zinc	mg/kg dry wt		-	-	-	38	31
Organochlorine Pesticides Screening in Soil							
Aldrin	mg/kg dry wt		-	-	-	< 0.014	< 0.014
alpha-BHC	mg/kg dry wt		-	-	-	< 0.014	< 0.014
beta-BHC	mg/kg dry wt		-	-	-	< 0.014	< 0.014
delta-BHC	mg/kg dry wt		-	-	-	< 0.014	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt		-	-	-	< 0.014	< 0.014
cis-Chlordane	mg/kg dry wt		-	-	-	< 0.014	< 0.014
trans-Chlordane	mg/kg dry wt		-	-	-	< 0.014	< 0.014

Sample Type: Soil						
Sample Name:		TBE 0.5 D 13-Jun-2025	TBS 0.5 C 13-Jun-2025	TBS 0.5 D 13-Jun-2025	BG01 0.15-0.3 13-Jun-2025	BG01 0.3-0.5 13-Jun-2025
Lab Number:		3916050.6	3916050.7	3916050.8	3916050.9	3916050.10
Organochlorine Pesticides Screening in Soil						
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.014	< 0.014
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.014	< 0.014
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.014	< 0.014
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.014	< 0.014
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.014	< 0.014
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Endosulfan I	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Endosulfan II	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Endrin	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Endrin ketone	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Heptachlor	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.014	< 0.014
Methoxychlor	mg/kg dry wt	-	-	-	< 0.014	< 0.014

Sample Name:		BG01 0.5-0.7 13-Jun-2025	BG02 0.15-0.3 13-Jun-2025	BG02 0.3-0.5 13-Jun-2025	BG02 0.5-0.7 13-Jun-2025	BG03 0.15-0.3 13-Jun-2025
Lab Number:		3916050.11	3916050.12	3916050.13	3916050.14	3916050.15
Individual Tests						
Dry Matter	g/100g as rcvd	73	68	76	79	78
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	2	4	2	2	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.19	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	5	7	6	5	7
Total Recoverable Copper	mg/kg dry wt	6	13	7	5	9
Total Recoverable Lead	mg/kg dry wt	16.8	17.3	16.2	15.6	15.4
Total Recoverable Mercury	mg/kg dry wt	< 0.10	0.16	0.15	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	2	3	3	< 2	3
Total Recoverable Zinc	mg/kg dry wt	25	49	26	21	35
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
alpha-BHC	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
beta-BHC	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
delta-BHC	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
cis-Chlordane	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
trans-Chlordane	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
2,4'-DDD	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
4,4'-DDD	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
2,4'-DDE	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
4,4'-DDE	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
2,4'-DDT	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
4,4'-DDT	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.09	< 0.08	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Endosulfan I	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Endosulfan II	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Endosulfan sulphate	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Endrin	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Endrin aldehyde	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Endrin ketone	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Heptachlor	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013

Sample Type: Soil						
Sample Name:		BG01 0.5-0.7 13-Jun-2025	BG02 0.15-0.3 13-Jun-2025	BG02 0.3-0.5 13-Jun-2025	BG02 0.5-0.7 13-Jun-2025	BG03 0.15-0.3 13-Jun-2025
Lab Number:		3916050.11	3916050.12	3916050.13	3916050.14	3916050.15
Organochlorine Pesticides Screening in Soil						
Heptachlor epoxide	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Hexachlorobenzene	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013
Methoxychlor	mg/kg dry wt	< 0.014	< 0.015	< 0.013	< 0.013	< 0.013

Sample Name:		BG03 0.3-0.5 13-Jun-2025	BG03 0.5-0.7 13-Jun-2025	BG04 0.15-0.3 13-Jun-2025	BG04 0.3-0.5 13-Jun-2025	BG04 0.5-0.7 13-Jun-2025
Lab Number:		3916050.16	3916050.17	3916050.18	3916050.19	3916050.20
Individual Tests						
Dry Matter	g/100g as rcvd	78	82	73	65	71
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	12	< 2	5	6	7
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.17	0.22	0.13
Total Recoverable Chromium	mg/kg dry wt	8	3	8	9	10
Total Recoverable Copper	mg/kg dry wt	21	4	16	36	21
Total Recoverable Lead	mg/kg dry wt	24	10.5	19.5	14.8	16.2
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	0.16	0.26	0.17
Total Recoverable Nickel	mg/kg dry wt	40	< 2	3	4	4
Total Recoverable Zinc	mg/kg dry wt	20	12	58	94	59
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
alpha-BHC	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
beta-BHC	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
delta-BHC	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
cis-Chlordane	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
trans-Chlordane	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
2,4'-DDD	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
4,4'-DDD	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
2,4'-DDE	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
4,4'-DDE	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
2,4'-DDT	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
4,4'-DDT	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Total DDT Isomers	mg/kg dry wt	< 0.08	< 0.08	< 0.09	< 0.10	< 0.09
Dieldrin	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Endosulfan I	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Endosulfan II	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Endosulfan sulphate	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Endrin	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Endrin aldehyde	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Endrin ketone	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Heptachlor	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Heptachlor epoxide	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Hexachlorobenzene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Methoxychlor	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.016	< 0.014
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	-	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.013	-	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.013	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.013	-	-	-	-
Acenaphthene	mg/kg dry wt	< 0.013	-	-	-	-
Anthracene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.031	-	-	-	-

Sample Type: Soil						
Sample Name:		BG03 0.3-0.5 13-Jun-2025	BG03 0.5-0.7 13-Jun-2025	BG04 0.15-0.3 13-Jun-2025	BG04 0.3-0.5 13-Jun-2025	BG04 0.5-0.7 13-Jun-2025
Lab Number:		3916050.16	3916050.17	3916050.18	3916050.19	3916050.20
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.031	-	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	-	-	-	-
Chrysene	mg/kg dry wt	< 0.013	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	-	-	-	-
Fluoranthene	mg/kg dry wt	< 0.013	-	-	-	-
Fluorene	mg/kg dry wt	< 0.013	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.07	-	-	-	-
Perylene	mg/kg dry wt	< 0.013	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.013	-	-	-	-
Pyrene	mg/kg dry wt	< 0.013	-	-	-	-

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 simple 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. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1-20
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	16
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-8
Heavy Metals with Mercury, 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	9-20
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	9-20
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.010 - 0.05 mg/kg dry wt	16
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	9-20
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	16
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	16

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

Testing was completed between 13-Jun-2025 and 17-Jun-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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

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

Certificate of Analysis

Client Fraser Thomas LTD
Client Contact Elliot Bish
Phone Number 021 225 4572
Email ebish@ftl.co.nz
Address 21 El Kobar Drive

IANZ# 1308

Certificate ID	Q-01479	Date Sampled[2]	23/05/2025
Samples Taken By[2]	EB/BLM	Date Sample(s) Received	26/05/2025
Project Reference[2]	33097	Date Sample(s) Analysed & Issued	03/06/2025
Site Address[2]	33097		
Location Sample Analysed	Eurofins | Focus 35 O'Rorke Road, Penrose, Auckland 1061		

Qualitative Analysis of Asbestos

Lab ID	Sample ID[2]	Sample Details[2]	Sample type	Sample size (g)[2]	Fibres Identified
1	TPAG11A 0-0.2m	-	Soils	607	**ORF, NAD**
2	TPAG11B 0-0.05m	-	Soils	573	**ORF, NAD**
3	TPAG11B 0.05-0.3m	-	Soils	803	**ORF, NAD**
4	TPAG11C 0-0.2m	-	Soils	624	**ORF, NAD**
5	TPAG11D 0-0.1m	-	Soils	654	**ORF, NAD**
6	TPAG11D 0.1-0.5m	-	Soils	554	**ORF, NAD**
7	TBE 0.5 A	-	Soils	586	**ORF, NAD**
8	TBE 0.5 B	-	Soils	628	**ORF, NAD**
9	TBW 0.5 A	-	Soils	361	**ORF, NAD**
10	TBW 0.5 B	-	Soils	435	**ORF, NAD**
11	TBN 0.5 A	-	Soils	404	**ORF, NAD**
12	TBN 0.5 B	-	Soils	618	**ORF, NAD**
13	TBS 0.5 A	-	Soils	393	**ORF, NAD**
14	TBS 0.5 B	-	Soils	544	**ORF, NAD**
15	TPAG14A 0-0.2m	-	Soils	703	**ORF, NAD**
16	TPAG14A 0.2-0.65m	-	Soils	691	**ORF, NAD**
17	TPAG14A 0.65-0.85m	-	Soils	555	**ORF, NAD**
18	TPAG14B 0-0.15m	-	Soils	602	**ORF, NAD**
19	TPAG14B 0.15-0.7m	-	Soils	634	**ORF, NAD**
20	TPAG14B 0.7-1.0m	-	Soils	564	**ORF, NAD**
21	TPAG14C 0-0.15m	-	Soils	574	**ORF, NAD**
22	TPAG14C 0.15-0.45m	-	Soils	653	**ORF, NAD**
23	TPAG14C 0.45-0.85m	-	Soils	524	**ORF, NAD**
24	TPAG14D 0-0.1m	-	Soils	661	**ORF, NAD**
25	TPAG14D 0.1-0.3m	-	Soils	582	**AMO, ORF**
26	TPAG14D 0.3-0.55m	-	Soils	672	**ORF, NAD**
27	TPAG14E 0-0.15m	-	Soils	691	**ORF, NAD**
28	TPAG14E 0.7-1.0m	-	Soils	730	**ORF, NAD**
29	TPAG14E 1.0-1.7m	-	Soils	645	**ORF, NAD**
30	TPAG14F 0-0.15m	-	Soils	595	**ORF, NAD**
31	TPAG14F 0.15-0.3m	-	Soils	601	**CHR, ORF**
32	TPAG14F 0.3-0.5m	-	Soils	599	**ORF, NAD**
33	TPAG14G 0-0.15m	-	Soils	619	**ORF, NAD**
34	TPAG14G 0.15-0.6m	-	Soils	562	**ORF, NAD**
35	TPAG14G 0.6-2m	-	Soils	532	**ORF, NAD**
36	TPAG15A 0-0.4m	-	Soils	597	**ORF, NAD**
37	TPAG15B 0-0.1m	-	Soils	621	**ORF, NAD**
38	TPAG15B 0.1-0.5m	-	Soils	571	**ORF, NAD**
39	TPAG15C 0-0.1m	-	Soils	651	**ORF, NAD**
40	TPAG15C 0.1-0.3m	-	Soils	538	**ORF, NAD**

Opinions and interpretations expressed herein are outside the scope of Eurofins | Focus IANZ accreditation

Analytical Notes	-

Fibre Identification Key:

*	See Analytical Notes	**ORF**	Organic Fibre
CHR	Chrysotile (White Asbestos)	**SMF**	Synthetic Mineral Fibre
AMO	Amosite (Brown / Grey Asbestos)	**NFD**	No Fibres Detected
CRO	Crocidolite – (Blue Asbestos)	**NAD**	No Asbestos Detected
UMF	Unknown Mineral Fibre		

Scope of Accreditation:

1. The analytical comments marked (*) stated in the semi-quantitative analysis and the calculations in the semi-quantitative analysis of asbestos in soil are beyond Eurofins | Focus scope of accreditation.
2. Eurofins | Focus did not carry out any sampling, and the data presented are based on the samples submitted. Data supplied by the client is indicated with superscript [2] and may impact the results.
3. This certificate should be read in its entirety and shall not be reproduced except in full, without written approval of the laboratory.

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 26/05/2025
Date sample(s) analysed: 03/06/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
1	TPAG1 1A 0-0.2m	607.4	563.4	7.2	(>10mm) Fraction	154.3	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	247.8	-	NAD	-					
					(<2mm) Fraction	161.3	-	NAD	-					
2	TPAG1 1B 0-0.05m	572.7	387.3	32.4	(>10mm) Fraction	147.3	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	152.4	-	NAD	-					
					(<2mm) Fraction	87.6	-	NAD	-					
3	TPAG1 1B 0.05-0.3m	803.4	759.2	5.5	(>10mm) Fraction	252.5	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	354.3	-	NAD	-					
					(<2mm) Fraction	152.4	-	NAD	-					
4	TPAG1 1C 0-00.2m	624.4	540.8	13.4	(>10mm) Fraction	146.2	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	243.5	-	NAD	-					
					(<2mm) Fraction	151.1	-	NAD	-					
5	TPAG1 1D 0-0.1m	654.2	547.9	16.2	(>10mm) Fraction	150.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	184.8	-	NAD	-					
					(<2mm) Fraction	213.1	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 26/05/2025
Date sample(s) analysed: 03/06/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
6	TPAG1 1D 0.1-0.5m	554.0	427.7	22.8	(>10mm) Fraction	94.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	179.4	-	NAD	-					
					(<2mm) Fraction	153.5	-	NAD	-					
7	TBE 0.5 A	585.6	403.2	31.1	(>10mm) Fraction	107.2	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	155.6	-	NAD	-					
					(<2mm) Fraction	140.4	-	NAD	-					
8	TBE 0.5 B	628.2	475.3	24.3	(>10mm) Fraction	68.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	171.3	-	NAD	-					
					(<2mm) Fraction	235.2	-	NAD	-					
9	TBW 0.5 A	360.9	203.5	43.6	(>10mm) Fraction	74.3	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	62.0	-	NAD	-					
					(<2mm) Fraction	67.2	-	NAD	-					
10	TBW 0.5 B	434.9	288.3	33.7	(>10mm) Fraction	95.4	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	108.8	-	NAD	-					
					(<2mm) Fraction	84.1	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 26/05/2025
Date sample(s) analysed: 03/06/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
11	TBN 0.5 A	404.3	280.2	30.7	(>10mm) Fraction	77.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	95.8	-	NAD	-					
					(<2mm) Fraction	106.8	-	NAD	-					
12	TBN 0.5 B	617.7	444.1	28.1	(>10mm) Fraction	153.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	158.3	-	NAD	-					
					(<2mm) Fraction	132.1	-	NAD	-					
13	TBS 0.5 A	393.1	261.2	33.6	(>10mm) Fraction	31.3	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	86.2	-	NAD	-					
					(<2mm) Fraction	143.7	-	NAD	-					
14	TBS 0.5 B	543.7	399.8	26.5	(>10mm) Fraction	118.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	135.3	-	NAD	-					
					(<2mm) Fraction	146.5	-	NAD	-					
15	TPAG14A 0-0.2m	702.8	514.1	26.8	(>10mm) Fraction	119.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	227.4	-	NAD	-					
					(<2mm) Fraction	167.7	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 26/05/2025
Date sample(s) analysed: 03/06/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
16	TPAG14A 0.2-0.65m	691.4	597.3	13.6	(>10mm) Fraction	300.5	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	206.7	-	NAD	-					
					(<2mm) Fraction	90.1	-	NAD	-					
17	TPAG14A 0.65-0.85m	554.8	423.7	23.6	(>10mm) Fraction	107.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	206.7	-	NAD	-					
					(<2mm) Fraction	109.4	-	NAD	-					
18	TPAG14B 0-0.15m	601.7	457.8	23.9	(>10mm) Fraction	116.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	203.7	-	NAD	-					
					(<2mm) Fraction	137.5	-	NAD	-					
19	TPAG14B 0.15-0.7m	634.2	550.9	13.1	(>10mm) Fraction	227.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	230.2	-	NAD	-					
					(<2mm) Fraction	92.9	-	NAD	-					
20	TPAG14B 0.7-1.0m	564.3	426.7	24.4	(>10mm) Fraction	140.9	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	193.4	-	NAD	-					
					(<2mm) Fraction	92.4	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 26/05/2025
Date sample(s) analysed: 03/06/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
21	TPAG1 4C 0-0.15m	573.6	440.7	23.2	(>10mm) Fraction	88.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	204.5	-	NAD	-					
					(<2mm) Fraction	147.5	-	NAD	-					
22	TPAG1 4C 0.15-0.45m	652.6	556.7	14.7	(>10mm) Fraction	160.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	254.7	-	NAD	-					
					(<2mm) Fraction	142.0	-	NAD	-					
23	TPAG1 4C 0.45-0.85m	524.0	394.1	24.8	(>10mm) Fraction	120.5	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	191.8	-	NAD	-					
					(<2mm) Fraction	81.8	-	NAD	-					
24	TPAG1 4D 0-0.1m	661.2	487.4	26.3	(>10mm) Fraction	129.1	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	230.5	-	NAD	-					
					(<2mm) Fraction	127.8	-	NAD	-					
25	TPAG1 4D 0.1-0.3m	582.2	392.5	32.6	(>10mm) Fraction	71.5	-	NAD	-	0.0002	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	167.4	0.0001	FFF	100					
					(<2mm) Fraction	153.6	0.0001	FFF	100					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 26/05/2025
Date sample(s) analysed: 03/06/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
26	TPAG1 4D 0.3-0.55m	672.3	516.7	23.1	(>10mm) Fraction	204.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	199.4	-	NAD	-					
					(<2mm) Fraction	112.6	-	NAD	-					
27	TPAG1 4E 0-0.15m	690.6	518.8	24.9	(>10mm) Fraction	105.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	235.2	-	NAD	-					
					(<2mm) Fraction	177.8	-	NAD	-					
28	TPAG1 4E 0.7-1.0m	729.6	558.1	23.5	(>10mm) Fraction	118.2	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	214.9	-	NAD	-					
					(<2mm) Fraction	225.0	-	NAD	-					
29	TPAG1 4E 1.0-1.7m	644.9	476.9	26.1	(>10mm) Fraction	314.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	109.8	-	NAD	-					
					(<2mm) Fraction	52.4	-	NAD	-					
30	TPAG1 4F 0-0.15m	595.1	421.9	29.1	(>10mm) Fraction	86.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	197.8	-	NAD	-					
					(<2mm) Fraction	138.1	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 26/05/2025
Date sample(s) analysed: 03/06/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
31	TPAG1 4F 0.15-0.3m	601.2	501.9	16.5	(>10mm) Fraction	208.4	-	NAD	-	0.0017	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	183.5	0.0028	INS	60					
					(<2mm) Fraction	110.0	-	NAD	-					
32	TPAG1 4F 0.3-0.5m	598.5	449.5	24.9	(>10mm) Fraction	232.3	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	156.8	-	NAD	-					
					(<2mm) Fraction	60.4	-	NAD	-					
33	TPAG1 4G 0-0.15m	619.2	515.6	16.7	(>10mm) Fraction	166.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	238.7	-	NAD	-					
					(<2mm) Fraction	110.3	-	NAD	-					
34	TPAG1 4G 0.15-0.6m	562.4	425.2	24.4	(>10mm) Fraction	93.5	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	195.9	-	NAD	-					
					(<2mm) Fraction	135.8	-	NAD	-					
35	TPAG1 4G 0.6-2m	531.7	401.1	24.6	(>10mm) Fraction	78.2	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	166.5	-	NAD	-					
					(<2mm) Fraction	156.4	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 26/05/2025
Date sample(s) analysed: 03/06/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
36	TPAG1 5A 0-0.4m	597.4	442.6	25.9	(>10mm) Fraction	103.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	224.3	-	NAD	-					
					(<2mm) Fraction	114.6	-	NAD	-					
37	TPAG1 5B 0-0.1m	620.6	463.5	25.3	(>10mm) Fraction	73.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	259.3	-	NAD	-					
					(<2mm) Fraction	130.6	-	NAD	-					
38	TPAG1 5B 0.1-0.5m	570.7	432.1	24.3	(>10mm) Fraction	142.5	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	183.8	-	NAD	-					
					(<2mm) Fraction	105.8	-	NAD	-					
39	TPAG1 5C 0-0.1m	651.2	557.9	14.3	(>10mm) Fraction	228.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	222.2	-	NAD	-					
					(<2mm) Fraction	107.0	-	NAD	-					
40	TPAG1 5C 0.1-0.3m	538.2	413.4	23.2	(>10mm) Fraction	277.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	89.9	-	NAD	-					
					(<2mm) Fraction	45.9	-	NAD	-					

Analysis Method:

Samples submitted have been analysed to determine the mass fraction of asbestos in soil using low powered stereo microscopy followed by polarised light microscopy (PLM) including dispersion staining techniques as documented in (AS 4964-2004), Method for the qualitative identification of asbestos in bulk samples, BRANZ, New Zealand Guidelines for Assessing and Managing Asbestos in Soils:2017.

Product Identification Key:

BTP	Bituminous Product	LSE	Loose Fill Insulation
CMP	Cement Product	NAD	No Asbestos Detected
COM	Composite	PPR	Paper Product
FFF	Free Fibres	RPL	Reinforced Plastics
FIB	Fibre Board	TXC	Textured Coating
GCP	Gaskets (compressed)	VNP	Vinyl Products
GRW	Gaskets (rope/woven)	VPP	Vinyl with paper backing
INS	Insulation	WVP	Woven Product

Interpretation of Key:

[a] Percentage of Asbestos in product is adopted from HSG 264 - 2012, Asbestos the survey guide, Appendix 2, ACMS in buildings and categorized in our internal Technical Procedure (NPM-TP02) for Qualitative and Semi-Quantitative analysis of asbestos in soil. A dash (-) denotes that there was no asbestos found in that fraction.

[b] Total Mass of Asbestos is the sum mass of asbestos-by-asbestos type in product type([a]) plus the mass of free fibre asbestos. A dash (-) denotes that there was no total mass of asbestos calculated asbestos found in that fraction.

[c] Bonded Asbestos Containing Material in the greater than 10mm fraction as percentage of the total sample (% w/w). A dash (-) denotes that there was no bonded asbestos containing materials found in that fraction.

[d] Asbestos as Fibrous Asbestos (FA) in greater than 10mm fraction as percentage of total sample (% w/w).

[e] Asbestos as Asbestos Fines (AF) in less than 10mm fraction as a percentage of total sample (% w/w).

[f] Total Friable Asbestos combining Fibrous Asbestos and Asbestos Fines as the percentage weight for weight of the total sample (% w/w).

Sample History

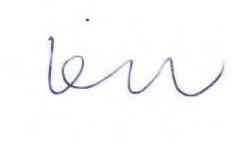
Where samples are submitted/analysed over several days, the last extraction date is reported. If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time. Client samples are disposed of 1 month after analysis

Description	Testing Site	Extracted	Holding Time
AS4964-2004 and in-house Method NPM -TP02	Auckland	03/06/2025	Indefinite

Comments

Asbestos Counter/Identifier:

Elsie Xu	Analyst-Asbestos
Emily Wang	Analyst-Asbestos



Emily Wang

Senior Analyst-Asbestos (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

Measurement uncertainty of test data is available on request or please click here.

APPENDIX SF2: FTL MEMO (11 AUGUST 2025), COMPARATIVE WATER QUALITY STANDARDS FOR BORON

FTL File Note - Comparative Water Quality Standards for Boron (11 August 2025)

Boron in relatively small amounts is essential to the normal growth of all plants, but can be toxic when present in excess.

Different water quality criteria are summarised below for acceptable boron concentrations, ranging in order from most strict (lowest) to least strict (highest) guidelines. The ANZECC 95% guideline has been adopted for comparison with measured boron concentrations in the Wharekōrino Stream and is the most strict of the criteria listed below.

Criteria	Guideline (mg/L)	Source
Protection of 95% of freshwater species	0.37	ANZECC (2000) Water Quality Guidelines
Irrigation Use – long term use (up to 100 years)	0.50	
Irrigation Use – short term use (up to 20 years)	0.50 (sensitive plants) to 6-15 (very tolerant plants)	
Protection of 95% of freshwater species	0.94	ANZECC (July 2021) "Toxicant Default Guideline Values for Aquatic Ecosystem Protection, Boron in Freshwater"
Drinking Water – Maximum Allowable Value	2.4	Water Services (Drinking Water Standards for New Zealand) Regulations 2022

Notes:

1. Acceptable short term boron concentrations vary depending on the agricultural crop. These concentrations are listed below for different types of crops and represent the maximum concentrations of boron tolerated by plants in irrigation water without reduction in yield or vegetative growth. For example, corn is moderately tolerant and can cope with boron concentrations in soil water of 2-4mg/L.

Table 9.2.18 Relative tolerance of agricultural crops to boron[a]

Tolerance	Concentration of boron in soil water (mg/L)	Crop
Very sensitive	<0.5	Blackberry, lemon
Sensitive	0.5–1.0	Peach, cherry, plum, grape, cowpea, onion, garlic, sweet potato, wheat, barley, sunflower, mung bean, sesame, lupin, strawberry, Jerusalem artichoke, kidney beans, lime beans
Moderately sensitive	1.0–2.0	Capsicum, pea, carrot, radish, potato, cucumber
Moderately tolerant	2.0–4.0	Lettuce, cabbage, celery, turnip, bluegrass, oat, corn, artichoke, tobacco, mustard, clover, squash, musk melon
Tolerant	4.0–6.0	Sorghum, tomato, alfalfa, purple, vetch, parsley, red beet, sugar-beet
Very tolerant	6.0–15.0	Asparagus

a From Westcot & Ayers (1984), cited by ANZECC (1992)

We have not been able to find any data on boron tolerance for a typical range of nursery plants, such as those grown in the Pūniu Rivercare nursery. However, research has found that boron tolerance also varies for nursery plants and depends on a range of factors including the growth medium and management practices. For example, if plants are grown in bags in the nursery, then they would likely be released from the nursery after a relatively short time period, and much shorter than the 20 years considered in deriving the short term use (20 year period) referred to above. New seedlings brought into the nursery would be in new planter bags containing fresh soil. For such practices, the plants are likely to be able to more tolerant of boron.

2. ANZECC 95% species protection level for boron was revised in 2021 based on errors identified in the 2000 derivation and new data becoming available. The revised default guideline value is approximately three times higher than the 2000 value.

APPENDIX SF3: FTL REPORT (12 SEPTEMBER 2025), ADDENDUM TARGETED DETAILED SITE INVESTIGATION REPORT, AGRESEARCH AREA 23 FARM ROAD, TOKANUI)

TOITŪ TE WHENUA

LAND INFORMATION NEW ZEALAND

Fraser Thomas

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

23 FARM ROAD, TOKANUI

FORMER TOKANUI PSYCHIATRIC HOSPITAL DEMOLITION AND REMEDIATION ADDENDUM TARGETED DETAILED SITE INVESTIGATION – AGRESEARCH AREA

TOITŪ TE WHENUA

LAND INFORMATION NEW ZEALAND

23 FARM ROAD, TOKANUI

FORMER TOKANUI PSYCHIATRIC HOSPITAL DEMOLITION AND REMEDIATION ADDENDUM TARGETED DETAILED SITE INVESTIGATION – AGRESEARCH AREA

Project No.	33097	Approved for Issue	
Version No.	2	Name	S Finnigan
Status	Final	Signature	
Authors	B Laing-McConnell/ E Bish/ S Finnigan		
Reviewer	S Finnigan	Date	12/09/2025

Fraser Thomas Limited
Consulting Engineers, Licensed Surveyors
Planners & Resource Managers
Level 1, 21 El Kobar Drive, East Tamaki, Auckland, 2025
PO Box 204006, Highbrook, Auckland, 2025
Auckland, New Zealand
Tel : +64 9 278-7078
Email: xxxxx@ftl.co.nz

TOITŪ TE WHENUA – LAND INFORMATION NEW ZEALAND
ADDENDUM TARGETED DETAILED SITE INVESTIGATION REPORT
23 FARM ROAD, TOKANUI

EXECUTIVE SUMMARY

In response to instructions from Toitū Te Whenua – Land Information New Zealand (LINZ) ('the client'), Fraser Thomas Limited (FTL) has undertaken a Targeted Detailed Site Investigation (TDSI) of the portion of the site located at 23 Farm Road, Tokanui (Section 3 SO 534156) ('the site'). Due to a misalignment between the fence line and legal boundaries, a small area of land formerly utilised as part of the Former Tokanui Psychiatric Hospital (FTPH) Closed Landfill (Existing Disposal Site) is currently located on land owned and operated by AgResearch Limited (ARL). These works have been undertaken to determine the extent and severity of any potential contamination within the portion of the existing disposal site currently under ARL ownership (the investigation area), as well as to check for any contamination of soils from demolition/removal of the historical buildings that were historically present in this area.

This investigation has involved a desktop study, site walkover, soil sampling, and reporting associated with potential land contamination issues. The main rationale and objectives for this investigation were:

- To identify the main actual or potential contamination issues due to ongoing and historic use of land within the investigation area;
- To confirm that the investigation area is suitable or can be made suitable for the existing agricultural land use.
- To determine whether any remediation is required of the investigation area, and if so, whether excavated soil from remedial activities can be transferred into the FTPH Existing Disposal Site or must be disposed of off-site to an approved disposal facility.

This investigation has been managed, reviewed, and approved by a Suitably Qualified and Experienced Practitioner (SQEP), as defined in the National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES: CS).

Overall, the aerial photographs and desktop information indicate that the investigation area was occupied by two historical buildings located adjacent to the existing disposal site from at least the 1940s to the mid-1970s. One of the historical buildings within the investigation area appears to have been demolished between 1966 and 1974, while the other was demolished and/or removed between 1979 and 1995. Landfilling activities in this area appear to be relatively minor, apart from potentially in the 1979 aerial, although some of the disturbed soil visible in this photo may have been for landfill access. The investigation area has appeared in pasture from the 1990s to the present day.

Given the identification of Hazardous Activities and Industries List (HAIL) activities (G3 & I) on site, intrusive soil sampling was undertaken across the investigation area to determine the contamination status of the portion of land that was subject to historical landfilling. The intrusive investigation focused on the potential presence of heavy metals, boron, polycyclic aromatic hydrocarbons (PAHs), and asbestos in soil to check for possible contamination derived from the potential presence of historical lead-based paint & asbestos-containing materials (ACM) on demolished structures, and historical landfilling of hospital activity derived waste materials on site.

This investigation was undertaken in two stages, with a total of 53 samples being collected from 20 excavated test pits, evenly distributed across the investigation area. Generally, soils from within the investigation area can be described as silty topsoil with gravels (~0-0.3m) and variable building debris content (generally ~5%, with isolated pockets of ~40%) underlain by silt (Hamilton Ash) with minor clay (0.3m+) and 'paleosol' (buried topsoil) inclusions. Fill depths were generally shallow, ranging from ~0.15-0.4m in most test pits. Fill was found at greater depth along the western edge of the investigation area, in locations AG14, AG14B, AG14E, and AG14G where the extent of the historical landfill was encountered. This buried fill was found from ~0.7-1.7m depth, overlain by a capping layer (0.2-0.7m depth) and topsoil (0.2m thick).

All 53 samples collected across the two investigations were analysed at an IANZ accredited laboratory for heavy metals, boron, PAHs, and semi-quantitative asbestos in soil (SQACM). Laboratory testing of selected soil samples found:

- One or more heavy metal concentrations were elevated above maximum background levels for selected elements in soils of the Waikato region in 47 of the 53 samples analysed;
- One or more heavy metal concentrations were in excess of the Site Specific Rural-Residential Remedial Standards (Derived by the HAIL Environmental Site-Specific Risk Assessment (SSRA) Report, dated April 2024) in seven of the 53 samples analysed, and the Site Specific Managed Remedial Standards (Derived by HAIL Environmental, SSRA, April 2024) in two of the 53 samples analysed;
- Low-level PAHs were detected in 36 of the 53 samples analysed;
- Low-level asbestos concentrations were detected in two samples analysed;
- A single exceedance of the NES: CS Soil Contaminant Standards (SCS) for commercial/industrial land use (outdoor worker) criteria for lead was noted in a single sample analysed;
- Toxicity Characteristic Leaching Procedure (TCLP) testing for lead and boron in soil samples with elevated levels of these contaminants found that all but one sample had acceptable TCLP values for off-site disposal to a Class 1 Landfill. However, complementary SPLP testing found that concentrations of all contaminants were acceptable for disposal to the Existing Disposal Site.

Based on these findings, it is recommended that the following soils/fill be transferred to Area A1 of the Existing Disposal Site:

Sample Location	Rationale	Area (m^2)	Volume (m^3)
AG14G (0.6-2.0m)	C&D content ~10%	67	94
AG14 (0.7-1.6m)	C&D content ~40%; high boron in 1m depth sample	46	41
Shallow fill materials from AG11 (0-0.2m), AG11D (0-0.5m), AG14D (0-0.1m), AG14F (0-0.3m), AG15 (0-0.25m), and AG15B (0-0.5m)	Contains low-level contamination	476	176
Fill material from location AG14B (0.7-1.0m) and AG14E (1-1.7m)	Contains moderate level contamination	77	42
Fill material from location AG14E (0.7-1.0m) and AG14D (0.1-0.3m depth)	Contains moderate level contamination - high boron concentrations but acceptable SPLP for onsite disposal	75	20
Totals (Net)		666	373

Notes:
- Total volume and area values reflect net coverage, ensuring no double-counting of shared spatial extents.
- C&D = construction and demolition waste

All other soil and fill material can be left undisturbed. Upon completion of the above-mentioned works, all landfill material/refuse will have been removed from the ARL site.

Based on advice from SLR Consulting Limited (SLR), FTL understands that the parcel of ARL-owned land has been included within the address description of the LINZ resource consent application (prepared by SLR) for renewing the resource consent covering the existing disposal site. Hence, no consent should be required under the NES: CS Regulations, and the works can be undertaken in accordance with conditions outlined in the updated forthcoming Former Tokanui Hospital Closed Landfill consent.

NATIONAL ENVIRONMENTAL STANDARD FOR ASSESSING AND MANAGING CONTAMINANTS IN SOIL TO PROTECT HUMAN HEALTH

TARGETED DETAILED SITE INVESTIGATION - CERTIFYING STATEMENT

I, Dr Sean Matthew Finnigan of Fraser Thomas Ltd *certify* that:

This Targeted Detailed Site Investigation meets the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, NES: CS) Regulations 2011 because it has been:

a. done by suitably qualified and experienced practitioners, and
b. done in accordance with the current edition of Contaminated land management guidelines No 5 – Site investigation and analysis of soils, and
c. reported on in accordance with the current edition of Contaminated land Management Guidelines No 1 – Reporting on Contaminated Sites in New Zealand, and
d. the report is certified by a Suitably Qualified and Experienced Practitioner.

This Targeted Detailed Site Investigation concludes that:

a. No consents are required under the NES: CS Regulations, as all works are to be undertaken in accordance with the forthcoming Former Tokanui Closed Landfill consent requirements.
b. Low to moderate level contaminated soil/fill and fill containing more than 5% construction and demolition debris is recommended to be excavated and transferred into the existing Landfill/disposal site.

This investigation has been undertaken by the following staff:

a. Dr Sean Finnigan, BE, MEnv.Sci, PhD; CPEng, M. ALGA, M.WasteMINZ, CEnvP-CL (24 yrs CL experience)
b. Elliot Bish, BSc, PGDipSci, M.ALGa, M.WasteMINZ, CEnvP-G, MEIANZ (8 yrs CL experience)
c. Ben Laing-McConnell, BSc, IP402, M.ALGa, M.WasteMINZ (3 yrs CL experience)

Further evidence of these staff' qualifications and experience can be provided on request.

Signed:  Date: 12 September 2025

TOITŪ TE WHENUA – LAND INFORMATION NEW ZEALAND
ADDENDUM TARGETED DETAILED SITE INVESTIGATION REPORT
23 FARM ROAD, TE AWAMUTU, WAIKATO

TABLE OF CONTENTS

DRAWINGS

APPENDICES

TOITŪ TE WHENUA – LAND INFORMATION NEW ZEALAND
ADDENDUM TARGETED DETAILED SITE INVESTIGATION REPORT
23 FARM ROAD, TOKANUI

1 INTRODUCTION

In response to instructions from Toitū Te Whenua – Land Information New Zealand (LINZ) ('the client'), Fraser Thomas Limited (FTL) has undertaken a Targeted Detailed Site Investigation (TDSI) of the portion of the site located at 23 Farm Road, Tokanui (Section 3 SO 534156) ('the site'). Due to a misalignment between the fence line and legal boundaries, a small area of land formerly utilised as part of the Former Tokanui Psychiatric Hospital (FTPH) Closed Landfill (Existing Disposal Site) is currently located on land owned and operated by AgResearch Limited (ARL). These works have been undertaken to determine the extent and severity of any potential contamination within the portion of the Existing Disposal Site currently under ARL ownership (the investigation area), as well as to check for any contamination of soils from demolition/removal of the historical buildings that were historically present in this area.

This investigation involved a desktop study, site walkover, soil sampling and analysis and reporting associated with potential land contamination issues.

The format of this report is as follows:

- Rationale, objectives and scope of work.
- Investigation methodology.
- Site details.
- Desktop study, site walkover and soil sampling results.
- Discussion, conclusions and recommendations.
- Site plans, representative photographs and other relevant information in appendix form.

2 RATIONALE, OBJECTIVES AND SCOPE OF WORK

The main rationale and objectives for this investigation were:

- To identify the main actual or potential contamination issues due to ongoing and historic use of land within the investigation area.
- To confirm that the investigation area is suitable or can be made suitable for the existing agricultural land use.
- To determine whether any remediation is required of the investigation area, and if so, whether excavated soil from remedial activities can be transferred into the FTPH Existing Disposal Site or must be disposed of off-site to an approved disposal facility.

3 INVESTIGATION METHODOLOGY

The methodology used for this site assessment is summarised below:

1. Desktop study involving review of available historical information for the subject site, including historical aerial photographs (Appendix B).
2. Conduct a site walkover investigation of the subject site, including a visual appraisal to identify any disturbed and/or potentially contaminated areas. Relevant photographs are set out in Appendix C.
3. Soil sampling and laboratory analysis.
4. Preparation of a TDSI report, including the results of the desktop study, site walkover survey, conclusions, and recommendations.
5. Provision of site plans, relevant documentation, and representative photographs as appendices to this report.

Fraser Thomas Limited Health and Safety Management Plan procedures were followed throughout the investigation.

4 SITE DETAILS

4.1 LOCATION AND ZONING

The investigation area comprises a small area of pasture to the west of Farm Road, which forms part of the larger rural block of ARL-owned land located at 23 Farm Road, Tokanui (Section 3 SO 534156) ('the site'). The site is zoned "Rural" under the Waipa District Plan. The site extent is outlined in FTL Drawing 33097/AG01 (attached).

4.2 TOPOGRAPHY, GEOLOGY AND SOILS

The site is located in a predominantly flat area. While completing the site appraisal, reference was made to the Institute of Geological and Nuclear Sciences geological web map (NZ 1:250,000). The geological map shows that the investigation area is underlain by Middle Pleistocene to Late Pleistocene River deposits, comprising locally derived pumiceous clays, sandy clays, and gravels.

4.3 PROPOSED DEVELOPMENT

The investigation area is currently in agricultural use for pastoral grazing. No change is expected to this land use in the future.

4.4 PREVIOUS INVESTIGATIONS

This report should be read in conjunction with the following reports:

- "*Former Tokanui Psychiatric Hospital Demolition and Remediation: Existing Disposal Sites – Intrusive Investigation Report*" dated October 2024 and prepared by Fraser Thomas Limited, henceforth referred to as 'The IIR'.
- "*Former Tokanui Hospital Demolition and Remediation: Remedial Action Plan – Contaminated Soil"* dated April 2025 and prepared by Fraser Thomas Limited, henceforth referred to as 'The RAP'.
- "*Former Tokanui Hospital Demolition and Remediation: Existing Disposal Site Repair and Upgrade Works Report"* dated November 2024 and prepared by Fraser Thomas Limited, henceforth referred to as 'The RUWR'.

4.4.1 INTRUSIVE INVESTIGATION REPORT (OCTOBER 2024)

In brief, The IIR covers the existing disposal sites portion of the site that was subject to landfilling from at least 1943 through to 1979 and possibly into the 1980s, located off Farm Road, directly east of the Wharekōrino Stream. The IIR identified nine areas for intrusive investigation, of which all but two were found to contain landfill material.

The IIR only included two trenches (TR6 & TR7) in the vicinity of the ARL investigation area, with TR7 confirming that the historic landfill area extended slightly into the ARL land. No soil samples from this area were tested for contamination as part of the IIR.

4.4.2 REMEDIAL ACTION PLAN (APRIL 2025)

In brief, The RAP was prepared to satisfy part of the requirements of the Ngāti Maniapoto Deed of Settlement (the Deed), which forms part of the Maniapoto Settlement Claims Act 2022, and to provide the remedial requirements for the demolition and remediation of the site occupied by the former Tokanui Hospital concerning soil contamination. It also provides a detailed summary of the previous investigations completed by Fraser Thomas Ltd (FTL) and other consultants and outlines the areas and volumes of soil requiring management and/or removal (excluding previous remedial works up to 2018) during the demolition and remediation of the site.

Whilst the RAP does not relate to the Existing Disposal Site, it is relevant to this investigation, as this TDSI report has adopted the same classification of soil contamination as in the RAP, namely:

- **Low Level** contamination: exceeds the Site-Specific Rural Residential (SSRR) Remedial Standard but not the Site-Specific Managed (SSM) Remedial Standard;
- **Moderate Level** contamination: exceeds the SSM Standard;
- **High Level** contamination: exceeds Class B criteria for asbestos contamination, Class 1 landfill TCLP criteria for other contaminants and adopted SPLP criteria for the Existing Disposal Site.

The RAP also added remediation criteria based on the removal of fill material containing more than 5% C&D waste materials to either the existing disposal site or off-site to an approved landfill.

4.4.3 DISPOSAL SITE REPAIR AND UPGRADE WORKS REPORT (NOVEMBER 2024)

In brief, The RUWR assessed a range of options relating to the repair and/or upgrade of the existing disposal site. The preferred option (Option 4) includes an item to relocate any fill/refuse material from the south-eastern corner of the existing disposal site, located on ARL land, into the existing disposal site. The affected area was estimated to be approximately 370m^2, with an associated refuse volume of 850m^3. However, these estimates were based on limited intrusive investigation in this area, and it was recommended to LINZ that further delineation testing be undertaken in this area to define the volume of potentially affected soils.

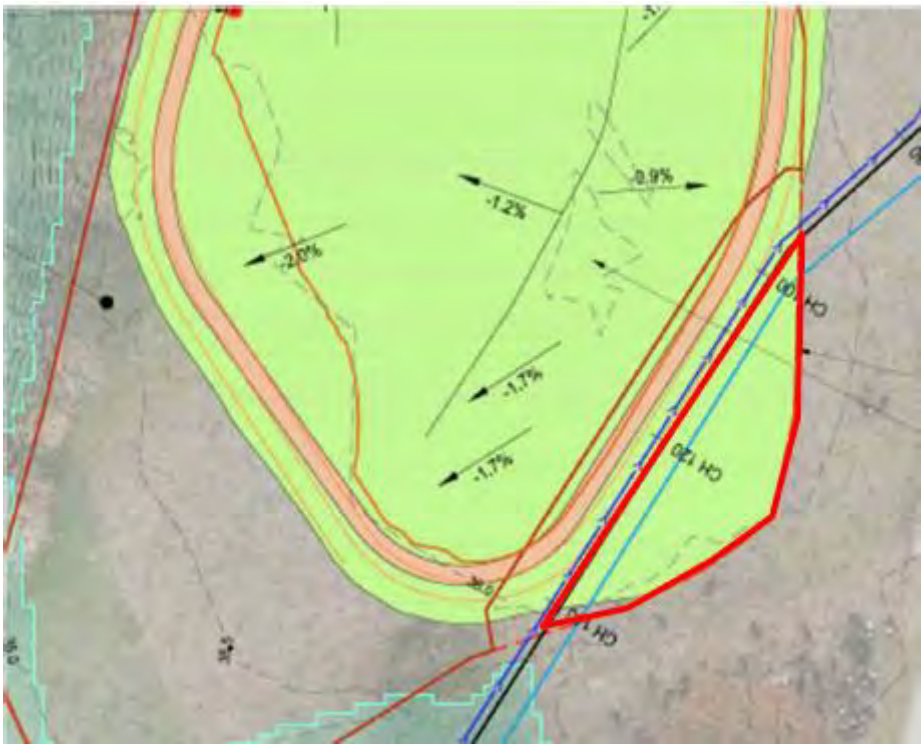


Figure 1: Portion of Area A1 located within ARL site (red outline)

The actual investigation area is larger than shown above, as shown in drawing 33097/AG01.

5 DESKTOP STUDY AND SITE WALKOVER FINDINGS

The results of the desktop study and the site walkover survey are summarized in this section and shown in the aerial photographs (Appendix B) and site photographs (Appendix C). Throughout the site walkover survey, a visual assessment was used to classify any foreign materials as particular contaminants, without any formal identification. Hence, reference to a

specific contaminant in the survey results should essentially be read as "suspected contaminant", unless otherwise stated.

5.1 SITE INVESTIGATION AND USE

The site details and ownership history are summarised below.

Table 1: Site Details and Ownership History

Registered Owners	AgResearch Limited	
Street Address	23 Farm Road	
Legal Description	Section 3 SO 534156	
Title	914899	
Total Area (ha)	~102.68ha	
Investigation Area (m^2)	1,779m^2	
Zoning	Rural	
Ownership History		
CTs	**From**	**Registered Owner**
SA54D/742	29/06/1994	AgResearch Limited
914899	2/10/2019	

The information available indicates that the subject site has been owned by ARL since at least 1994.

5.2 AERIAL PHOTOGRAPHS

Historical aerial photographs from 1943, 1944, 1957, 1961, 1966, 1974, 1979, 1995, 2012, 2016, 2021 & 2025 were reviewed as part of the desktop study. Aerial photographs were accessed from the Retrolens Image Resource and are included in Appendix B.

1943-1944 Aerials: The investigation area shows no signs of landfilling, but instead appears to show two buildings and several smaller features adjacent to it, located within what appears to be part of a paved/metalled compound. Farm Road is visible at the eastern boundary of the investigation area, connecting from the north. Tokanui Hospital is visible to the north west of the investigation area, while two other vehicle accessways exit the building area to the west and east. Some buildings are visible further north of the investigation area, as well as to the south and west, within the paved compound area. Other surrounding areas appear in pasture.

1957-1966 Aerials: The investigation area appears largely unchanged. Small-scale filling activity appears to have begun to the west of the site, within the Existing Disposal Site.

1974 Aerial: A building has been removed/demolished within the southern boundary of the investigation area. Filling activity within the Existing Disposal Site appears to have intensified, slightly west of the investigation area. All other surrounding areas appear to remain in pasture.

1979 Aerial: Filling activity within the Existing Disposal Site appears to have further intensified and spread into or close to the western extent of the investigation area, with an access point connecting the investigation area to the filling area within the Existing Disposal Site. The investigation area and the surrounding areas otherwise remain largely unchanged.

1995-2025 Aerials: In the 1995 aerial photograph, all structures and the paved/metalled area within the investigation area have been removed, and Farm Road has been extended to the south. No clear signs of the historical activity within the investigation area remain. Filling appears to have ceased in the adjacent portion of the Existing Disposal Site in the 1995 aerial photograph, and all surrounding sites appear in pasture from 1995 to the present day.

5.3 DESKTOP SUMMARY

Overall, the aerial photographs and desktop information indicate that the investigation area was occupied by two historical buildings located adjacent to the Existing Disposal Site from at least the 1940s to the mid-1970s. One of the historical buildings within the investigation area appears to have been demolished between 1966 and 1974, while the other was demolished and/or removed between 1979 and 1995. Landfilling activities in this area appear to be relatively minor, apart from potentially in the 1979 aerial, although some of the disturbed soil visible in this photo may have been for landfill access. The eastern boundary of the investigation area has been directly adjacent to Farm Road from the 1940s to the present. The investigation area has appeared in pasture from the 1990s to the present day.

6 SITE WALKOVER RESULTS

FTL Environmental Scientist Elliot Bish conducted a site walkover of the subject site on 20th March 2025. The site was accessed from Farm Road, which extends from Te Mawhai Road, past the Existing Disposal Site, towards the investigation area.

The site appeared in pasture, with Farm Road connecting from north to south along the eastern boundary of the investigation area. No structures were observed within the investigation area. The areas in pasture were separated from Farm Road by farm fencing comprised of wooden posts with metal wire, and metal farm gates at access points. Pasture growth appeared in good condition, with significant grass cover and only minor patches where grass growth was sparse.

Localised areas of brick and concrete were observed in the surface soils; however, no discoloured soils or fibrous materials were observed.

No signs of potential contamination were observed during the site walkover. Site walkover photographs are provided as Appendix C.

7 INTRUSIVE SAMPLING

7.1 RATIONALE

Intrusive soil sampling was conducted of the subject area based on the findings of the desktop study to:

- Check the nature of the soils (visual observation, soil sampling) within the investigation area.
- Determine the nature and severity of any potential contamination caused by historical site activities (if any) in the soil.
- Determine whether contaminated soil, if any, identified in the investigation area can be retained on-site, or can be transferred to the Existing Disposal Site or disposed of off-site to an approved landfill.

The intrusive investigation focused on the potential presence of heavy metals, boron, PAHs, and asbestos in soil to check for possible contamination derived from the potential presence of historical lead-based paint and ACM on demolished structures, and historical landfilling activity on the site.

7.2 DATA QUALITY OBJECTIVES & CONCEPTUAL SITE MODEL

Following MfE Contaminated Land Management Guidelines (CLMG) No.5, the Data Quality Objectives (DQOs) and Conceptual Site Model (CSM) for this investigation are summarized in Table 2 below.

Table 2: DQOs and CSM

Purpose of Investigation	Assess human and environmental health risks associated with the proposed remedial works.	
Define boundaries	Our investigation focused on the portion of the site on ARL land positioned to the west of Farm Road, which was formerly part of the existing disposal site.	
Develop Conceptual Site Model	Known/possible HAIL land use	*HAIL G3 - Landfill Sites; and* *HAIL I - Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment*
	Contaminants of concern	Heavy metals, boron, PAHs, and asbestos
	Distribution of contaminants	Lateral – across the investigation area Vertical – depending on the soil type
	Receptors	Site users (long-term) and construction workers (short-term)

	Potential pathways	Dermal contact, ingestion, and inhalation.
	Applicable land use scenario	Commercial/Industrial land use (outdoor worker), and Site-Specific Remedial Standards – Rural-Residential and Managed Recreational
Additional information required (Sampling and Analysis Plan)	Based on the HAIL activities identified during the desktop study (HAIL G3 & I), a systematic sampling methodology was undertaken to obtain an even sampling spread representative of both the vertical and horizontal extent of soil materials in this area. Based on the desktop study, a total of 11 samples were collected from six excavated test pit locations at multiple depths, to a maximum of 1m below ground level within the investigation area. Based on the results of this initial investigation, in May 2025, FTL collected 42 additional samples from 14 excavated test pits. These locations surrounded the original six test pit locations to delineate the extent of contaminated material identified during the initial investigation.	

7.3 EVALUATION BASIS

The sampling results have been compared with the NES: CS Soil Contaminant Standards (SCS) for commercial industrial land use (outdoor worker standard), and the Site-Specific Remedial Standards derived by HAIL Environmental Limited as part of their Site-Specific Risk Assessment (SSRA) report for the former Tokanui Psychiatric Hospital remedial works dated April 2024.

HAIL derived two standards in their report, per the Ministry for the Environment's Contaminated Land Management Guideline No.2: *Hierarchy and application in New Zealand of environmental guideline values. Ref: CLMG2,* namely the site-specific "rural-residential" remedial standard and the site-specific "managed recreational" remedial standard. These standards have been established to derive values that are as low as practicable, but no lower than necessary to achieve compliance with anticipated future land uses.

7.4 METHODOLOGY

On 19th and 20th March 2025, FTL collected 11 individual samples from six excavated test pit locations at multiple depths with a maximum depth of 1m below ground level (bgl) using a 50mm diameter hand auger. Based on the results of this initial investigation, a further 42 samples were collected on 12th May 2025 from 14 excavated test pits surrounding the original six excavated test pit locations. All 53 samples were analysed for heavy metals, boron, PAHs, and SQACM.

Generally, soils from within the investigation area can be described as silty topsoil with gravels (~0-0.3m) and variable building debris content (generally ~5%, with isolated pockets of ~40%) underlain by silt (Hamilton Ash) with minor clay (0.3m+) and 'paleosol' (buried topsoil)

inclusions. Fill depths were generally shallow, ranging from ~0.15m - 0.4m in most test pits. Fill was found at greater depths along the western edge of the investigation area, in locations AG14, AG14B, AG14E, and AG14G, where the extent of the existing disposal site was encountered. This buried fill was found from ~0.7 to 1.7m deep, and was overlain by a capping layer (0.2-0.7m deep) and topsoil (0.2m thick). Geotechnical logs have been included as Appendix D.

These samples are representative of the soils that may have been impacted by HAIL activities (G3 & I), which may require remediation. The sample breakdown is provided in Table 3, and a breakdown of additional analysis of discrete samples undertaken following the original sample analysis stated in Table 3, is shown in Table 4 below.

Table 3: Soil Sample Breakdown

Sample ID	Depth (m)	Soil Description	Test
TPAG10	Sur (0.0m)	TOPSOIL/FILL] SILT, minor gravel (fine, subangular), dark grey mottled dark brown/black, dry, non-plastic, contains <5% building debris including brick and concrete	Heavy Metals, Boron, PAHs, & Asbestos
TP_AG_11	0.2m	[FILL] GRAVEL (fine, sub-angular), silty, dark grey mottled brown, medium dense, dry, poorly graded, contains 5% building debris, including brick and concrete	Heavy Metals, Boron, PAHs, & Asbestos
TPAG11A	0-0.2m	Topsoil with gravels and pebbles	
	0.2-0.4m	Mixed clays (orange/light brown) - <5% C&D debris	Heavy Metals, Boron, PAHs
	0.4m+	Natural ground	
TPAG11B	0-0.05m	Topsoil	Heavy Metals, Boron, PAHs, & Asbestos
	0.05-0.3m	Major gravels in clay (appears as basecourse/sub-base) - <5% C&D debris	
	0.3m+	Natural ground	Hold Cold
TPAG11C	0-0.2m	Topsoil with gravel and rock - <5% C&D debris	Heavy Metals, Boron, PAHs, & Asbestos
	0.2-1.1m	Natural ground	Heavy Metals, Boron, PAHs
TPAG11D	0-0.1m	Topsoil with some rock/cement pieces - <5% C&D debris	Heavy Metals, Boron, PAHs, & Asbestos
	0.1-0.5m	Silt with major rock component (appears to be old quarried rock) - <5% C&D debris	
	0.5-1.7m	Natural ground	Hold Cold
TP_AG_12	Sur (0.0m)	TOPSOIL] SILT, black, dry, non-plastic	Heavy Metals, Boron, PAHs, & Asbestos

	0.2m	[FILL] GRAVEL (fine, sub-angular), silty, dark brown/black, medium dense, dry, poorly graded, contains 5% building debris, including brick and concrete	Heavy Metals, Boron, PAHs, & Asbestos
	0.4m	[PALEOSOL] SILT, minor clay, black, stiff, moist, slightly plastic, trace rootlets	
TP_AG_13	Sur (0.0m)	[TOPSOIL/FILL] SILT, minor gravel (fine, subangular), dark grey mottled dark brown/black, dry, non-plastic, contains <5% building debris including brick and concrete	Heavy Metals, Boron, PAHs, & Asbestos
TP_AG_14	Sur (0.0m)	[TOPSOIL/FILL] SILT, minor gravel (fine, subangular), dark grey mottled dark brown/black, dry, non-plastic, contains <5% building debris including brick and concrete	Heavy Metals, Boron, PAHs, & Asbestos
	0.5m	[CAPPING MATERIAL] SILT, some gravel (fine, sub-angular), minor clay, orange/brown, hard, dry, non-plastic	
	0.8m	[LANDFILL] SILT, some gravel (fine, sub-angular), dark grey/black speckled white, stiff, moist, non-plastic, contains 40% building debris including glass, plastic, brick, and concrete	
	1m		Heavy Metals, Boron, PAHs, Asbestos & TCLP (Boron)
TPAG14A	0-0.2m	Topsoil	Heavy Metals, Boron, PAHs, & Asbestos
	0.2-0.65m	Capping material	
	0.65-0.85m	Buried topsoil with very minor debris (1-2 metal wires)	
	0.85m	Natural ground	Heavy Metals, Boron & PAHs
TPAG14B	0-0.15m	Topsoil	Heavy Metals, Boron, PAHs, & Asbestos
	0.15-0.7m	Capping material	
	0.7-1.0m	Fill with minor debris (brick/ceramic, rocks, glass, wire, wood) - <5% C&D debris	Heavy Metals, Boron, PAHs, Asbestos, and TCLP (Lead)
	1.0m+	Natural ground	Hold Cold
TPAG14C	0-0.15m	Topsoil	Heavy Metals, Boron, PAHs, & Asbestos
	0.15-0.45m	Capping material	
	0.45-0.85m	Fill (1x Boulder) - <5% C&D debris	
	0.85m+	Natural ground	Hold Cold

TPAG14D	0-0.1m	Topsoil and some gravels - <5% C&D debris	Heavy Metals, Boron, PAHs, Asbestos, and Synthetic Precipitation Leachate Procedure (SPLP) for Boron)
	0.1-0.3m	Gravels, burnt material & asphalt millings - <5% C&D debris	Heavy Metals, Boron, PAHs, & Asbestos
	0.3-0.55m	Fill (silt, no debris) - <5% C&D debris	
	0.55m +	Natural ground	Hold Cold
TPAG14E	0-0.15m	Topsoil	Heavy Metals, Boron, PAHs, & Asbestos
	0.15-0.7m	Capping material	Heavy Metals, Boron & PAHs
	0.7-1.0m	Coal ash, metal springs + rock - <5% C&D debris	Heavy Metals, Boron, PAHs, Asbestos, SPLP & TCLP (Boron)
	1.0-1.7m	Fill - high rock content mixed through buried topsoil/clay (brown), 10% C&D debris (brick shards & earthenware pipe fragments)	Heavy Metals, Boron, PAHs, Asbestos & TCLP (Boron)
	1.7m	Natural ground	Hold Cold
TPAG14F	0-0.15m	Topsoil with gravels - <5% C&D debris	Heavy Metals, Boron, PAHs, & Asbestos
	0.15-0.3m	Capping material with solid layer of burnt material - <5% C&D debris	Heavy Metals, Boron, PAHs, Asbestos & SPLP (Boron)
	0.3-0.5m	Buried topsoil	Heavy Metals, Boron, PAHs, & Asbestos
	0.5m +	Natural ground	
TPAG14G	0-0.15m	Topsoil	
	0.15-0.6m	Capping material + minor debris (metal pipe)	
	0.6-2m	Fill (mixed clay, plastic, concrete, single large metal sheet) 10% C&D debris	
	2-3m	Natural ground	Heavy Metals, Boron & PAHs

TP_AG_15	Sur (0.0m)	[TOPSOIL/FILL] SILT, minor gravel (fine, subangular), dark grey mottled dark brown/black, dry, non-plastic, contains <5% building debris including brick and concrete	Heavy Metals, Boron, PAHs, & Asbestos
TPAG15A	0-0.4m	Topsoil, very minor debris (brick/ceramic + single large concrete piece) - <5% C&D debris	
	0.4m +	Natural ground	Heavy Metals, Boron & PAHs
TPAG15B	0-0.1m	Topsoil/fill - <5% C&D debris (brick pieces)	Heavy Metals, Boron, PAHs, & Asbestos
	0.1-0.5m	Black silt and mixed clay - <5% C&D debris (brick pieces)	
	0.5-0.7m	Natural ground	Heavy Metals, Boron & PAHs
TPAG15C	0-0.1m	Topsoil with gravels/pebbles (red/brown) - <5% C&D debris (brick pieces)	Heavy Metals, Boron, PAHs, & Asbestos
	0.1-0.3m	Light brown/orange clay with buried topsoil - <5% C&D debris	
	0.3m +	Natural ground	Hold Cold

The sampling locations and results are shown on FTL Drawing 33097/AG02 appended to this report and in the following table, respectively.

7.5 RESULTS SUMMARY

The soil sampling results are summarised in the table below. The laboratory certificates are shown in Appendix E.

Former Tokanui Psychiatric Hospital Closed Landfill: Soil Results																							
Sample Date								20-Mar-25		12-May-25												20-Mar-25		
Sample Name	**Background Concentrations [1]**	**NESCS commercial/ industrial outdoor worker (unpaved) [2]**	**Site Specific Remedial Standards - Rural Residential [3]**	**Site Specific Remedial Standards - Managed [3]**	**Waste Acceptance Criteria**			TP_AG_10	TP_AG_11	TPAG11A	TPAG11A	TPAG11A	TPAG11B	TPAG11B	TPAG11C	TPAG11C	TPAG11D	TPAG11D	TPAG11D	TP_AG_12	TP_AG_12	TP_AG_12
Sample Depth (m)					**WRC Cleanfill Criteria**	**Envirofill South (Managed Fill)**	**Hampton Downs landfill**	Sur	0.2	0-0.2m	0.2-0.4m	0.4m +	0-0.05m	0.05-0.3m	0-0.2m	0.2-1.1m	0-0.1m	0.1-0.5m	0.5-1.7m	Sur	0.2	0.4
Lab Number	**95% upper limit for Waikato background (mg/kg)**							3822207.10	3822207.11	3892836.19	3892836.20	3892836.21	3892836.22	3892836.23	3892836.24	3892836.25	3892836.26	3892836.27	3892836.28	3822207.12	3822207.17	3822207.18
Heavy Metals (mg/kg dry weight)								TS/FILL (<5%)	FILL (5%)	TS	FILL <5%)	NG	TS	FILL (<5%)	TS/FILL (<5%)	NG	TS/FILL (<5%)	FILL (<5%)	NG	TS	FILL (5%)	TS
Arsenic	6.8	70	9	70	17	70	100	6	10	3	3	< 2	6	5	3	< 2	28	42	< 2	7	5	3
Boron	6.7	300,000	-	-	15	260	500	< 20	47	46	< 20	< 20	85	77	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Cadmium	0.22	1,300	0.9	10	0.8	1.2	20	0.27	0.2	0.3	0.15	< 0.10	0.41	0.18	0.21	< 0.10	0.3	0.22	< 0.10	0.31	0.2	0.44
Chromium	30	6,300	150	150	56	362	100	12	12	11	7	8	13	15	9	7	12	14	7	9	8	7
Copper	25	>10,000	280	280	120	107	200	24	30	20	16	12	32	23	21	13	230	79	14	29	30	150
Lead	20	3,300	120	460	78	210	200	74	45	37	29	18.5	38	86	31	17.1	93	70	17.8	40	37	78
Nickel	7.6	6,000	-	-	33	320	200	8	10	7	4	4	11	10	6	4	4	5	3	5	4	4
Zinc	53	400,000	350	450	175	1,160	500	158	80	84	82	35	250	85	121	35	142	127	38	93	69	123
PAHs																						
BaP (Eq) NES	-	35	6	35	2	35	1	0.124	0.75	0.181	< 0.031	< 0.036	0.111	0.169	0.052	< 0.036	0.133	< 0.029*	< 0.034	0.182	0.054	< 0.033
Asbestos (SQ)					ND	AF/FA Only	AF/FA & ACM	ND	ND	ND	-	-	ND	ND	ND	-	ND	ND	-	ND	ND	ND
AF/FA	ND	< 0.001 [4]	0.001	0.001				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% ACM	ND	< 0.05 [4]	0.01	0.01				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Former Tokanui Psychiatric Hospital Closed Landfill: Soil Results																							
Sample Date								20-Mar-25					12-May-25										
Sample Name	**Background Concentrations [1]**	**NESCS commercial/ industrial outdoor worker (unpaved) [2]**	**Site Specific Remedial Standards - Rural Residential [3]**	**Site Specific Remedial Standards - Managed [3]**	**Waste Acceptance Criteria**			TP_AG_13	TP_AG_14	TP_AG_14	TP_AG_14	TP_AG_14	TPAG14A	TPAG14A	TPAG14A	TPAG14A	TPAG14B	TPAG14B	TPAG14B	TPAG14C	TPAG14C	TPAG14C
Sample Depth (m)					**WRC Cleanfill Criteria**	**Envirofill South (Managed Fill)**	**Hampton Downs landfill**	Sur	Sur	0.5	0.8	1	0-0.2m	0.2-0.65m	0.65-0.85m	0.85m +	0-0.15m	0.15-0.7m	0.7-1.0m	0-0.15m	0.15-0.45m	0.45-0.85m
Lab Number	**95% upper limit for background (mg/kg)**							3822207.13	3822207.14	3822207.19	3822207.20	3822207.21	3892836.29	3892836.30	3892836.31	3892836.32	3892810.10	3892810.20	3892810.30	3892810.40	3892810.50	3892810.60
Heavy Metals (mg/kg dry weight)								TS/FILL (5%)	TS/FILL (<5%)	CAP	FILL (40%)	FILL (40%)	TS	CAP	FILL (<5%)	NG	TS	CAP	FILL (5%)	TS	CAP	FILL (<5%)
Arsenic	6.8	70	9	70	17	70	100	4	5	3	5	7	5	4	4	2	4	4	4	5	4	3
Boron	6.7	300,000	-	-	15	260	500	< 20	72	< 20	380	1,160	< 20	< 20	< 20	< 20	< 20	82	21	< 20	< 20	< 20
Cadmium	0.22	1,300	0.9	10	0.8	1.2	20	0.2	0.22	< 0.10	0.12	0.13	0.3	0.1	0.43	< 0.10	0.17	0.1	0.72	0.26	0.11	0.25
Chromium	30	6,300	150	150	56	362	100	8	13	27	6	16	12	23	9	6	14	24	7	13	23	6
Copper	25	>10,000	280	280	120	107	200	14	27	17	13	32	33	18	32	9	27	21	27	34	18	16
Lead	20	3,300	120	460	78	210	200	33	35	14.9	15.9	22	49	45	106	16.5	29	23	620	54	26	71
Nickel	7.6	6,000	-	-	33	320	200	4	10	13	10	45	10	12	6	3	10	15	4	10	11	3
Zinc	53	400,000	350	450	175	1,160	500	78	105	64	24	63	104	71	112	25	77	76	320	101	67	77
PAHs																						
BaP (Eq) NES	-	35	6	35	2	35	1	< 0.027*	0.153	< 0.026	< 0.034*	0.086	0.41	< 0.028	< 0.031*	< 0.034	0.2	0.23	< 0.032	0.32	< 0.029*	< 0.032
Asbestos (SQ)					ND	AF/FA Only	AF/FA & ACM	ND	ND	ND	ND	ND	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
AF/FA	ND	< 0.001 [4]	0.001	0.001				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% ACM	ND	< 0.05 [4]	0.01	0.01				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* = Residual concentrations detected

1. Upper limit background concentrations for selected elements in soil of the Waikato region, acid recoverable data, sourced from: https://www.waikatoregion.govt.nz/services/regional-services/waste-hazardous-substances-and-contaminated-sites/contaminated-sites/natural-background-concentrations/
2. Resource Management (National Environmental Standard for Assessing and managing Contaminants in Soil to Protect Human Health) Regulation 2012 (NES:CS) - Soil contaminant standards (SCS) applicable to commercial/industrial land use have been selected.
3. Site Specific Remedial Standards as presented in HAIL Environmental Ltd Site Specific Risk Assessment, Version 3.2, dated Feburary 2024
4. BRANZ 2017 Asbestos in Soil guidelines of 0.05% w/w % ACM or 0.001% w/w for % FA & AF fraction (Commercial/Industrial guidelines applied to assess risk to Remedial workers)
5. Target Leachate Concentration for SPLP - Derived from the ANZECC (July 2021) "Toxicant Default Guideline Values for Aquatic Ecosystem Protection, Boron in Freshwater" via method outlined in WasteMINZ Technical Guidelines for Disposal to Land Rev 3.1 (September 2023)
6. Target Leachate Concentration for SPLP - Derived from Water Services "Drinking Water Standards for New Zealand" Regulations (June 2022) via method outlined in WasteMINZ Technical Guidelines for Disposal to Land Rev 3.1 (September 2023)

Underlined:	Above background concentrations
Italicised	Above NES:CS / BRANZ Guideline (Commercial/Industrial land use - Outdoor Worker)
RED:	Exceeded SSRA Rural Residential
BOLD:	Exceeded SSRA Managed
ND:	Not detected
-	Not tested for
	Above cleanfill acceptance criteria
	Above managed fill acceptance criteria
	Above Class 1 landfill acceptance criteria
	Exceeds TCLP Limit

23 Farm Road, Tokanui - SPLP (Boron) Test Results					
Sample Date	**Waste Acceptance Criteria**		12-May-25		
Sample Name			TPAG14E	TPAG14D	TPAG14F
Sample Depth (m)	**ANZECC 95% Freshwater Derived SPLP Limit**	**Groundwater DWSNZ Derived SPLP Limit**	0.7-1.0m	0-0.1m	0.15-0.3m
Lab Number			3892810.45	3892810.46	3892810.47
Heavy Metals					
(g/m^3)					
Boron	94 [5]	48 [6]	16.2	0.33	0.72

Former Tokanui Psychiatric Hospital Closed Landfill: Soil Results

Sample Date	Background Concentrations [1]	NESCS commercial/ industrial outdoor worker (unpaved) [2]	Site Specific Remedial Standards - Rural Residential [3]	Site Specific Remedial Standards - Managed [3]	Waste Acceptance Criteria			12-May-25											
Sample Name								TPAG14D	TPAG14D	TPAG14D	TPAG14E	TPAG14E	TPAG14E	TPAG14E	TPAG14E	TPAG14F	TPAG14F	TPAG14F	TPAG14G	TPAG14G	TPAG14G	TPAG14G
Sample Depth (m)								0-0.1m	0.1-0.3m	0.3-0.55m	0-0.15m	0.15-0.7m	0.7-1.0m	1.0-1.7m	1.7m +	0-0.15m	0.15-0.3m	0.3-0.5m	0-0.15m	0.15-0.6m	0.6-2.0m	2.0-3.0m
Lab Number								3892810.70	3892810.80	3892810.90	3892810.10	3892810.12	3892810.13	3892810.14	3892810.15	3892810.16	3892810.17	3892810.18	3892810.19	3892810.20	3892810.21	3892810.22
Heavy Metals	95% upper limit for background (mg/kg)				WRC Cleanfill Criteria	Envirofill South (Managed Fill)	Hampton Downs landfill	TS/FILL (<5%)	FILL (<5%)	FILL (<5%)	TS	CAP	FILL (<5%)	FILL (10%)	NG	TS/FILL (<5%)	CAP/FILL (<5%)	TS	TS	CAP	FILL (10%)	NG
(mg/kg dry weight)																						
Arsenic	6.8	70	9	70	17	70	100	6	9	2	6	4	8	5	3	6	4	3	4	3	4	4
Boron	6.7	300,000	-	-	15	260	500	480	2,300	41	33	< 20	3,200	139	67	560	640	78	20	< 20	40	62
Cadmium	0.22	1,300	0.9	10	0.8	1.2	20	0.36	0.24	0.21	0.35	< 0.10	0.27	0.62	< 0.10	0.19	0.12	0.26	0.15	< 0.10	0.16	0.39
Chromium	30	6,300	150	150	56	362	100	13	19	5	13	21	23	10	7	19	12	6	10	24	8	12
Copper	25	>10,000	280	280	120	107	200	50	41	16	34	22	34	20	15	32	21	29	21	17	19	30
Lead	20	3,300	120	460	78	210	200	45	19.8	17.1	62	22	14.4	*4,200*	19.2	27	53	30	36	17.7	52	58
Nickel	7.6	6,000	-	-	33	320	200	35	65	3	11	11	16	6	5	33	23	4	7	10	6	12
Zinc	53	400,000	350	450	175	1,160	500	132	230	89	119	67	31	340	51	98	84	96	67	63	75	189
PAHs																						
BaP (Eq) NES	-	35	6	35	2	35	1	0.29	< 0.035	< 0.033	0.51	0.07	< 0.031*	< 0.032*	< 0.035	0.152	0.043	< 0.032	0.146	< 0.028*	0.053	< 0.038
Asbestos (SQ)					ND	AF/FA Only	AF/FA & ACM	ND	Amosite (Brown Asbestos) Detected	ND	ND	-	ND	ND	-	ND	Chrysotile (White Asbestos) Detected	ND	ND	ND	ND	-
AF/FA	ND	< 0.001 [4]	0.001	0.001				-	<0.001%	-	-	-	-	-	-	-	<0.001%	-	-	-	-	-
% ACM	ND	< 0.05 [4]	0.01	0.01				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Former Tokanui Psychiatric Hospital Closed Landfill: Soil Results

Sample Date	Background Concentrations [1]	NESCS commercial/ industrial outdoor worker (unpaved) [2]	Site Specific Remedial Standards - Rural Residential [3]	Site Specific Remedial Standards - Managed [3]	Waste Acceptance Criteria			20-Mar-25	12-May-25						
Sample Name								TP_AG_15	TPAG15A	TPAG15A	TPAG15B	TPAG15B	TPAG15B	TPAG15C	TPAG15C
Sample Depth (m)								Sur	0-0.4m	0.4m +	0-0.1m	0.1-0.5m	0.5-0.7m	0-0.1m	0.1-0.3m
Lab Number								3822207.15	3892810.23	3892810.24	3892810.25	3892810.26	3892810.27	3892810.28	3892810.29
Heavy Metals	95% upper limit for background (mg/kg)				WRC Cleanfill Criteria	Envirofill South (Managed Fill)	Hampton Downs landfill	TS/FILL (<5%)	TS/FILL (<5%)	NG	TS/FILL (<5%)	FILL (<5%)	NG	TS/FILL (<5%)	FILL (<5%)
(mg/kg dry weight)															
Arsenic	6.8	70	9	70	17	70	100	5	3	4	6	8	< 2	5	5
Boron	6.7	300,000	-	-	15	260	500	< 20	< 20	< 20	< 20	45	< 20	< 20	< 20
Cadmium	0.22	1,300	0.9	10	0.8	1.2	20	0.57	< 0.10	0.29	0.66	0.35	< 0.10	0.21	0.14
Chromium	30	6,300	150	150	56	362	100	9	6	8	10	6	7	10	9
Copper	25	>10,000	280	280	120	107	200	27	14	20	32	55	5	22	15
Lead	20	3,300	120	460	78	210	200	154	14.2	88	142	53	14.6	73	41
Nickel	7.6	6,000	-	-	33	320	200	6	3	4	10	7	2	12	4
Zinc	53	400,000	350	450	175	1,160	500	130	37	82	148	81	27	109	76
PAHs															
BaP (Eq) NES	-	35	6	35	2	35	1	0.22	< 0.035	0.049	0.124	< 0.033*	< 0.032	< 0.028*	< 0.030*
Asbestos (SQ)					ND	AF/FA Only	AF/FA & ACM	ND	ND	-	ND	ND	-	ND	ND
AF/FA	ND	< 0.001 [4]	0.001	0.001				-	-	-	-	-	-	-	-
% ACM	ND	< 0.05 [4]	0.01	0.01				-	-	-	-	-	-	-	-

23 Farm Road, Tokanui - TCLP (Boron) Test Results

Sample Date	Waste Acceptance Criteria		20-Mar-25	12-May-25
Sample Name			TP_AG_14	TPAG14E
Sample Depth (m)	Landfill (Hampton Downs, TCLP Criteria)	Landfill (Hampton Downs, Max Acceptable Value)	1.0m	0.7-1.0m
Lab Number			3822207.23	3892810.43
Heavy Metals				
(g/m^3)				
Boron	25	N/L	2.2	28

23 Farm Road, Tokanui - TCLP (Lead) Test Results

Sample Date	Waste Acceptance Criteria		12-May-25	
Sample Name			TPAG14B	TPAG14E
Sample Depth (m)	Landfill (Hampton Downs, TCLP Criteria)	Landfill (Hampton Downs, Max Acceptable Value)	0.7-1.0m	1.0-1.7m
Lab Number			3892810.42	3892810.44
Heavy Metals				
(g/m^3)				
Lead	10	N/L	0.081	6.2

	Topsoil (TS)
	Landfill Cap
	Fill
	Natural Ground

* = Residual concentrations detected

1. Upper limit background concentrations for selected elements in soil of the Waikato region, acid recoverable data, sourced from: https://www.waikatoregion.govt.nz/services/regional-services/waste-hazardous-substances-and-contaminated-sites/contaminated-sites/natural-background-concentrations/
2. Resource Management (National Environmental Standard for Assessing and managing Contaminants in Soil to Protect Human Health) Regulation 2012 (NES:CS) - Soil contaminant standards (SCS) applicable to commercial/industrial land use have been selected.
3. Site Specific Remedial Standards as presented in HAIL Environmental Ltd Site Specific Risk Assessment, Version 3.2, dated Feburary 2024
4. BRANZ 2017 Asbestos in Soil guidelines of 0.05% w/w % ACM or 0.001% w/w for % FA & AF fraction (Commercial/Industrial guidelines applied to assess risk to Remedial workers)

Underlined:	Above background concentrations
Italicised	Above NES:CS / BRANZ Guideline (Commercial/Industrial land use - Outdoor Worker)
RED:	Exceeded SSRA Rural Residential
BOLD:	Exceeded SSRA Managed
ND:	Not detected
-	Not tested for
	Above cleanfill acceptance criteria
	Above managed fill acceptance criteria
	Above Class 1 landfill acceptance criteria
	Exceeds TCLP Limit

8 DISCUSSION

8.1 SOIL ANALYTICAL RESULTS

Laboratory testing of selected soil samples found:

- One or more heavy metal concentrations were elevated above maximum background levels for selected elements in soils of the Waikato region in 47 of the 53 samples analysed;
- One or more heavy metal concentrations were in excess of the Site Specific Rural-Residential Remedial Standards in seven of the 53 samples analysed, and the Site Specific Managed Remedial Standards in two of the 53 samples analysed;
- Low-level PAHs were detected in 36 of the 53 samples analysed;
- Low-level asbestos concentrations were detected in two samples analysed; and
- A single exceedance of the NES: CS SCS for commercial/industrial land use (outdoor worker) criteria for lead was noted in a single sample analysed.

TCLP analysis was undertaken on four representative samples with high contaminant levels that indicated they might require disposal off-site to the Hampton Downs landfill, a Class 1 landfill. Two of these samples contained elevated concentrations of boron (AG14 1.0m & AG14E 0.7-1.0m) and two contained elevated lead concentrations (AG14B 0.7-1.0m & AG14E 1.0-1.7m). TCLP analysis found:

- Soils represented by three of the four samples analysed (AG14 1.0m, AG14B 0.7-1.0m, and AG14E 1.0-1.7m) are suitable for off-site disposal to a Class 1 landfill, if required.
- Soils represented by one sample (AG14E 0.7-1.0m) are unsuitable for disposal to an off-site Class 1 landfill in their current condition, due to having a TCLP result for boron of 28g/m^3, exceeding the Hampton Downs landfill TCLP limit of 25g/m^3. This is a relatively minor exceedance, and it is expected that mixing of soils from this location with soils with lower boron concentrations would bring the average boron TCLP concentration to within Hampton Downs landfill WAC.

The TCLP test gives an indication of likely leaching in a Class 1 landfill during the landfill's acidic phase, where the decomposition of organic content typically results in the leachate being slightly acidic, particularly during the early stages of landfilling. This does not apply to the Existing Disposal Site, where the buried refuse is old and contains very little residual degradable organic material. In this situation, the complementary SPLP (synthetic precipitation leaching procedure) testing is normally done to check the likely leachability of key contaminants under normal rainfall conditions, which is less acidic.

Hence, SPLP testing was undertaken on selected samples with a range of boron concentrations to check for the acceptability of disposing of these materials within the Existing Disposal Site. The results of this analysis were compared with a target leachate concentration value, which was derived by multiplying the current Drinking-Water Standards for New Zealand (DWSNZ) (2022) value for boron (2.4g/m^3) and the Australian and New Zealand Environment and Conservation Council (ANZECC) aquatic protection values (95% Level of protection in Freshwater Species) boron value, as modified in 2022 (0.94g/m^3) by their respective dilution and attenuation factors (DWSNZ = 20x, ANZECC = 100x), as per the methodology outlined in

the WasteMINZ Technical Guidelines for Disposal to Land (Revision 3.1 – 2023). Analytical results found that the SPLP values for all three samples analysed were below the lowest of the derived comparison values (48g/m^3). This means that all boron-contaminated material found in the investigation area can be disposed of on-site, without exceeding the adopted SPLP limits.

8.2 SOIL MANAGEMENT RECOMMENDATIONS

Based on the soil contamination classifications set out earlier in this report (refer section 4.4.2), it is recommended that the following fill material be excavated and transferred into the Existing Disposal Site:

- Fill material from location AG14G (0.6-2m) beneath the capping material, due to its construction and demolition material content of around 10%. This corresponds to an area of 67m^2 and an estimated volume of 94m^3.
- Fill material from location AG14 (0.7-1.6m) beneath the capping material, due to its construction and demolition material content of around 40% and elevated boron concentration in the 1m depth sample. This corresponds to an area of 46m^2 and an estimated volume of 41m^3.
- Shallow fill material from locations AG11 (0-0.2m), AG11D (0-0.5m), AG14D (0-0.1m), AG14F (0-0.3m), AG15 (0-0.25m), and AG15B (0-0.5m), due to it containing low-level contamination. This corresponds to an area of 476m^2 and an estimated volume of 176m^3.
- Fill material from location AG14B (0.7-1.0m) and AG14E (1-1.7m) beneath the capping material, due to it containing moderate level contamination. This corresponds to an area of 77m^2 and an estimated volume of 42m^3.
- Fill material from location AG14E (0.7-1.0m) beneath the capping material contains high-level boron contamination (3,200mg/kg) exceeding the Class 1 Landfill TCLP waste acceptance criteria, but satisfying the derived SPLP leaching criteria. Hence, fill from this location can be moved into Area A1 of the Existing Disposal Site either in its current form or by mixing with other soils to reduce boron leaching. This corresponds to an area of 47m^2 and an estimated volume of 14m^3.
- Similarly, soil from location AG14D (0.1-0.3m depth) contained high boron levels (2,300mg/kg). This concentration represents 72% of the boron concentration measures at location AG14E (0.7-1.0m) and hence can also be disposed of by transfer into Area A1 of the Existing Disposal Site. This corresponds to an area of 28m^2 and an estimated volume of 6m^3.

All other soil and fill material can be left undisturbed. Upon completion of the above-mentioned works, all landfill material/refuse will have been removed from the ARL site. Excavated areas will require backfilling with suitable clean fill materials (subsoils and topsoils) followed by grass seeding.

9 CONSENTING REQUIREMENTS

Due to a misalignment between the fence line and legal boundaries at the existing disposal site, a portion of Area A1 of the existing disposal site is currently located on land owned by ARL (see section 4.6). As part of remedial works, material located within the portion of the ARL-owned land (Section 3 SO 5341566) that was found to contain >5% construction and demolition debris and/or contaminant concentrations in excess of the applicable site-specific remedial standards will require excavation and transfer to the existing disposal site (Section 1 SO 44852).

Based on advice from SLR Consulting Limited (SLR), FTL understands that the parcel of ARL-owned land has been included within the address description of the SLR application for an updated consent covering the Existing Disposal Site. Hence, no consent should be required under the NES: CS Regulations, and the works can be undertaken in accordance with conditions outlined in the updated forthcoming Former Tokanui Hospital Closed Landfill consent.

10 CONCLUSIONS AND RECOMMENDATIONS

Overall, the aerial photographs and desktop information indicate that the investigation area was occupied by two historical buildings located adjacent to the Existing Disposal Site from at least the 1940s to the mid-1970s. One of the historical buildings within the investigation area appears to have been demolished between 1966 and 1974, while the other was demolished and/or removed between 1979 and 1995. Landfilling activities in this area appear to be relatively minor, apart from potentially in the 1979 aerial, although some of the disturbed soil visible in this photo may have been for landfill access. The eastern boundary of the investigation area has been directly adjacent to Farm Road from the 1940s to the present. The investigation area has appeared in pasture from the 1990s to the present day.

Given the identification of HAIL activities (G3 & I) on site, intrusive soil sampling was undertaken across the investigation area to determine the contamination status of the portion of land that was subject to historical landfilling. The intrusive investigation focused on the potential presence of heavy metals, boron, PAHs, and asbestos in soil to check for possible contamination derived from the potential presence of historical lead-based paint & ACM on demolished structures in this area, and historical landfilling of hospital activity derived waste materials on site.

This investigation was undertaken in two stages, with a total of 53 samples being collected from 20 excavated test pits, evenly distributed across the investigation area. Generally, soils from within the investigation area can be described as silty topsoil with gravels (~0-0.3m) and variable building debris content (generally ~5%, with isolated pockets of ~40%) underlain by silt (Hamilton Ash) with minor clay (0.3m+) and 'paleosol' (buried topsoil) inclusions. Fill depths were generally shallow, ranging from ~0.15-0.4m in most test pits. Fill was found at greater depth along the western edge of the investigation area, in locations AG14, AG14B, AG14E, and

AG14G where the extent of the historical landfill was encountered. This buried fill was found from ~0.7-1.7m depth, overlain by a capping layer (0.2-0.7m depth) and topsoil (0.2m thick).

All 53 samples collected across the two investigations were analysed at an IANZ accredited laboratory for heavy metals, boron, PAHs, and SQACM. Laboratory testing of selected soil samples found:

- One or more heavy metal concentrations were elevated above maximum background levels for selected elements in soils of the Waikato region in 47 of the 53 samples analysed;
- One or more heavy metal concentrations were in excess of the SSRR Remedial Standards in seven of the 53 samples analysed, and the SSM Remedial Standards in two of the 53 samples analysed;
- Low-level PAHs were detected in 36 of the 53 samples analysed;
- Low-level asbestos concentrations were detected in two samples analysed; and
- A single exceedance of the NES: CS SCS for commercial/industrial land use (outdoor worker) criteria for lead was noted in a single sample analysed.
- TCLP testing for lead and boron in soil samples with elevated levels of these contaminants found that all but one sample had acceptable TCLP values for off-site disposal to a Class 1 Landfill. However, complementary SPLP testing found that concentrations of all contaminants were acceptable for disposal to the Existing Disposal Site.

Based on these findings, it is recommended that the following soils/fill be transferred to Area A1 of the Existing Disposal Site:

Sample Location	**Rationale**	**Area (m^2)**	**Volume (m^3)**
AG14G (0.6-2.0m)	C&D content ~10%	67	94
AG14 (0.7-1.6m)	C&D content ~40%; high boron in 1m depth sample	46	41
Shallow fill materials from AG11 (0-0.2m), AG11D (0-0.5m), AG14D (0-0.1m), AG14F (0-0.3m), AG15 (0-0.25m), and AG15B (0-0.5m)	Contains low-level contamination	476	176
Fill material from location AG14B (0.7-1.0m) and AG14E (1-1.7m)	Contains moderate level contamination	77	42
Fill material from location AG14E (0.7-1.0m) and AG14D (0.1-0.3m depth)	Contains moderate level contamination - high boron concentrations but acceptable SPLP for onsite disposal	75	20
Totals (Net)		666	373

Notes:
- Total volume and area values reflect net coverage, ensuring no double-counting of shared spatial extents.
- C&D = construction and demolition waste

All other soil and fill material can be left undisturbed. Upon completion of the above-mentioned works, all landfill material/refuse will have been removed from the ARL site.

Based on advice from SLR Consulting Limited (SLR), FTL understands that the parcel of ARL-owned land has been included within the address description of the LINZ resource consent application (prepared by SLR) for renewing the resource consent covering the existing disposal site. Hence, no consent should be required under the NES: CS Regulations, and the works can be undertaken in accordance with conditions outlined in the updated forthcoming Former Tokanui Hospital Closed Landfill consent.

11 LIMITATIONS

The professional opinion expressed herein has been prepared solely for, and is furnished to our client, Toitū Te Whenua – Land Information New Zealand, on the express condition that it will only be used for the purpose for which it is intended.

No liability is accepted by this firm or by any Principal, or Director, or any servant or agent of this firm, in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at its own risk. This disclaimer shall apply notwithstanding that this report may be made available to any person by any person in connection with any application for permission or approval, or pursuant to any requirement of law.

We do not assume any liability for misrepresentation or items not visible, accessible or present at the subject site during the time of the site inspection; or for the validity or accuracy of any information provided by our client or third parties that have been utilised in the preparation of this report.

Figures

Fraser Thomas
Over 50 Years
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

Drawing 33097/AG01: Site Location Plan

Toitū Te Whenua Land Information New Zealand
Former Tokanui Hospital Demolition and Remediation Project
Addendum Targeted Detailed Site Investigation
23 Farm Road, Tokanui, Te Awamutu

Date:	29/05/2025
Figure Reference:	33097/AG01
Drawn by:	BLM
Reviewed by:	SF
Job Number:	33097

N

0 60 120 240 360 480 600
Meters

Fraser Thomas
Over 50 Years
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

Drawing 33097/AG02: Test Pit Location Plan

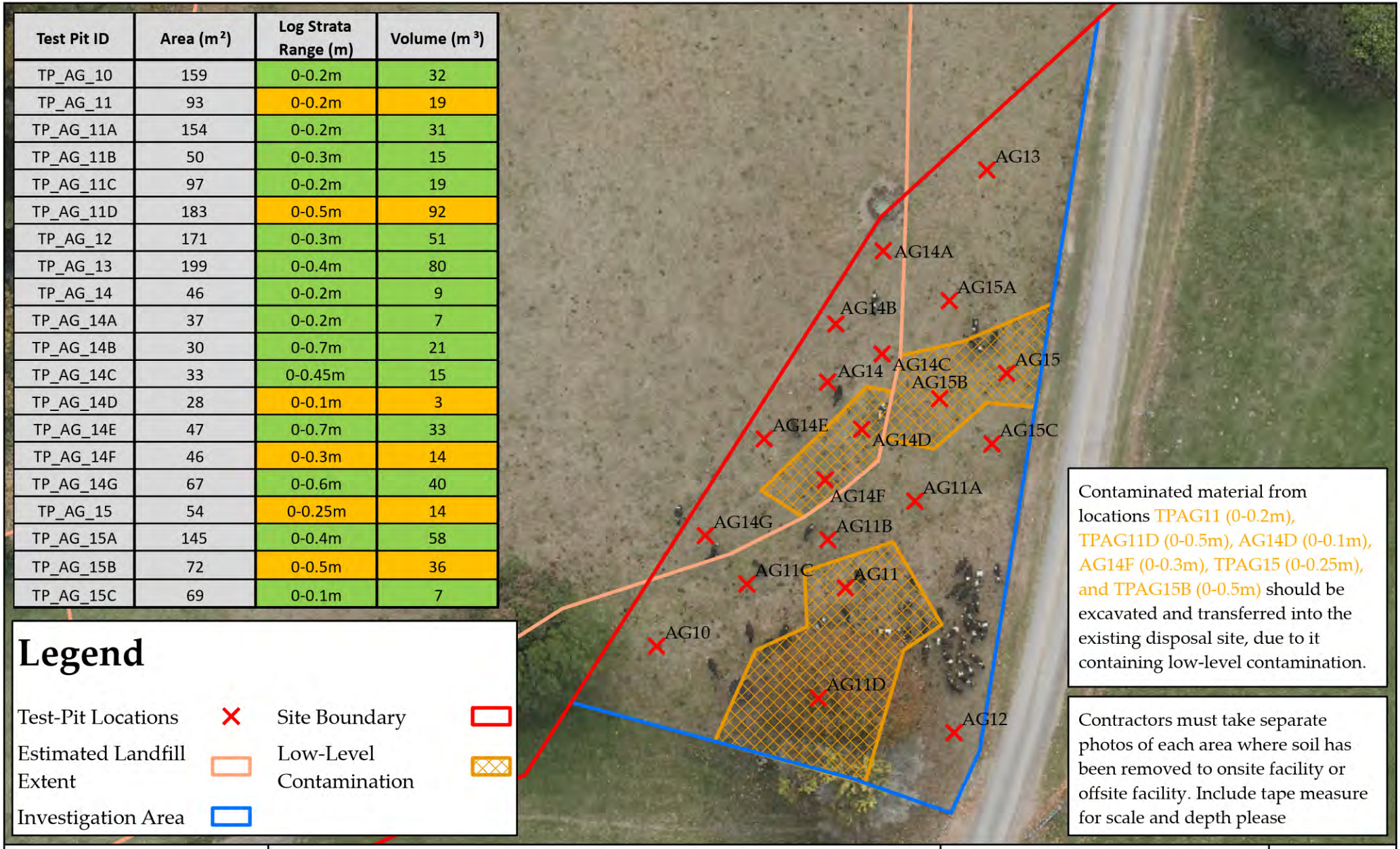
Toitū Te Whenua Land Information New Zealand
Former Tokanui Hospital Demolition and Remediation Project
Addendum Targeted Detailed Site Investigation
23 Farm Road, Tokanui, Te Awamutu

Date:	29/05/2025
Figure Reference:	33097/AG02
Drawn by:	BLM
Reviewed by:	SF
Job Number:	33097

N

0 5 10 20 30 40
Meters

Test Pit ID	Area (m^2)	Log Strata Range (m)	Volume (m^3)
TP_AG_10	159	0-0.2m	32
TP_AG_11	93	0-0.2m	19
TP_AG_11A	154	0-0.2m	31
TP_AG_11B	50	0-0.3m	15
TP_AG_11C	97	0-0.2m	19
TP_AG_11D	183	0-0.5m	92
TP_AG_12	171	0-0.3m	51
TP_AG_13	199	0-0.4m	80
TP_AG_14	46	0-0.2m	9
TP_AG_14A	37	0-0.2m	7
TP_AG_14B	30	0-0.7m	21
TP_AG_14C	33	0-0.45m	15
TP_AG_14D	28	0-0.1m	3
TP_AG_14E	47	0-0.7m	33
TP_AG_14F	46	0-0.3m	14
TP_AG_14G	67	0-0.6m	40
TP_AG_15	54	0-0.25m	14
TP_AG_15A	145	0-0.4m	58
TP_AG_15B	72	0-0.5m	36
TP_AG_15C	69	0-0.1m	7



Legend

- Test-Pit Locations
- Site Boundary
- Estimated Landfill Extent
- Low-Level Contamination
- Investigation Area

Contaminated material from locations TPAG11 (0-0.2m), TPAG11D (0-0.5m), AG14D (0-0.1m), AG14F (0-0.3m), TPAG15 (0-0.25m), and TPAG15B (0-0.5m) should be excavated and transferred into the existing disposal site, due to it containing low-level contamination.

Contractors must take separate photos of each area where soil has been removed to onsite facility or offsite facility. Include tape measure for scale and depth please

Fraser Thomas
Over 50 Years
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

Drawing 33097/AG03: Surface Soil Contamination Plan

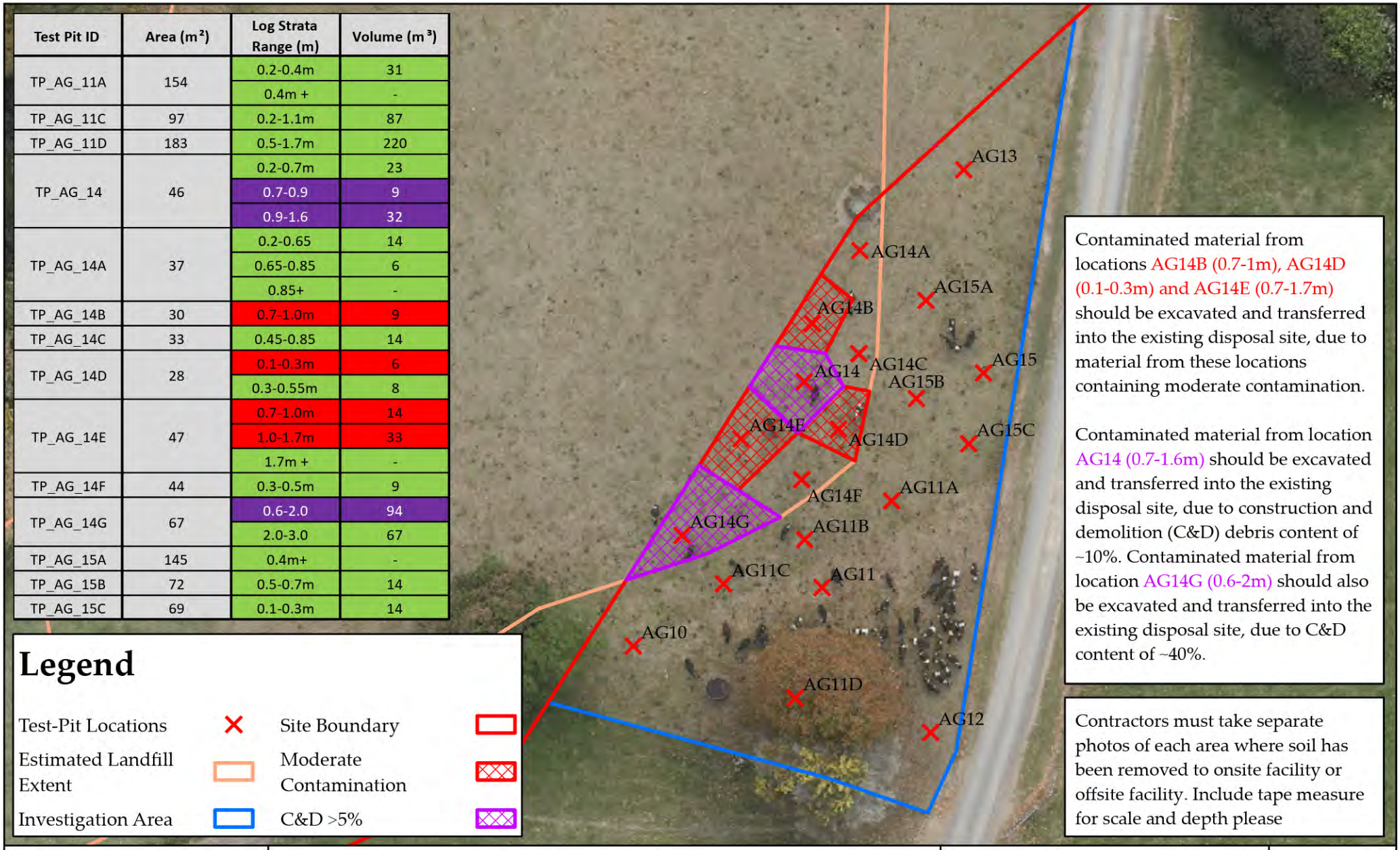
Toitū Te Whenua Land Information New Zealand
Former Tokanui Hospital Demolition and Remediation Project
Addendum Targeted Detailed Site Investigation,
23 Farm Road, Tokanui, Te Awamutu

Date:	11/08/2025
Figure Reference:	33097/AG03
Drawn by:	BLM
Reviewed by:	SF
Job Number:	33097

N

0 4 8 16 24 32 40
Meters

Test Pit ID	Area (m²)	Log Strata Range (m)	Volume (m³)
TP_AG_11A	154	0.2-0.4m	31
		0.4m +	-
TP_AG_11C	97	0.2-1.1m	87
TP_AG_11D	183	0.5-1.7m	220
TP_AG_14	46	0.2-0.7m	23
		0.7-0.9	9
		0.9-1.6	32
TP_AG_14A	37	0.2-0.65	14
		0.65-0.85	6
		0.85+	-
TP_AG_14B	30	0.7-1.0m	9
TP_AG_14C	33	0.45-0.85	14
TP_AG_14D	28	0.1-0.3m	6
		0.3-0.55m	8
TP_AG_14E	47	0.7-1.0m	14
		1.0-1.7m	33
		1.7m +	-
TP_AG_14F	44	0.3-0.5m	9
TP_AG_14G	67	0.6-2.0	94
		2.0-3.0	67
TP_AG_15A	145	0.4m+	-
TP_AG_15B	72	0.5-0.7m	14
TP_AG_15C	69	0.1-0.3m	14



Legend

- Test-Pit Locations
- Estimated Landfill Extent
- Investigation Area
- Site Boundary
- Moderate Contamination
- C&D >5%

Contaminated material from locations AG14B (0.7-1m), AG14D (0.1-0.3m) and AG14E (0.7-1.7m) should be excavated and transferred into the existing disposal site, due to material from these locations containing moderate contamination.

Contaminated material from location AG14 (0.7-1.6m) should be excavated and transferred into the existing disposal site, due to construction and demolition (C&D) debris content of ~10%. Contaminated material from location AG14G (0.6-2m) should also be excavated and transferred into the existing disposal site, due to C&D content of ~40%.

Contractors must take separate photos of each area where soil has been removed to onsite facility or offsite facility. Include tape measure for scale and depth please

Fraser Thomas
Over 50 Years
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

Drawing 33097/AG04: Sub-Surface Soil Contamination Plan

Toitū Te Whenua Land Information New Zealand
Former Tokanui Hospital Demolition and Remediation Project
Addendum Targeted Detailed Site Investigation,
23 Farm Road, Tokanui, Te Awamutu

Date:	11/08/2025
Figure Reference	33097/AG04
Drawn by:	BLM
Reviewed by:	SF
Job Number:	33097

N

0 4 8 16 24 32 40
Meters

Appendix A

Ministry for the Environment
Contaminated Site Report Checklist

TOITŪ TE WHENUA – LAND INFORMATION NEW ZEALAND
ADDENDUM TARGETED DETAILED SITE INVESTIGATION REPORT
23 FARM ROAD, TE AWAMUTU, WAIKATO

No.	Content	Required	Required if relied on	CLMG 5 section
1.	**Introduction**			
o	investigation objectives	☒		2.1
o	site identification (site name, address, legal description; site boundaries; a map reference and geographic coordinates)	☒		3.3.1
o	proposed site use		☒	3.3.2
2.	**Site description**			
o	environmental setting		☒	3.3.3
o	site layout	☒		3.3.4
o	current site uses	☒		3.3.5
o	surrounding land uses	☒		3.3.6
o	geophysical surveys		☐	5.1
o	site inspection		☒	3.3.8
3.	**Historical site use**			
o	Summary of site history gained from:	☒		3.3.7
	−review of existing investigation reports		☒	
	−review of council information		☐	
	−review of aerial photographs		☒	
	−interviews		☐	
	− review of other historical information		☐	
o	preliminary sampling (if carried out) − description (including diagram) − justification for sample location and analyte selection − results − comparison of results to guidelines		☒	3.3.9
4.	**Sampling and analysis plan (could be appended if complex)-**			4.2
o	media to be sampled	☒		4.2
o	contaminants of potential concern and/or analyte selection	☒		4.2.1
o	background concentration level (if relevant), contaminant standard and/or environmental guideline value selection	☒		4.2.2 & 4.2.7
o	sampling design (eg, targeted or systematic sampling)	☒		4.2.3
o	number of samples including justification for number selected and potential limitations of methodology adopted in the context of	☒		4.2.4

	investigation objectives (eg, hotspot size, statistical reliability)			
o	sample depth	☒		4.2.5
o	composite sampling including number of sub-samples per sample		☐	4.2.6
o	background sampling methodology		☒	4.2.7
o	field sampling technique(s)	☒		4.3, 5.2
o	field screening technique(s)		☐	5.4
o	quality assurance and quality control	☒		4.3
5.	**Sampling results**			
o	summary of works undertaken with rationale for any departure from, or addition to, sampling and analysis plan	☒		6.2
o	field observations (eg, staining, odour, soil characteristics)	☒		5.2.1
o	evaluation of analytical laboratory results with comparison to background concentration levels (if relevant), contaminant standards and/or environmental guideline values	☒		7
o	evaluation of field screening results with comparison to background concentration levels (if relevant), contaminant standards and/or environmental guideline values		☒	7
o	results of field and laboratory sample quality assurance and/or quality control	☒		6.5 & 7.1
o	statistical analysis of results		☐	
6.	**Disposal of soil**			
	transport, disposal, and tracking of soil and other materials taken away in the course of the activity		☐	
7.	**Risk assessment**			
o	Conceptual site model	☒		3
o	evaluation of the probability that contamination exists on the site	☒		3.3.11
o	characterisation of the source through adequate delineation of contamination horizontally and vertically and assessment of contaminant concentrations	☒		
o	identification and characterisation of potential pathways and receptors for each exposure area across the site (eg, assessment of geology, hydrogeology, building construction, site use)	☒		
o	likelihood that contamination poses a risk to identified receptors including potential receptors	☒		
o	evaluation of the level of any identified risk to human health pursuant to regulation 5(9) *− does a detailed site investigation exist that demonstrates that any contaminants in or on the*	☒		

	piece of land are at, or below, background concentrations? o evaluation of the magnitude of any identified risk to other receptors (eg, ecological) o limitations, assumptions and uncertainties in data and models used	☒	☒	
8.	**Discussion**		☒	
9.	**Conclusions**	☒		
10	**Recommendations (if relevant to report purpose)**		☒	
11.	**Report limitations**	☒		
12.	**SQEP certification of report (refer appendix C)**	☒		1.2
13.	**References**	☒		
Appendices: relevant supporting information		☒		

Appendix B

Aerials

1943

Source: Waikato Regional Council

1944

Source: NZ Aerial Imagery: retrolens.co.nz

1957

Source: Waikato Regional Council

1961

Source: NZ Aerial Imagery: retrolens.co.nz

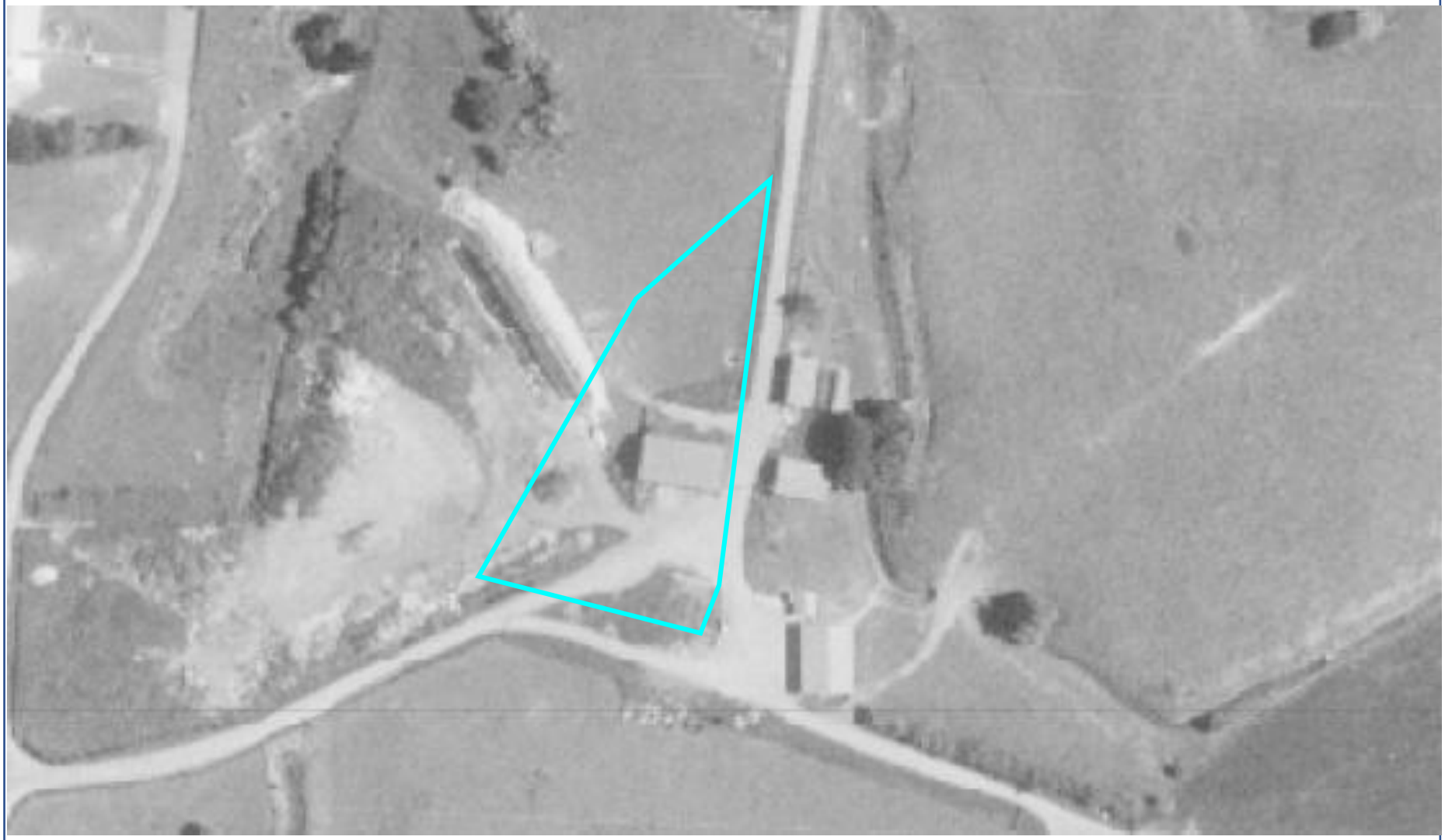
1966

Source: NZ Aerial Imagery: retrolens.co.nz

1974

Source: NZ Aerial Imagery: retrolens.co.nz

1979



Source: Waikato Regional Council: retrolens.co.nz

1995

Source: NZ Aerial Imagery: retrolens.co.nz

2012

Source: NZ Aerial Imagery: retrolens.co.nz

2016

Source: NZ Aerial Imagery: retrolens.co.nz

2021

Source: NZ Aerial Imagery: retrolens.co.nz

2025

Source: NZ Aerial Imagery: retrolens.co.nz

Appendix C

Site Walkover Photographs

Appendix D

Geotechnical Logs

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

TEST PIT LOG

Hole No: TPAG10

Project No:	Project:	Shear Vane:	Date Excavated:	Logged By:	Checked By:
65547	Toitū Te Whenua Land Information New Zealand Former Tokanui Hospital Closed Landfill, Tokanui	GEO3450	19/03/2025	C. Lee	A. Stuart

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)	Values	Depth (m)	Dynamic Cone Penetrometer	Groundwater
				Vane readings corrected as per BS 1377 ● Shear Vane ○ Residual Shear Vane 50 100 150 200			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm) 2 4 6 8 10 12 14 16	
0	[TOPSOIL/FILL] SILT, minor gravel (fine, sub-angular), dark grey mottled dark brown/black, dry, non-plastic, contains <5% building debris including brick and concrete	Fill				0		
0.2	SILT, minor clay, light grey streaked orange/light brown, very stiff, moist, slightly plastic [HAMILTON ASH]	Kauroa-Hamilton Ash				0.2		GWNE
0.4	EOTP: 0.50 m TARGET DEPTH			○ ●	132 (32)	0.4		
0.6						0.6		
0.8						0.8		

Profile:

Excavation Method:
5t Excavator

Remarks:
1. Groundwater not encountered on 19/03/25.

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

TEST PIT LOG

Hole No: TPAG11

Project No:	Project:	Shear Vane:	Date Excavated:	Logged By:	Checked By:
65547	Toitū Te Whenua Land Information New Zealand Former Tokanui Hospital Closed Landfill, Tokanui	GEO3450	19/03/2025	C. Lee	A. Stuart

Depth (m)	Description of Strata	Geological Unit	Graphic Log
	[TOPSOIL] SILT, black, dry, non-plastic	T/S	
	[FILL] GRAVEL (fine, sub-angular), silty, dark grey mottled brown, medium dense, dry, poorly graded, contains 5% building debris including brick and concrete	Fill	
0.2	[PALEOSOL] SILT, light brown mottled dark brown/black, very stiff, moist, slightly plastic	T/S	
	SILT, minor clay, light grey streaked orange/light brown, very stiff, moist, slightly plastic [HAMILTON ASH]	Kauroa-Hamilton Ash	
0.4			
0.6	EOTP: 0.65 m TARGET DEPTH		
0.8			

Undrained Shear Strength (kPa)

Vane readings corrected as per BS 1377

● Shear Vane ○ Residual Shear Vane

50 100 150 200

Values: 116 (32)

Dynamic Cone Penetrometer

Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)

2 4 6 8 10 12 14 16

Groundwater: GWNE

Profile:

Excavation Method:

5t Excavator

Remarks:

1. Groundwater not encountered on 19/03/25.

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

TEST PIT LOG

Hole No: TPAG12

Project No:	Project:	Shear Vane:	Date Excavated:	Logged By:	Checked By:
65547	Toitū Te Whenua Land Information New Zealand Former Tokanui Hospital Closed Landfill, Tokanui	GEO3450	19/03/2025	C. Lee	A. Stuart

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	[TOPSOIL] SILT, black, dry, non-plastic	T/S	TS
0.2	[FILL] GRAVEL (fine, sub-angular), silty, dark brown/black, medium dense, dry, poorly graded, contains 5% building debris including brick and concrete	Fill	
0.4	[PALEOSOL] SILT, minor clay, black, stiff, moist, slightly plastic, trace rootlets	Topsoil	TS
0.6	SILT, minor clay, light brown streaked orange/brown, very stiff, moist, slightly plastic [HAMILTON ASH]	Kauroa-Hamilton Ash	
1.0	EOTP: 0.95 m TARGET DEPTH		

Undrained Shear Strength (kPa)

Vane readings corrected as per BS 1377

● Shear Vane ○ Residual Shear Vane

50 100 150 200

Values: 109 (32)

Dynamic Cone Penetrometer

Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)

2 4 6 8 10 12 14 16

Groundwater: GWNE

Profile:

Excavation Method:

5t Excavator

Remarks:

1. Groundwater not encountered on 19/03/25.

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

TEST PIT LOG

Hole No: TPAG13

Project No:	Project:	Shear Vane:	Date Excavated:	Logged By:	Checked By:
65547	Toitū Te Whenua Land Information New Zealand Former Tokanui Hospital Closed Landfill, Tokanui	GEO3450	19/03/2025	C. Lee	A. Stuart

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)	Values	Depth (m)	Dynamic Cone Penetrometer	Groundwater
0.2	[TOPSOIL/FILL] SILT, minor gravel (fine, sub-angular), dark grey mottled dark brown/black, dry, non-plastic, contains <5% building debris including brick and concrete	Fill				0.2		
0.4	[PALEOSOL] SILT, minor clay, black, stiff, moist, slightly plastic, trace rootlets	T/S	TS TS			0.4		GWNE
0.6	SILT, minor clay, light grey streaked orange/light brown, very stiff, moist, slightly plastic [HAMILTON ASH]	Kauroa-Hamilton Ash				0.6		
0.8						0.8		
1.0	EOTP: 0.90 m TARGET DEPTH				161 (26)	1.0		
1.2						1.2		
1.4						1.4		
1.6						1.6		
1.8						1.8		

Undrained Shear Strength (kPa): Vane readings corrected as per BS 1377 — ● Shear Vane ○ Residual Shear Vane; 50, 100, 150, 200

Dynamic Cone Penetrometer: Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm); 2, 4, 6, 8, 10, 12, 14, 16

Profile:

Excavation Method:

5t Excavator

Remarks:

1. Groundwater not encountered on 19/03/25.

Datum:

Coordinates:

Fraser Thomas
50 Years
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

TEST PIT LOG

Hole No: TPAG14

Project No:	Project:	Shear Vane:	Date Excavated:	Logged By:	Checked By:
65547	Toitū Te Whenua Land Information New Zealand Former Tokanui Hospital Closed Landfill, Tokanui	GEO3450	19/03/2025	C. Lee	A. Stuart

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	[TOPSOIL/FILL] SILT, minor gravel (fine, sub-angular), dark grey mottled dark brown/black, dry, non-plastic, contains <5% building debris including brick and concrete	Fill	
0.2	[CAPPING MATERIAL] SILT, some gravel (fine, sub-angular), minor clay, orange/brown, hard, dry, non-plastic	LFC	
0.6	[LANDFILL] SILT, some gravel (fine, sub-angular), dark grey/black speckled white, stiff, moist, non-plastic, contains 40% building debris including glass, plastic, brick and concrete	Fill	
1.6	SILT, minor clay, light grey streaked orange/light brown, very stiff, moist, slightly plastic [HAMILTON ASH]	Kauroa-Hamilton Ash	
1.90	EOTP: 1.90 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Depth (m)	Values
1.8	112 (29)

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Profile:

Excavation Method:
5t Excavator

Remarks:
1. Groundwater not encountered on 19/03/25.

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

TEST PIT LOG

Hole No: TPAG15

Project No:	Project:	Shear Vane:	Date Excavated:	Logged By:	Checked By:
65547	Toitū Te Whenua Land Information New Zealand Former Tokanui Hospital Closed Landfill, Tokanui	GEO3450	19/03/2025	C. Lee	A. Stuart

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	[TOPSOIL/FILL] SILT, minor gravel (fine, sub-angular), dark grey mottled dark brown/black, dry, non-plastic, contains <5% building debris including brick and concrete		
	SILT, minor clay, light brown mottled dark grey, very stiff, dry, slightly plastic	Fill	
0.2	[PALEOSOL] SILT, minor clay, black, stiff, moist, slightly plastic, trace rootlets	T/S	TS
0.4	SILT, minor clay, light brown streaked orange, very stiff, moist, slightly plastic [HAMILTON ASH]	Kauroa-Hamilton Ash	
0.6	EOTP: 0.70 m TARGET DEPTH		
0.8			

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values
177 (16)

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Profile:

Excavation Method:
5t Excavator

Remarks:
1. Groundwater not encountered on 19/03/25.

Datum:

Coordinates:

Appendix E

Laboratory Transcripts

Certificate of Analysis

Client Fraser Thomas LTD
Client Contact Elliot Bish
Phone Number 021 225 4572
Email ebish@ftl.co.nz
Address 21 El Kobar Drive

IANZ# 1308

Certificate ID	Q-01384	Date Sampled[2]	21/03/2025
Samples Taken By[2]	EB/BLM	Date Sample(s) Received	24/03/2025
Project Reference[2]	33097	Date Sample(s) Analysed & Issued	28/03/2025
Site Address[2]	33097		
Location Sample Analysed	Eurofins | Focus 35 O'Rorke Road, Penrose, Auckland 1061		

Qualitative Analysis of Asbestos

Lab ID	Sample ID[2]	Sample Details[2]	Sample type	Sample size (g)[2]	Fibres Identified
1	TP_AG_01 Sur	-	Soils	466	**ORF, NAD**
2	TP_AG_02 Sur	-	Soils	551	**CHR, ORF**
3	TP_AG_03 Sur	-	Soils	546	**ORF, NAD**
4	TP_AG_04 Sur	-	Soils	572	**ORF, NAD**
5	TP_AG_05 Sur	-	Soils	541	**ORF, NAD**
6	TP_AG_06 Sur	-	Soils	612	**ORF, NAD**
7	TP_AG_07 Sur	-	Soils	542	**ORF, NAD**
8	TP_AG_08 Sur	-	Soils	492	**ORF, NAD**
9	TP_AG_09 Sur	-	Soils	601	**ORF, NAD**
10	TP_AG_10 Sur	-	Soils	555	**ORF, NAD**
11	TP_AG_11 0.25	-	Soils	619	**ORF, NAD**
12	TP_AG_12 Sur	-	Soils	593	**ORF, NAD**
13	TP_AG_12 0.2	-	Soils	561	**ORF, NAD**
14	TP_AG_12 0.4	-	Soils	528	**ORF, NAD**
15	TP_AG_13 Sur	-	Soils	599	**ORF, NAD**
16	TP_AG_14 Sur	-	Soils	621	**ORF, NAD**
17	TP_AG_14 0.5	-	Soils	675	**ORF, NAD**
18	TP_AG_14 0.8	-	Soils	499	**ORF, NAD**
19	TP_AG_14 1.0	-	Soils	529	**ORF, NAD**
20	TP_AG_15 Sur	-	Soils	566	**ORF, NAD**

Opinions and interpretations expressed herein are outside the scope of Eurofins | Focus IANZ accreditation

Analytical Notes	-

Fibre Identification Key:

*	See Analytical Notes	**ORF**	Organic Fibre
CHR	Chrysotile (White Asbestos)	**SMF**	Synthetic Mineral Fibre
AMO	Amosite (Brown / Grey Asbestos)	**NFD**	No Fibres Detected
CRO	Crocidolite – (Blue Asbestos)	**NAD**	No Asbestos Detected
UMF	Unknown Mineral Fibre		

Scope of Accreditation:

1. The analytical comments marked (*) stated in the semi-quantitative analysis and the calculations in the semi-quantitative analysis of asbestos in soil are beyond Eurofins | Focus scope of accreditation.
2. Eurofins | Focus did not carry out any sampling, and the data presented are based on the samples submitted. Data supplied by the client is indicated with superscript [2] and may impact the results.
3. This certificate should be read in its entirety and shall not be reproduced except in full, without written approval of the laboratory.

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 24/03/2025
Date sample(s) analysed: 28/03/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
1	TP_AG_01 Sur	465.8	385.3	17.3	(>10mm) Fraction	90.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	188.7	-	NAD	-					
					(<2mm) Fraction	106.6	-	NAD	-					
2	TP_AG_02 Sur	550.9	473.7	14.0	(>10mm) Fraction	126.0	-	NAD	-	0.0002	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	214.6	0.0002	FFF	100					
					(<2mm) Fraction	133.1	-	NAD	-					
3	TP_AG_03 Sur	546.1	485.0	11.2	(>10mm) Fraction	109.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	220.9	-	NAD	-					
					(<2mm) Fraction	155.1	-	NAD	-					
4	TP_AG_04 Sur	572.1	442.7	22.6	(>10mm) Fraction	97.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	241.0	-	NAD	-					
					(<2mm) Fraction	104.1	-	NAD	-					
5	TP_AG_05 Sur	541.1	504.8	6.7	(>10mm) Fraction	134.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	227.6	-	NAD	-					
					(<2mm) Fraction	142.4	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 24/03/2025
Date sample(s) analysed: 28/03/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
6	TP_AG_06 Sur	611.6	550.5	10.0	(>10mm) Fraction	205.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	211.3	-	NAD	-					
					(<2mm) Fraction	133.5	-	NAD	-					
7	TP_AG_07 Sur	542.3	471.7	13.0	(>10mm) Fraction	98.2	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	262.4	-	NAD	-					
					(<2mm) Fraction	111.1	-	NAD	-					
8	TP_AG_08 Sur	492.1	443.7	9.8	(>10mm) Fraction	122.4	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	187.8	-	NAD	-					
					(<2mm) Fraction	133.5	-	NAD	-					
9	TP_AG_09 Sur	600.8	479.4	20.2	(>10mm) Fraction	63.1	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	255.3	-	NAD	-					
					(<2mm) Fraction	161.0	-	NAD	-					
10	TP_AG_10 Sur	554.5	439.9	20.7	(>10mm) Fraction	143.3	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	198.6	-	NAD	-					
					(<2mm) Fraction	98.0	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 24/03/2025
Date sample(s) analysed: 28/03/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
11	TP_AG_11 0.25	618.9	559.4	9.6	(>10mm) Fraction	219.1	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	241.8	-	NAD	-					
					(<2mm) Fraction	98.5	-	NAD	-					
12	TP_AG_12 Sur	593.1	465.1	21.6	(>10mm) Fraction	108.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	199.8	-	NAD	-					
					(<2mm) Fraction	157.3	-	NAD	-					
13	TP_AG_12 0.2	560.8	443.6	20.9	(>10mm) Fraction	92.5	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	150.4	-	NAD	-					
					(<2mm) Fraction	200.7	-	NAD	-					
14	TP_AG_12 0.4	528.2	398.4	24.6	(>10mm) Fraction	96.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	188.6	-	NAD	-					
					(<2mm) Fraction	113.1	-	NAD	-					
15	TP_AG_13 Sur	599.2	529.9	11.6	(>10mm) Fraction	204.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	230.9	-	NAD	-					
					(<2mm) Fraction	94.4	-	NAD	-					

*Semi Quantitative Analysis of Soil

*Semi Quantitative Analysis of Asbestos in Soil

Date sample(s) received: 24/03/2025
Date sample(s) analysed: 28/03/2025

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Moisture (%)	Fraction size (mm)	Dry fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
16	TP_AG_14 Sur	620.7	539.2	13.1	(>10mm) Fraction	123.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	252.3	-	NAD	-					
					(<2mm) Fraction	163.1	-	NAD	-					
17	TP_AG_14 0.5	674.8	623.3	7.6	(>10mm) Fraction	141.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	286.3	-	NAD	-					
					(<2mm) Fraction	195.2	-	NAD	-					
18	TP_AG_14 0.8	498.8	382.0	23.4	(>10mm) Fraction	159.3	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	105.0	-	NAD	-					
					(<2mm) Fraction	117.7	-	NAD	-					
19	TP_AG_14 1.0	528.5	455.9	13.7	(>10mm) Fraction	81.7	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	178.6	-	NAD	-					
					(<2mm) Fraction	195.6	-	NAD	-					
20	TP_AG_15 Sur	565.6	494.9	12.5	(>10mm) Fraction	60.0	-	NAD	-	-	-	<0.001	<0.001	<0.001
					(10-2mm) Fraction	247.2	-	NAD	-					
					(<2mm) Fraction	187.7	-	NAD	-					

Analysis Method:

Samples submitted have been analysed to determine the mass fraction of asbestos in soil using low powered stereo microscopy followed by polarised light microscopy (PLM) including dispersion staining techniques as documented in (AS 4964-2004), Method for the qualitative identification of asbestos in bulk samples, BRANZ, New Zealand Guidelines for Assessing and Managing Asbestos in Soils:2017.

Product Identification Key:

BTP	Bituminous Product	LSE	Loose Fill Insulation
CMP	Cement Product	NAD	No Asbestos Detected
COM	Composite	PPR	Paper Product
FFF	Free Fibres	RPL	Reinforced Plastics
FIB	Fibre Board	TXC	Textured Coating
GCP	Gaskets (compressed)	VNP	Vinyl Products
GRW	Gaskets (rope/woven)	VPP	Vinyl with paper backing
INB	Insulating Board	WVP	Woven Product

Interpretation of Key:

[a] Percentage of Asbestos in product is adopted from HSG 264 - 2012, Asbestos the survey guide, Appendix 2, ACMS in buildings and categorized in our internal Technical Procedure (NPM-TP02) for Qualitative and Semi-Quantitative analysis of asbestos in soil. A dash (-) denotes that there was no asbestos found in that fraction.

[b] Total Mass of Asbestos is the sum mass of asbestos-by-asbestos type in product type([a]) plus the mass of free fibre asbestos. A dash (-) denotes that there was no total mass of asbestos calculated asbestos found in that fraction.

[c] Bonded Asbestos Containing Material in the greater than 10mm fraction as percentage of the total sample (% w/w). A dash (-) denotes that there was no bonded asbestos containing materials found in that fraction.

[d] Asbestos as Fibrous Asbestos (FA) in greater than 10mm fraction as percentage of total sample (% w/w).

[e] Asbestos as Asbestos Fines (AF) in less than 10mm fraction as a percentage of total sample (% w/w).

[f] Total Friable Asbestos combining Fibrous Asbestos and Asbestos Fines as the percentage weight for weight of the total sample (% w/w).

Sample History

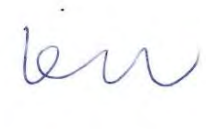
Where samples are submitted/analysed over several days, the last extraction date is reported. If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time. Client samples are disposed of 1 month after analysis

Description	Testing Site	Extracted	Holding Time
AS4964-2004 and in-house Method NPM -TP02	Auckland	28/03/2025	Indefinite

Comments

Asbestos Counter/Identifier:

Colin Wang	Senior Analyst-Asbestos
Elsie Xu	Analyst-Asbestos
Emily Wang	Analyst-Asbestos



Emily Wang

Senior Analyst-Asbestos (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

Measurement uncertainty of test data is available on request or please click here.

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Fraser Thomas Limited	**Lab No:**	3822207 SPv1
Contact:	Elliot Bish	**Date Received:**	20-Mar-2025
	C/- Fraser Thomas Limited	**Date Reported:**	24-Mar-2025
	PO Box 204006	**Quote No:**	110707
	Highbrook	**Order No:**	33097
	Auckland 2161	**Client Reference:**	33097
		Submitted By:	Elliot Bish

Sample Type: Soil

Sample Name:		TP_AG_01-Sur 20-Mar-2025	TP_AG_02-Sur 20-Mar-2025	TP_AG_03-Sur 20-Mar-2025	TP_AG_04-Sur 20-Mar-2025	TP_AG_05-Sur 20-Mar-2025
Lab Number:		3822207.1	3822207.2	3822207.3	3822207.4	3822207.5
Individual Tests						
Dry Matter	g/100g as rcvd	82	86	89	81	87
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	4	3	7	6	5
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
Total Recoverable Cadmium	mg/kg dry wt	0.28	0.20	0.32	3.5	0.28
Total Recoverable Chromium	mg/kg dry wt	10	6	8	14	9
Total Recoverable Copper	mg/kg dry wt	17	28	35	16	19
Total Recoverable Lead	mg/kg dry wt	157	110	95	106	27
Total Recoverable Nickel	mg/kg dry wt	3	4	7	5	4
Total Recoverable Zinc	mg/kg dry wt	169	118	147	260	129
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	0.5	0.6	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.012	0.014	< 0.011	< 0.012	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.012	0.012	< 0.011	< 0.012	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.012	0.014	< 0.012	< 0.012
Acenaphthene	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.012	< 0.012
Anthracene	mg/kg dry wt	< 0.012	< 0.012	0.012	< 0.012	< 0.012
Benzo[a]anthracene	mg/kg dry wt	0.015	0.036	0.048	0.012	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.014	0.049	0.060	0.019	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.029	0.072	0.091	< 0.029	< 0.028
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.029	0.072	0.090	< 0.029	< 0.028
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.020	0.055	0.073	0.022	< 0.012
Benzo[e]pyrene	mg/kg dry wt	< 0.012	0.027	0.037	< 0.012	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012	0.028	0.033	0.015	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	0.022	0.030	< 0.012	< 0.012
Chrysene	mg/kg dry wt	0.013	0.036	0.044	< 0.012	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.012	< 0.012
Fluoranthene	mg/kg dry wt	0.020	0.050	0.074	< 0.012	< 0.012
Fluorene	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.012	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	0.031	0.038	0.015	< 0.012
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.012	0.013	< 0.012	< 0.012
Phenanthrene	mg/kg dry wt	< 0.012	0.024	0.022	< 0.012	< 0.012
Pyrene	mg/kg dry wt	0.019	0.065	0.081	0.016	< 0.012

Sample Type: Soil						
	Sample Name:	TP_AG_06-Sur 20-Mar-2025	TP_AG_07-Sur 20-Mar-2025	TP_AG_08-Sur 20-Mar-2025	TP_AG_09-Sur 20-Mar-2025	TP_AG_10-Sur 20-Mar-2025
	Lab Number:	3822207.6	3822207.7	3822207.8	3822207.9	3822207.10
Individual Tests						
Dry Matter	g/100g as rcvd	88	89	84	77	84
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	6	30	6	8	6
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
Total Recoverable Cadmium	mg/kg dry wt	0.40	0.42	0.55	0.17	0.27
Total Recoverable Chromium	mg/kg dry wt	10	25	12	12	12
Total Recoverable Copper	mg/kg dry wt	39	37	74	20	24
Total Recoverable Lead	mg/kg dry wt	51	155	780	45	74
Total Recoverable Nickel	mg/kg dry wt	4	4	6	5	8
Total Recoverable Zinc	mg/kg dry wt	135	180	290	101	158
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	0.4	< 0.3	< 0.4	0.9
1-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.013	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.013	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.013	< 0.012
Acenaphthene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.013	< 0.012
Anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	0.016	< 0.012
Benzo[a]anthracene	mg/kg dry wt	< 0.012	0.023	< 0.012	< 0.013	0.062
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.012	0.044	0.016	< 0.013	0.085
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.027	0.066	< 0.029	< 0.031	0.124
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.027	0.066	< 0.029	< 0.031	0.123
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.012	0.056	0.020	< 0.013	0.102
Benzo[e]pyrene	mg/kg dry wt	< 0.012	0.034	< 0.012	< 0.013	0.056
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012	0.044	< 0.012	< 0.013	0.061
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	0.021	< 0.012	< 0.013	0.041
Chrysene	mg/kg dry wt	< 0.012	0.028	< 0.012	< 0.013	0.061
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.013	< 0.012
Fluoranthene	mg/kg dry wt	< 0.012	0.052	0.024	< 0.013	0.117
Fluorene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.013	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	0.043	< 0.012	< 0.013	0.062
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.07	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.013	0.019
Phenanthrene	mg/kg dry wt	< 0.012	0.015	< 0.012	< 0.013	0.031
Pyrene	mg/kg dry wt	< 0.012	0.054	0.022	0.014	0.127

	Sample Name:	TP_AG_11_0.2m 20-Mar-2025	TP_AG_12 Sur 20-Mar-2025	TP_AG_13 Sur 20-Mar-2025	TP_AG_14 Sur 20-Mar-2025	TP_AG_15 Sur 20-Mar-2025
	Lab Number:	3822207.11	3822207.12	3822207.13	3822207.14	3822207.15
Individual Tests						
Dry Matter	g/100g as rcvd	90	81	89	89	88
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	10	7	4	5	5
Total Recoverable Boron	mg/kg dry wt	47	< 20	< 20	72	< 20
Total Recoverable Cadmium	mg/kg dry wt	0.20	0.31	0.20	0.22	0.57
Total Recoverable Chromium	mg/kg dry wt	12	9	8	13	9
Total Recoverable Copper	mg/kg dry wt	30	29	14	27	27
Total Recoverable Lead	mg/kg dry wt	45	40	33	35	154
Total Recoverable Nickel	mg/kg dry wt	10	5	4	10	6
Total Recoverable Zinc	mg/kg dry wt	80	93	78	105	130
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	5.3	1.2	< 0.3	1.0	1.8
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.012	< 0.011	< 0.011	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.012	< 0.011	< 0.011	< 0.011

Sample Type: Soil						
Sample Name:		TP_AG_11_0.2m 20-Mar-2025	TP_AG_12 Sur 20-Mar-2025	TP_AG_13 Sur 20-Mar-2025	TP_AG_14 Sur 20-Mar-2025	TP_AG_15 Sur 20-Mar-2025
Lab Number:		3822207.11	3822207.12	3822207.13	3822207.14	3822207.15
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.012	< 0.011	< 0.011	< 0.011
Acenaphthene	mg/kg dry wt	0.030	< 0.012	< 0.011	< 0.011	< 0.011
Anthracene	mg/kg dry wt	0.103	0.013	< 0.011	0.012	0.034
Benzo[a]anthracene	mg/kg dry wt	0.39	0.095	< 0.011	0.076	0.133
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.51	0.123	0.014	0.105	0.147
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.75	0.182	< 0.027	0.153	0.22
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.74	0.180	< 0.027	0.152	0.22
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.64	0.149	0.016	0.123	0.188
Benzo[e]pyrene	mg/kg dry wt	0.31	0.080	< 0.011	0.063	0.096
Benzo[g,h,i]perylene	mg/kg dry wt	0.38	0.092	< 0.011	0.067	0.103
Benzo[k]fluoranthene	mg/kg dry wt	0.20	0.061	< 0.011	0.051	0.076
Chrysene	mg/kg dry wt	0.35	0.087	< 0.011	0.068	0.119
Dibenzo[a,h]anthracene	mg/kg dry wt	0.073	0.017	< 0.011	0.014	0.021
Fluoranthene	mg/kg dry wt	0.78	0.185	0.018	0.152	0.30
Fluorene	mg/kg dry wt	0.021	< 0.012	< 0.011	< 0.011	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.36	0.085	< 0.011	0.069	0.104
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	0.119	0.027	< 0.011	0.022	0.029
Phenanthrene	mg/kg dry wt	0.29	0.040	< 0.011	0.042	0.122
Pyrene	mg/kg dry wt	0.74	0.184	0.017	0.158	0.27

Sample Name:		TP_AG_04_0.25 m 20-Mar-2025	TP_AG_12_0.2m 20-Mar-2025	TP_AG_12_0.4m 20-Mar-2025	TP_AG_14_0.5m 20-Mar-2025	TP_AG_14_0.8m 20-Mar-2025
Lab Number:		3822207.16	3822207.17	3822207.18	3822207.19	3822207.20
Individual Tests						
Dry Matter	g/100g as rcvd	79	81	71	91	71
7 Heavy metals plus Boron						
Total Recoverable Arsenic	mg/kg dry wt	3	5	3	3	5
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	< 20	380
Total Recoverable Cadmium	mg/kg dry wt	0.56	0.20	0.44	< 0.10	0.12
Total Recoverable Chromium	mg/kg dry wt	8	8	7	27	6
Total Recoverable Copper	mg/kg dry wt	7	30	150	17	13
Total Recoverable Lead	mg/kg dry wt	32	37	78	14.9	15.9
Total Recoverable Nickel	mg/kg dry wt	3	4	4	13	10
Total Recoverable Zinc	mg/kg dry wt	69	69	123	64	24
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	0.4	< 0.4	< 0.3	< 0.4
1-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.011	< 0.014
2-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.011	< 0.014
Acenaphthylene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.011	< 0.014
Acenaphthene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.011	< 0.014
Anthracene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.011	< 0.014
Benzo[a]anthracene	mg/kg dry wt	< 0.013	0.032	< 0.014	< 0.011	< 0.014
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	0.037	< 0.014	< 0.011	< 0.014
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.030	0.054	< 0.033	< 0.026	< 0.034
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.030	0.054	< 0.033	< 0.026	< 0.034
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.013	0.043	< 0.014	< 0.011	< 0.014
Benzo[e]pyrene	mg/kg dry wt	< 0.013	0.024	< 0.014	< 0.011	< 0.014
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	0.018	< 0.014	< 0.011	< 0.014
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	0.019	< 0.014	< 0.011	< 0.014
Chrysene	mg/kg dry wt	< 0.013	0.023	< 0.014	< 0.011	< 0.014

Sample Type: Soil						
Sample Name:		TP_AG_04_0.25m 20-Mar-2025	TP_AG_12_0.2m 20-Mar-2025	TP_AG_12_0.4m 20-Mar-2025	TP_AG_14_0.5m 20-Mar-2025	TP_AG_14_0.8m 20-Mar-2025
Lab Number:		3822207.16	3822207.17	3822207.18	3822207.19	3822207.20
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.011	< 0.014
Fluoranthene	mg/kg dry wt	< 0.013	0.064	< 0.014	< 0.011	0.016
Fluorene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.011	< 0.014
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	0.023	< 0.014	< 0.011	< 0.014
Naphthalene	mg/kg dry wt	< 0.07	< 0.06	< 0.07	< 0.06	< 0.07
Perylene	mg/kg dry wt	< 0.013	< 0.012	< 0.014	< 0.011	0.090
Phenanthrene	mg/kg dry wt	< 0.013	0.014	< 0.014	< 0.011	< 0.014
Pyrene	mg/kg dry wt	< 0.013	0.062	< 0.014	< 0.011	< 0.014

Sample Name:		TP_AG_14_1.0m 20-Mar-2025
Lab Number:		3822207.21
Individual Tests		
Dry Matter	g/100g as rcvd	84
7 Heavy metals plus Boron		
Total Recoverable Arsenic	mg/kg dry wt	7
Total Recoverable Boron	mg/kg dry wt	1,160
Total Recoverable Cadmium	mg/kg dry wt	0.13
Total Recoverable Chromium	mg/kg dry wt	16
Total Recoverable Copper	mg/kg dry wt	32
Total Recoverable Lead	mg/kg dry wt	22
Total Recoverable Nickel	mg/kg dry wt	45
Total Recoverable Zinc	mg/kg dry wt	63
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	0.6
1-Methylnaphthalene	mg/kg dry wt	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.012
Acenaphthene	mg/kg dry wt	< 0.012
Anthracene	mg/kg dry wt	< 0.012
Benzo[a]anthracene	mg/kg dry wt	0.044
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.059
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.086
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.085
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.071
Benzo[e]pyrene	mg/kg dry wt	0.036
Benzo[g,h,i]perylene	mg/kg dry wt	0.031
Benzo[k]fluoranthene	mg/kg dry wt	0.028
Chrysene	mg/kg dry wt	0.038
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012
Fluoranthene	mg/kg dry wt	0.083
Fluorene	mg/kg dry wt	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.034
Naphthalene	mg/kg dry wt	< 0.06
Perylene	mg/kg dry wt	0.013
Phenanthrene	mg/kg dry wt	0.026
Pyrene	mg/kg dry wt	0.086

Analyst's Comments

It has been noted that the System Monitoring Compounds 1-methylnaphthalene-d10, Fluoranthene-d10 and Benzo[a] pyrene-d12 in the PAH analysis on samples 3822207.2, .4 and .14, had lower than expected recoveries. Sample 2 was 63% to 68%, sample 4 was 62% to 63% and sample 14 was 57% to 60%. Therefore the results may be underestimated.

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 simple 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. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1-21
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1-21
7 Heavy metals plus Boron	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 - 20 mg/kg dry wt	1-21
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.010 - 0.05 mg/kg dry wt	1-21
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-21
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1-21
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1-21

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

Testing was completed between 20-Mar-2025 and 24-Mar-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Appendix F

QA/QC

Item	Description
Field Quality Assurance	
Sampling Team Details	Elliot Bish & Ben Laing-McConnell, Environmental Scientists, and Cameron Lee, Engineering Geologist
Intended duplicate/blank frequency	N/A
Sample Records	• Hill Laboratories chain of custody forms. • Sample locations shown in drawings 33097/AG02-33097/AG04 • Site observations stated in main report.
Chain of Custody	• FTL/RJ Hill Laboratories/Eurofins standard forms. • Directly taken to lab by FTL.
Other	• All field work was completed in accordance with the current FTL field procedures, which are designed to eliminate cross-contamination and associated 'false positive' and 'false negative' sampling errors. • Between samples all sampling utensils were triple washed with potable tap water, then cleaned with a proprietary laboratory grade phosphate free detergent (Decon 90), and finally rinsed with clean water. During sampling, clean latex laboratory gloves were worn. • All samples were deposited into laboratory supplied clean glass jars, and immediately placed into a ruggedised chilled container. All samples were transported to an IANZ accredited laboratory under standard FTL chain of custody procedures.
Laboratory QA/QC	
Analytical methods and detection limits	• See Appendix E (RJ Hill Laboratories/Eurofins transcripts). • Compliance with sample holding times.
QA/QC Data evaluation	
General	Comparison of laboratory results with field observations