



CONTAMINATED LAND ASSESSMENT (DETAILED SITE INVESTIGATION)

NZ Transport Agency Waka Kotahi
Mill Road Stage 1

AUGUST 2026

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QUALITY REVIEW AND APPROVAL RECORD

Item	Name	Date
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Reviewed by:	Philip Ware, Beca Limited	August 2026
Approved for lodgement by:	Nicola Bishop, NZTA	August 2026

EXECUTIVE SUMMARY

Beca Limited (**Beca**) have been engaged to undertake a Detailed Site Investigation (**DSI**) of the Mill Road Stage 1 Corridor. The purpose of this investigation and the subsequent reporting was to:

- Assess the applicability of the National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2011 (**NESCS**) to the proposed works.
- Assess the applicability of the Auckland Council Auckland Unitary Plan (**AUP**) Chapter E.30 Contaminated Land Requirements to the proposed development.
- Undertake a DSI to inform and fulfil the requirements for the assessment of the Project against the NESCS and AUP, and the alteration to the designation, including the deletion of Condition 38.1 (excluding the Murphys Road section) of the existing conditions on Designation 6786.
- Inform controls required to be implemented during the proposed development, including the soil reuse and/or disposal requirements, and areas requiring more granular delineation sampling during the construction stage to refine controls.

This DSI builds on three previous stages of primarily desk-based investigation completed as part of the establishment of the designation in 2014 and as part of the NZUP program in 2021 including:

- Auckland Transport 2014. Contaminated Land Assessment – Redoubt Road/Mill Road Corridor - Contaminated Land Assessment.
- Te Tupu Ngātahi Supporting Growth Alliance 2021. NZUP Mill Road Preliminary Site Investigation (Contaminated Land).
- NZ Transport Agency 2021. Mill Road NZUP Summary Report – Soil Quality Investigation Factual Report.

The combination of previous investigations, and a renewed desktop study as part of this assessment, identified the below categories of land within the designation:

- HAIL – Properties where an activity listed on the Ministry for the Environment (**MfE**) Hazardous Activities and Industries List (**HAIL**) was identified as occurring, or likely to have occurred.
- Residential – A large proportion of the residential properties were developed in the late 1970s through to early 1990s. Given the period of development, there is a risk that soil may have been contaminated through building material use, including lead-based paints, zinc galvanizing, and asbestos. This risk is less than for properties built earlier.
- Rural – Land that is used for grazing, or pasture, with no identified potential source of soil contamination.
- Road verges – Land within the current road corridor which may have been exposed to contaminants from vehicles and materials transported within the corridor. Primary contaminants of concern are heavy metals, asbestos, and hydrocarbons.

As part of the current Project works intrusive investigations were undertaken at various locations across the Project Site. These investigations comprised the collection of soil samples from 347 sample locations across more than 60 properties that were accessible during the period of investigation, including all identified HAIL properties. 361 discrete soil samples were analysed for a suite of heavy metals, asbestos, and other contaminants of concern (identified by the desktop study). Of the samples submitted, less than 5% returned contaminant concentrations which exceeded the applied human health or environmental criteria.

Following completion of the intrusive investigations:

- The majority of samples from residential properties and the road verge returned contaminant concentrations which were compliant with applied human health and environmental criteria. Soil within these locations is considered low risk, with limited areas containing contaminant concentrations which require management as part of the proposed road construction.
- The impact of residential structures on soil contamination is considered to be low due to the age of development of many properties occurring when the use of hazardous building materials were, or

were in the process of being, phased out, such as lead-based paints, or asbestos. This is supported by contaminant of concern (e.g. asbestos, arsenic, lead) concentrations generally being below the applied human health criteria for residential land uses. While residual risk remains, this can be managed through appropriate demolition and removal control.

- The risk from asbestos from structures was assessed on visual inspections only, and did not include any intrusive surveys. The risk from asbestos containing materials can be managed through asbestos demolition surveys prior to any demolition/removal work by licenced asbestos assessors, and removal by licenced removalists where asbestos is identified.
- Three properties, identified as the location of HAIL land uses, contained soil contamination which exceeded the applied human health and/or environmental criteria which requires site specific handling and management controls as part of the works.
 - Corner of Hilltop and Redoubt Road – Records report this site as a Closed Landfill location. Site observations noted fill material and testing identified heavy metal and asbestos concentrations that could pose a risk to site workers and the receiving environment. Further testing to refine the extent of fill material and inform controls is to be undertaken prior to earthworks.
 - 1345 Alfriston Road – Former orchard, location of filling, and small contractors yard. Contains heavy metal concentrations that could pose a risk to site workers and the receiving environment. Delineation sampling to inform the level of handling and management controls to be implemented is required prior to earthworks.
 - 38 Mill Road – Consented placement of asbestos contaminated fill material (by Watercare) has anecdotally been removed. While sampling as part of this investigation did not identify residual asbestos contamination, further sampling may be necessary following finalisation of construction plans if confirmation of the complete stockpile removal can't be formally obtained.

While intrusive investigations have been broad across all land categories, given the length of the site and the types of existing and previous land uses present it is likely that areas of soil contamination exist that have not been identified by this assessment, as is the case with all similar linear infrastructure projects. The types of contamination that are often found with no previous indication of presence include: infilled gullies, farm dumps, and burn pits.

A Contaminated Soil Management Plan (**CSMP**) has been prepared alongside this DSI that identifies the pre-works requirements and management controls to be implemented during the project works. The management plan establishes a framework for the movement of soils across the alignment, with the intention of providing a sustainable and safe way of retaining the majority of soils onsite. Key measures of the management plan include:

- Controls to manage the risk to human health and the environment.
- Soil classification, handling and management/disposal requirements.
- Provision for further testing of soil during construction.
- Provision for location-specific management of high-risk soils.
- Procedures in the event of accidental soil contamination discoveries.

1 INTRODUCTION

Beca Limited (**Beca**) have been engaged to undertake a Detailed Site Investigation (**DSI**) report of the Mill Road Stage 1 designation footprint (**the Project Site**).

1.1 Project Background

The Mill Road Corridor Project involves developing a new four-lane 21.5km road corridor in three stages, running parallel to State Highway 1 (**SH1**), providing residents with a more efficient way to move between the communities of Flat Bush, Manukau, Manurewa, Papakura and Drury.

Stage 1 of the Mill Road Corridor (**the Project**), from Manukau to Takaanini (Redoubt Road Interchange with SH1 to Alfriston Rd), has been prioritised by the Government and the NZ Transport Agency Waka Kotahi (**NZTA**) due to significant congestion and safety concerns arising from ongoing urban development and high traffic demand.

There are three existing designations for the Project, as described in the substantive application report (**SAR**). Alterations to these designations and associated approvals are being sought under the Fast-track Approvals Act 2024 (**FTAA**).

1.2 Investigation Basis

This DSI has been undertaken based on a desktop review of historical land use and contamination information. The primary sources of information included the Preliminary Site Investigation (**PSI**)¹ prepared by AECOM in 2014, for the Notice of Requirement, and a subsequent PSI² prepared by Te Tupu Ngatahi – Supporting Growth Alliance in 2021 which included limited soil sampling.

The previous Notice of Requirement process resulted in the confirmation of Designation 6786 which included requirements for future contamination assessment and contamination management conditions. The Assessment of Environmental Effects³ supporting the designation process also recognised that future resource consents would be required including under the National Environmental Standards for Contaminants in Soil to Protect Human Health 2011 (**NESCS**).

This DSI builds on the work completed by these previous investigations and includes detailed soil sampling results. The findings of this DSI will inform the soil handling and management approach for the Project. A Contaminated Soil Management Plan (**CSMP**) has been prepared for the Project that identifies areas where additional site sampling will be required during the construction stage in order to refine the extent of management controls for disposal and handling.

1.3 Purpose and Scope

The purpose of this report is to outline:

- The relevant requirements under the NESCS.
- The relevant provisions from Chapter E.30 Contaminated Land of the Auckland Council Auckland Unitary Plan (**AUP**).
- The results of the DSI to inform and fulfil the requirements for the assessment of the Project against the NESCS and AUP.
- The results of the assessment of 1345 Alfriston Road (see condition 38.2 of the existing conditions on Designation 6786).

¹ Auckland Transport - Contaminated Land Assessment – Redoubt Road/Mill Road Corridor, – dated October 2014

² SGA - NZUP Mill Road Preliminary Site Investigation (Contaminated Land), dated October 2021

³ Auckland Transport – Redoubt Road-Mill Road Corridor Project – Notice of Requirement for Designation – Assessment of Environmental Effects, dated 10 April 2015.

- The controls required to be implemented during the proposed development, including the soil reuse and/or disposal requirements, and areas requiring more granular delineation sampling during the construction stage to refine controls.

The scope of works entailed:

- Desktop study comprising the review of:
 - The 2014 and 2021 PSI reports for the site.
 - Updated historical and present-day aerial image search for the site.
 - The results of an updated Auckland Council Contaminated Land enquiry for the site.
- A visual inspection of accessible properties to identify potentially contaminating activities occurring at the site.
- The collection of soil samples from 347 hand auger borehole and test pit locations across the site.
- Laboratory analysis of 361 soil samples for a suite of contaminants of concern.
- Preparation of a contamination map to inform project works and areas where further construction stage soil testing for handling and soil relocation/disposal purposes may be required.

This assessment has been undertaken in accordance with the following guidelines:

- Ministry for the Environment (**MfE**) Contaminated Land Management Guidelines (**CLMG**) No. 1 – Reporting on Contaminated Sites in New Zealand (revised 2021).
- MfE CLMG No.5 – Site Investigation and Analysis (revised 2021).
- BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017) (**GAMAS**).

This report has been prepared by Phillip Ware, Technical Director at Beca. Mr Ware's relevant qualifications and experience are outlined in **Appendix A** along with confirmation that Mr Ware has prepared this report in accordance with the Environment Court's Expert Code of Conduct.

2 SITE IDENTIFICATION

The site has been broken into three segments for the contaminated land assessment as shown in Figure 2-1 below:

- Segment A – This segment is the urban section of the corridor and comprises the portion of the site beginning at the Southern Motorway offramp in the west, travelling east through to Murphys Road. This segment encompasses the portion of the site where residential properties and traffic movements are most concentrated.
- Segment B – This segment is the peri-urban section of the corridor and extends from Murphys Road along Redoubt Road before travelling adjacent the eastern side of existing Mill Road, through Cheesman's Bush through to Ranfurly Road.
- Segment C – This segment is the rural section of the corridor and extends from Ranfurly Road, travelling adjacent the existing western extent of the existing road corridor, and ending at Philip Road.

The Murphy's Road designation is not covered by this assessment. Condition 38 of the Murphy's Road designation requires a DSI to be completed prior to commencement of construction of that part of the Project.

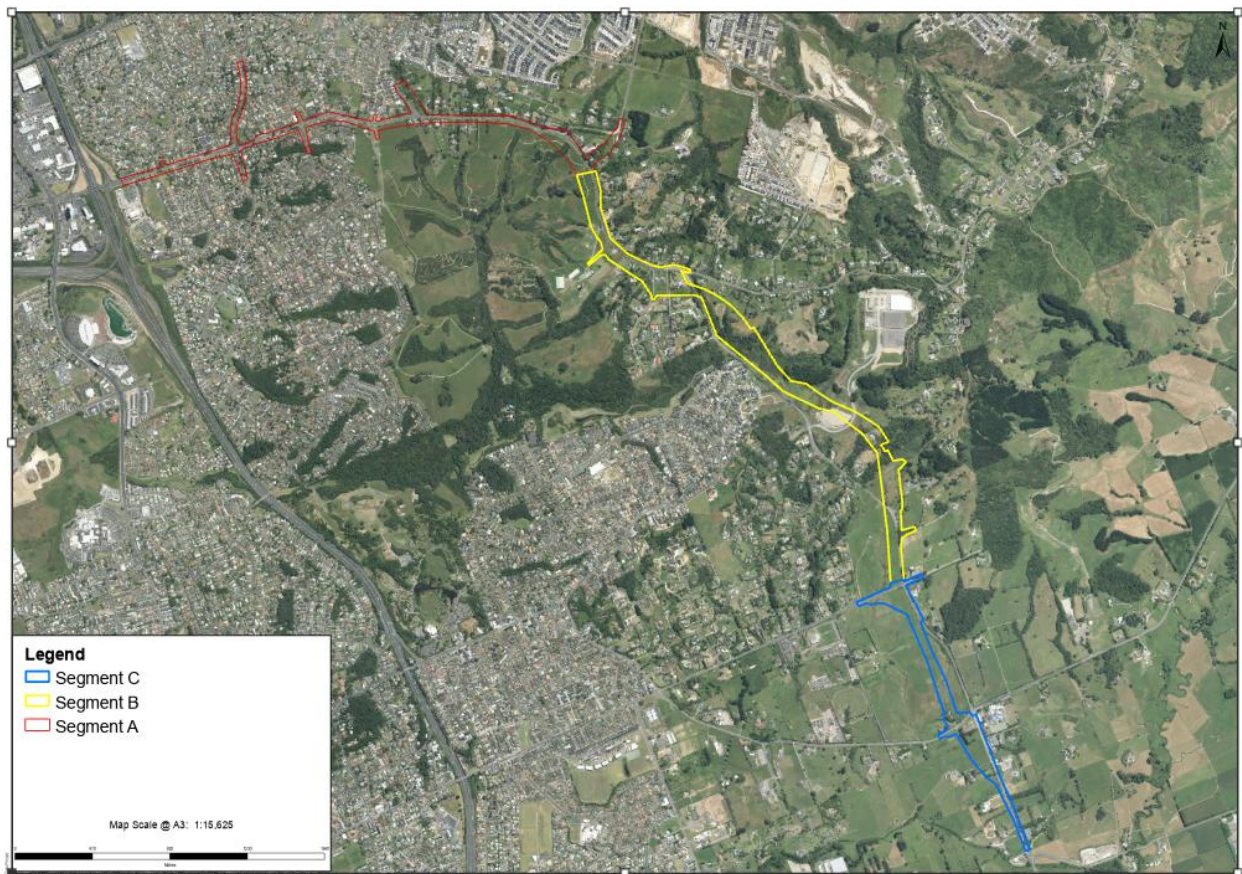


Figure 2-1: Map showing the Mill Road Stage 1 route. The site comprises the extent of Segment A, B, and C, as shown in the figure above.

3 FORMER INVESTIGATION AND CONSENT REVIEW

The following reports and resource consent information which are publicly available for the Project Site have been reviewed:

- Auckland Transport 2014. Contaminated Land Assessment – Redoubt Road/Mill Road Corridor - Contaminated Land Assessment.
- Te Tupu Ngātahi Supporting Growth Alliance 2021. NZUP Mill Road Preliminary Site Investigation (Contaminated Land).
- NZ Transport Agency 2021. Mill Road NZUP Summary Report – Soil Quality Investigation Factual Report.

The key findings of these reports as they relate to the Project Site are summarised below. Copies of the reports can be made available on request.

3.1 Auckland Transport 2014. Contaminated Land Assessment – Redoubt Road/Mill Road Corridor - Contaminated Land Assessment

A Contaminated Land Assessment (**CLA**) was prepared by AECOM for Auckland Transport (**AT**) in 2014. The objective of the CLA was to identify the potential locations of soil contamination across the investigation area. The investigation area defined in the 2014 CLA is similarly aligned to the current DSI report site boundary and the original designation footprint.

The 2014 CLA outlined the following, which are relevant to assessing the contamination risk associated with the proposed works and Project Site:

Historical aerial photography review:

- Majority of Redoubt Road appeared to be developed as residential land use by 1997.
- Possible landfills were identified at 140 Ranfurly Road in the 1988 aerial photo and on Thomas Road in the 2010 aerial photo.
- Earthworks identified as occurring at several intersections along the alignment in 1997 and 2010 aerals.

Auckland Council contaminated land records review:

A total of 32 registered environmental incidents were reported:

- 14 cases relating to open burning; and
- 12 cases relating to pollutants being discharged to either the public stormwater system or neighbouring streams. Most of these sites were outside the Project Site except for the following:
 - Less than 10 L of oil discharge to stormwater occurring at 34 Murphys Road, Flatbush as a result of a car crash and inferred as minor impact.
 - Paint and oil were discharged into a stream at 33 Murphys Road however, the council noted the discolouration was due to natural iron oxide and did not require further investigation.
- Resource consent information identified the following activities which have the potential for contamination:
 - A contaminated site discharge consent for the redevelopment of residential properties at 138-150 Redoubt Road. The Council considered the likelihood of contamination to be remote and did not require an intrusive environmental investigation to be conducted.
- Information from the former Manukau City Council identified that an investigation was undertaken in 1999 to assess the asbestos contamination in the Flat Bush area. The Council did not have a copy of the report by Manukau Consultants Limited (now GHD) – Asbestos Investigation Report: Flat Bush Study Area, Manukau (1999). However, a peer review report by Alan Roger OH&S Pty Ltd – Review of the Flat Bush Asbestos Investigation (1999) was provided and identified the following:
 - Two locations were used for the disposal of asbestos waste material comprised of broken asbestos cement, uncured asbestos cement waste and unbound fibrous wastes. The two sites where disposal of asbestos material occurred is unclear but appear to be associated with the former Thomas Farm location (147 Thomas Road)⁴. This material was also distributed to be used for filling gullies and unsealed tracks to other rural properties. The review determined that residential development has disturbed areas of contamination and has resulted in dispersal of impacted soils across a wide area although in '*relatively low level asbestos contamination over some areas. Other areas remain uncontaminated*'.
 - Asbestos contamination was identified between 0.0001% and 0.001% however no unit was given by the 2014 CLA, it is assumed the unit was weight for weight [w/w]. The asbestos types predominantly encountered were chrysotile (white) asbestos and amosite (brown), crocidolite (blue) was rarely identified.
 - The PSI determined that the extent of asbestos containing material (**ACM**) contamination could not be characterised from the field sampling.
 - Results of the sampling identified that (of the sampling tested for ACM), 'approximately 75% were $\leq 0.0001\%$ (w/w), a further 10% were $\leq 0.003\%$ (w/w) and a small number of samples contained up to 0.03 % (w/w)'.
- A request for contamination information for 140 Ranfurly Road and 130-136 Mill Road was made to Council by AECOM in 2014. These properties were suspected of having Hazardous Activities and Industries List (**HAIL**) activities. However, the Council did have not information regarding the presence of contamination at the properties.

⁴ The peer report noted the Thomas Farm site as located at 83 Thomas Road. This site is now identified in the Auckland Council Geomaps as 147 Thomas Road, Flatbush, with further subdivision occurring in this area since the peer report was prepared.

- A copy of an application for the redevelopment of an existing building to a covered fuelling space at 130-136 Mill Road was obtained. The application has no further information on the type of storage system, the fuel stored and no evidence of the fuelling space from aerial imagery. More recent aerial images have confirmed that the building and canopy located at this property are the likely location of the bulk fuel storage and are outside the Project Site.
- Unauthorised earthworks, stockpiling and tipping may have occurred at 295 Mill Road, and it is reported that the fill was removed in 2010. Property files reviewed in the 2014 CSA identified that in 1991, the fill that blocked a water course contained plastic, refuse bags, tin, wood, rubber paper and a cow carcass.
- The corner of Hilltop Road and Redoubt Road was identified as a closed landfill by the Contaminated Land and Closed Landfill teams. Reviewing Section C.2 (Appendix C) of the AECOM CLA, a scanned note states '*No Landfill Only[sic] Road Reserve. Not on register*'. Further information pertaining to 160 Redoubt Road (the adjoining land parcel to the east) noted "*the site was in an area investigated for the presence of asbestos containing materials in soils (commencing in 1998). Investigations of the site as part of the general overall flat bush asbestos investigation have not identified any bulk asbestos containing materials (ACM). Further site assessment is necessary to confirm that no bulk ACM is present before major earthworks or major site development is undertaken.*" It was unclear from the information provided whether this note was limited to 160 Redoubt Road, or historically encompassed the corner of Hilltop and Redoubt Road. The aerial image review completed by AECOM did not identify any evidence of landfill activity.
- A groundwater database search found the nearest registered bore is adjacent to 294 Redoubt Road and used for domestic supply. One other bore was identified along Mill Road used for geotechnical investigations.
- 104 Redoubt Road was investigated for the presence of ACM in 1998, and the site was deemed suitable for residential use.
- Historical title records identified that 140 Ranfurly Road was a former illegal landfill and the property was owned by a farmer. 147 Thomas Road was an asbestos waste disposal property and 130-136 Mill Road were used for fuel storage, and the title records show that the original owner was a contractor based in Manurewa in 1963.
- The 2014 CLA included a media search and reported information on the asbestos dumping in the Flat Bush area, identifying asbestos in soils at the 25 Hilltop Road subdivision and five properties on Rakaia Rise with asbestos contamination. It was reported that the asbestos from the affected properties would be removed.
- The 2014 PSI concluded that potential soil contamination is present along the alignment and some of the potential contaminants of concern are asbestos (associated with landfill waste) polycyclic aromatic hydrocarbons (**PAH**) (associated with road building) and petroleum hydrocarbons.
- The following HAIL activities were identified by the 2014 report as occurring within the site under investigation:
 - The possible use of persistent pesticide at an orchard located at 1345 Alfriston Road (**HAIL A10**).
 - The closed landfill and illegal landfilling (including asbestos) identified at the corner of Hilltop and Redoubt Road (**HAIL E1/G3**).

3.2 Te Tupu Ngātahi Supporting Growth Alliance 2021. NZUP Mill Road Preliminary Site Investigation (Contaminated Land)

Te Tupu Ngātahi Supporting Growth Alliance (**SGA**) prepared a PSI report in 2021. This assessment covered the full Mill Road corridor through to Drury. The summary below outlines the key findings in relation to the Project Site:

- An aerial photography review of the year 2020 was undertaken and residential properties were identified along the alignment which may contain hazardous building materials based on their age. This was indicated as a potential to be classified as **HAIL I**. Additionally storage yards containing stockpiles of construction material on unsealed ground surface was identified at 1345 Alfriston Road and was indicated as potential to be classified as **HAIL I**.

- Site walkover observations identified an area located on the corner of Hilltop and Redoubt Road which was flagged in the previous investigation by AECOM in 2014 to potentially have bulk ACM, however the land was overgrown, and no asbestos was visually observed during the walkover. Given the above the area was indicated as potential to be classified as **HAIL I** and **HAIL G3**. Furthermore, residential properties of certain ages were identified which could contain asbestos or lead based paint and were indicated as potential to be classified as **HAIL I**.
- A review of the historical aerial imagery identified soil disturbance within the footprint of 208 Redoubt Road, with the footprint of this activity situated outside the site but adjoining the current site boundary. The SGA PSI was unable to conclude whether this soil disturbance was associated with Auckland Council information indicating illegal dumping occurring at the time, however the property was indicated as potential **HAIL I**.
- In 1988 an orchard was visible at 1345 Alfriston Road however hedgerows were visible in the 1990s. Given the above the area was indicated as potential to be classified as **HAIL A10**.
- 2 Wastney Road had a consent issued for a proposed *clean landfill* [cleanfill] and had a consent issued for earthworks associated with ephemeral watercourse and infilling of a gully. The area was identified as possibly appropriate to be classified as **HAIL I** and **HAIL G3**.

The site contamination enquiry request from Auckland Council did not return any information relevant to the Project Site. The PSI concluded that three HAIL activities were identified in 11 locations along the alignment. In summary:

- HAIL I was identified at the corner of Hilltop and Redoubt Road, 160, 162, 166, 170, 182, 190, 200 and 210 Redoubt Road.
- HAIL G3 was identified on the corner of Hilltop and Redoubt Road, and 2 Wastney Road.
- HAIL A10 was identified at 1345 Alfriston Road.
- The report identified asbestos and lead paint was a contaminant of concern for structures constructed prior to 2000, particularly those constructed prior to 1980, and resulting contamination may be present within a subset of these structures.
- The report recommended a DSI be undertaken to inform resource consent requirements, human health and environmental controls to be implemented during site redevelopment, and soil re-use and off-site disposal requirements.

3.3 NZ Transport Agency 2021. Mill Road NZUP Summary Report – Soil Quality Investigation Factual Report

A factual soil testing investigation was undertaken by SGA for NZTA in 2021. The report included reporting on soil sampling undertaken at properties of interest identified in the SGA 2021 PSI which related to the full Mill Road Corridor. Set out below is a summary of the factual soil quality testing undertaken at that time within the current Project site.

Prior to the soil sampling investigation, field observations were made during a site walkover and underground service location exercise. The following was observed:

- Ground conditions encountered generally comprised of natural silts and sand between 0.0 m and 0.5 m bgl and silty clays below 0.5 m bgl.
- Fill with asbestos containing material was encountered at location ENV_HA08 at 0.35 m bgl on the corner of Hilltop and Redoubt Road. This sample location was situated between sample locations MRS1_SS255 and MRS1_258 collected as part of the current investigation.
- In geotechnical drill hole DH103 located in Tōtara Park, asbestos containing material was observed between 0.2 – 0.3 m bgl. This location is approximately 40 m south-west of MRS1_SS379 on the edge of the Project Site.
- A mobile above ground diesel storage tank (AST) was observed at 200 Redoubt Road. The AST was in poor condition but there was no visual or olfactory evidence of petroleum hydrocarbon spills observed on the ground within a 2 m radius.

- No visual evidence of hazardous activities or industries were noted during the site visit at 1345 Alfriston Road, 166, 170, 182 or 190 Redoubt Road.
- Ground water was observed in one environmental borehole at 0.3 m bgl and between 6 to 15.35 m bgl in geotechnical boreholes.

Nine soil samples were collected from six locations for heavy metal and semi-volatile organic compound (SVOC) analysis, and 15 samples collected from 10 locations for semi-quantitative asbestos analysis. Soil sampling results reported the following:

- Two samples reported heavy metal concentrations above the Auckland Council Background concentrations. One sample was collected directly beneath the mobile AST at 200 Redoubt Road, and one sample was collected at 1345 Alfriston Road.
- Pyrene, a compound in the PAH suite, was detected in a shallow soil sample at 200 Redoubt Road. Two sampling locations, in a geotechnical bore at 1345 Alfriston Road, reported PAH compounds above the detection limit.
- No samples exceeded the AUP permitted activity standards or the NESCS soil contaminant standards.
- Five shallow samples detected asbestos and of those samples three were analysed for a semi-quantitative asbestos. Two samples recorded concentrations above the BRANZ Guidelines for all site users located at 166 and 200 Redoubt Road. One sample was below the BRANZ Guidelines for all site uses located on the corner of Hilltop and Redoubt Road. These locations are situated adjacent the site to the north, but are outside the Project Site.
- Two asbestos bulk samples were collected on the corner of Hilltop and Redoubt Road. Both samples had chrysotile and amosite detected.

The report concluded that soil sample analytical results generally reported concentrations below the Auckland Background Criteria or within the 95% upper confidence concentration for the data set for Auckland Background Criteria.

4 HISTORIC AERIAL PHOTOGRAPHY REVIEW

Since the completion of the 2014 and 2021 investigations, additional aerial images have been made publicly available through the Retrolens website, which have not been reviewed previously. In order to identify potential land use changes or activities which may pose a soil contamination risk, and which may not have been identified by previous investigations, a high level aerial image review of the Project Site where potential contaminating activities have been identified in the previous investigations, and these properties have been subject to more detailed review.

The key findings of aerial photography review as they relate to the Project Site are summarised below. Copies of these images have been shared with Auckland Council and can be made available on request.

4.1 Site-wide Aerial Image Overview

4.1.1 Segment A – SH1 to Murphys Road

Segment A was predominantly rural prior to 1960 and maintained under a combination of low intensity drystock pasture grazing and bush cover. There has been gradual change to a residential land use since this time, concentrated to the western half of the segment, with the rate of land use change greatest since 1980.

A high-level summary of Segment A is provided in Table 4-1 below.

Table 4-1: Segment A Historic Aerial Image Overview

Year	Observations
1939	This is the earliest aerial image available, providing coverage for the eastern third of Segment A. Redoubt Road and Murphys Road have been established, with adjoining land use rural, with minimal development.
1960	Redoubt Road is undergoing gradual residential development in this image. Residential lots generally comprise a single residential dwelling, with ancillary sheds.
1968	The southern motorway offramp is evident in this image, with minimal change to the rest of the segment.
1980 - 2025	Redoubt Road is undergoing further residential development, with the development of suburbs occurring north and south of Redoubt Road, concentrated in the eastern half of the segment.

4.1.2 Segment B – Murphys Road to Ranfurly Road

Segment B has been predominantly maintained under rural land use since prior to 1939 until present. There has been limited rural residential development within this portion of the site. The only notable features observed was the placement of fill at 38 Mill Road.

A high-level summary of Segment B is provided in Table 4-2 below.

Table 4-2: Segment B Historic Aerial Image Overview

Year	Observations
1939	This is the earliest aerial image available, showing only the southern half of Segment B. The entirety of this segment is maintained under pasture and bush cover, with the only notable features being a residential dwelling located adjacent the south-eastern Segment Corner.
1960 - 1968	This image shows the entirety of Segment B, with Mill and Redoubt Road formed. The majority of the segment is maintained under pasture and bush cover, with only two dwellings located within the Segment Boundary, near the Mill Road/Redoubt Road intersection.
1980	The only notable change is the construction of additional rural residential dwellings within the segment. The dominant land use remains pasture and bush cover.
1988	There is minimal change to the segment in this image. There is fill activity occurring adjacent the south-eastern corner of the segment, however this doesn't intersect the Segment Boundary.
2005 – 2025	The only notable change across these images is the placement of fill material at 38 Mill Road.

4.1.3 Segment C – Ranfurly Road to Philip Road

Segment C has been predominantly maintained under a rural land use since prior to 1939 until present. There has been limited rural residential development within this portion of the site. The only notable features are the placement of fill at 38 Mill Road.

A high-level summary of Segment C is provided in Table 4-3 below.

Table 4-3: Segment C Historic Aerial Image Overview

Year	Observations
1939	This is the earliest aerial image available for the segment and shows the southern extent of Mill Road and Alfriston Road as established. The only development is at 1345 Alfriston Road, with the balance of the segment maintained under pasture or bush cover.
1960	Mill Road has been extended to its current extent in this image. The only notable change is the construction of a rural residential dwelling on Alfriston Road opposite 1345 Alfriston Road.
1968 - 2025	The only notable changes to the Segment Across these images is at 1345 Alfriston Road.

4.2 HAIL Sites

Five properties were identified as potentially previously containing HAIL activities (Figure 4-1). Of these, 1345 Alfriston Road, the corner of Hilltop and Redoubt Road, and 2 Wastney Road, were identified by previous investigations. This review includes 1345 Alfriston Road, which was specifically identified through the previous assessment, and by the existing designation condition 38.2, as requiring specific assessment due to historic horticultural activity which may have included the bulk storage and use of persistent pesticides (HAIL A10).

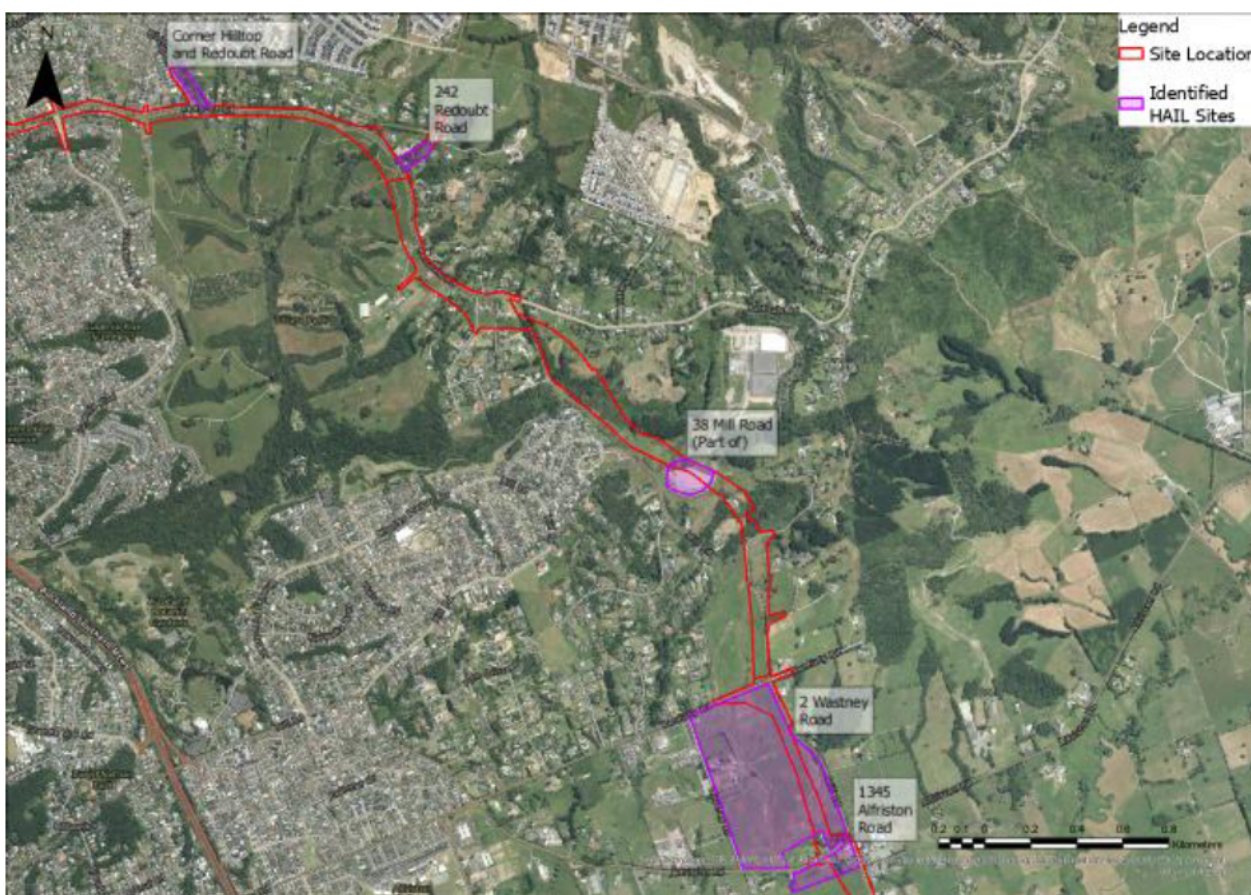


Figure 4-1: Identified HAIL Sites

4.2.1 1345 Alfriston Road

1345 Alfriston Road was developed as a rural residential land use prior to 1939, with little change until between 1980 and 1988. Between 1980 and 1988 a portion of the property was developed into an orchard

with this activity ceasing by 1996. Between 1996 and 2005 a portion of the property appears to have been utilised for a transport depot, with all structures removed from the property between 2015 and 2025

The bulk storage and application of persistent pesticides associated with historic horticultural activity is listed as **HAIL A10**, while transport depots and yards are listed as **HAIL F8**.

Table 4-4 below provides more detail.

Table 4-4: 1345 Alfriston Road Historic Aerial Image Overview

Year	Observations
1939	This is the earliest aerial image available for the property and shows the western half as developed into a residential dwelling, with ancillary sheds to support a rural residential land use. The balance of the property is maintained under pasture, with no evidence structures which may be utilised as a sheep dip, or other livestock treatment.
1960 – 1980	The only notable change to the property over this period is the removal of some ancillary sheds between 1968 and 1980.
1988	The south-western quarter of the property has been developed into a small orchard. There is little other change to the property. There are no structures within the orchard which may indicate agrichemical storage or mixing locations, and the quality of the image limits these observations for the balance of the property.
1996	This image is of poor quality, limiting detailed observations. Orchard activity appears to have ceased, and this area placed under pasture. The portion of the property immediately west of the residential building appears to have been cleared of vegetation. No other changes are discernible.
2001	The area where soil disturbance was noted in the 1996 image has been placed under hardstand cover, with a large volume of heavy equipment stored. The quality of the aerial image limits finer observations, but no evidence of vehicle maintenance or bulk fuel storage is apparent.
2005	The storage of heavy equipment appears to have ceased. No other changes to the property are evident.
2015	There is little change to the property in this image, however the placement of fill material is evident immediately south-west of the designation footprint.
2025	All structures have been removed in this image, and the property surface in this location left exposed.

4.2.2 Corner Hilltop Road and Redoubt Road

The corner of Hilltop Road and Redoubt Road has remained undeveloped for most of its discernible history. The only notable change is the recontouring of the western half of the property, which gradually occurred from prior to 1960 until 1988.

The recontouring of this portion of the property involved the placement of fill material of unknown quality. Depending on the quality and characteristics of the fill, placement of this fill material may be **HAIL G3 – Landfill Sites**, or **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**.

Table 4-5 below provides a more detailed summary.

Table 4-5: Corner Hilltop Road and Redoubt Road Historic Aerial Image Overview

Year	Observations
1960	This is the earliest aerial image available, however does not provide coverage of the northern fifth of the property. The southern half of the property appears to be maintained under pasture. A small gully intersects the centre of the property on a north-west striking line and is under bush cover for the northern half of the property. Along the western edge of the property, the soil surface appears unvegetated or disturbed. There are no structures within the property boundary, however Hilltop Road is established along the western property boundary, and Redoubt Road along the southern boundary.
1968	This image is of poor quality, limiting detailed observations. An access track/driveway has been constructed cutting east/west through the centre of the property. No other changes to the property are discernible.
1980	Bush cover has been removed from the entire property covered by the site in this image. Soil disturbance is evident in the northern half of the property and is concentrated along the western boundary with Hilltop Road. The topography along the full length of the western boundary appears to have been changed, which may be associated with upgrades of Hilltop Road.
1988 - 2025	The only notable change in this image is the establishment of vegetation within the western half of the property and gradual conversion to vegetative cover from pasture.

4.2.3 2 Wastney Road

2 Wastney Road has been maintained under a low-intensity grazing pasture for its discernible history. No evidence of filling, livestock dips, spray-races, or other infrastructure was noted.

Table 4-6 below provides a more detailed summary.

Table 4-6: 2 Wastney Road Historic Aerial Image Overview

Year	Observations
1939	This is the earliest aerial image available and shows the property maintained under pasture, with several shallow gully situated within the property.
1960 – 2005	There is minimal change to the property across this period. The only changes include the establishment of farm tracks to access established paddocks. There are no structures or other features (i.e. filling) evident.
2011	The only notable change is the construction of a dwelling located against the north-western property boundary, west of this site's designation.
2015 – 2025	There is minimal change to property across this period.

4.2.4 242 Redoubt Road

242 Redoubt Road was maintained under grazing pasture prior to 1939 until sometime prior to 1960 when small sheds were developed in the centre of the property. Between 1960 and 1988 these were removed and replaced with a residential dwelling, and ancillary sheds. Observations since 1988 are limited due to the presence of large vegetation, however no evidence of potential soil contaminating activities or land uses were noted during the aerial image review.

Table 4-7 below provides a more detailed summary.

Table 4-7: 242 Redoubt Road Historic Aerial Image Overview

Year	Observations
1939	The property is maintained under pasture. No structures or other features are apparent.
1960	Two small sheds have been constructed in the centre of the property. No other changes are apparent.
1968 - 1977	These images are of poor quality, limiting detailed observation. The only notable change is that the sheds have been removed and replaced with a larger structure.
1988	A large dwelling has been constructed in the centre of the property, with large ancillary sheds. Vegetation has been established across the property, with the balance maintained under pasture.
2005 – 2025	There is presence of large vegetative cover which limits detailed observation of the southern half of the property. There is no change to the northern half of the property.

4.2.5 38 Mill Road

The majority of 38 Mill Road has been maintained under pasture from 1960 until present. A small woolshed and stockyard were constructed between 1960 and 1968; this was removed around 1980. Between 2015 and 2025 fill material was placed in the south-western quarter of the property.

Livestock races and dips commonly associated with woolsheds and stockyards are listed as **HAIL A8**. Depending on the quality and characteristics of fill material, placement of fill material may be considered as **HAIL G3 – Landfill Sites**, or **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**.

Table 4-8 below provides a more detailed summary.

Table 4-8: 38 Mill Road Historic Aerial Image Overview

Year	Observations
1960	This is the earliest aerial image and shows the property maintained under pasture and scrub. No features of structures are evident.
1968	A small woolshed and stockyards have been constructed in the south-western corner of the property, near Mill Road. No other structures or changes are evident.
1980	The small woolshed and stockyards appear to be in the process of being removed or recently removed. No other changes are evident.
1988 - 2015	There is minimal change to the property during this period.
2025	Fill material has been placed in the south-western quarter of the property, intersecting a portion of the site. An accessway has been constructed along the southern boundary. Review of Google Earth aerial images between 2022 and 2025 show the placement and movement of fill material across this time. It is not clear from the latest aerial image if the stockpile has been completely removed.

5 AUCKLAND COUNCIL INFORMATION

5.1 Property Files

The earlier Mill Road investigations reviewed the property files for a large number of properties along the route but did not include 1345 Alfriston Road or the corner of Hilltop and Redoubt Roads. As part of this DSI Report, property files were requested for 1345 Alfriston Road. Property files were ordered for the Corner of Hilltop Road and Redoubt Road, however, were not available through Auckland Council at the

time of request as this location is captured within the road corridor rather than as an individual property title.

Property files were not requested for 38 Mill Road, as the placement and movement history of fill material was provided by Watercare. The 245 Redoubt Road property file was not reviewed as the identified HAIL activities seen as the time of the walkover inspection were not identified in the Auckland Council contaminated land database search and not of a nature likely to have property file references.

5.1.1 1345 Alfriston Road Property File

The electronic property file for the site was obtained from Auckland Council on 7 July 2025. Information relevant to the site history and potential contamination sources has been retrieved and is summarised in Table 5-1.

Copies of the documents listed can be provided upon request.

Table 5-1: Summary of 1345 Alfriston Road Property File Information.

Document Type	Date / Author	Summary of Information
Land Use Consent Application	February 1992, Papakura District Council	Application to operate a vegetable and fruit stall which may also sell flowers and plants from an existing garage building.
Land Use Consent Application and AEE	July 2008, Harrison Grierson	Identified that there was a cleanfill stockpile and storage of concrete tiles. The application to continue the use of 510 m ² of land to store and stockpile construction materials. Consent was granted.
Letter to Harrison Grierson Consultants Ltd	February 2009, Letter of consent decision	Application to undertake an excavation and cleanfill at 1345 Alfriston Road. No record of resource consent, or reject of resource consent application, was identified in the property file.
Resource Consent Application	November 2010, Auckland Council	Application to construction an onsite truck parking for Kidd Contracting.
Design Plans for property	November 2010	Building plans showing where the cleanfill site is located, the top-soil bund and building on the property. Based on the building plans, the cleanfill location is adjacent to the west of the property.
Resource Consent Application	November 2010	Consent application to use part of the property for truck parking. The planning checklist notes there will be no vehicle washdown, maintenance, or repairs.
Land Use Resource Consent Amendment and Withdrawal	December 2010, Hill Design Engineering Ltd; February 2011, Auckland City Council	Application to amend condition that cleanfill will be top soiled and grassed for five years and to extend the time in which construction material can be stored on the property. The application stated that there have been no adverse effects of the stockpile placement for the previous two years and there will be no effect on the environment, vegetation and wildlife.
		Application subsequently withdrawn.
Plans for building relocation	Papakura District Council (undated)	Site plan showing location of house, garage, shed, bore shed, existing position of study and proposed location position of study.

In summary, review of the property file information indicates 1345 Alfriston Road was used a small orchard supplementing rural residential activity in the early 1990s, before being utilised as a civil contractor base around 2010. Activities associated with the civil contractor include the placement of

cleanfill and storage of inert building materials. However, this appears to have occurred outside of the Project Site. No evidence of vehicle maintenance or bulk fuel storage occurring within this property is recorded within the property file.

5.2 Auckland Council Site Contamination Enquiry

A site contamination enquiry was requested from Auckland Council for the Project Site and was obtained on 10 July 2025. The site contamination inquiry also covered a 200m radius surrounding the Project Site.

There are multiple land parcels within the 200m radius of the Project Site that are recorded as being the location of current or historic HAIL activities. Table 5-2 below details the location of the only identified HAIL property within the Project Site.

Table 5-2: HAIL properties that intersecting development extent.

Property/Location	Risks Identified
2 Wastney Road, Ardmore	Consented cleanfill location. Possible placement of fill material of unknown quality – HAIL I.

5.3 Auckland Council Resource Consent DIS60360700 – 38 Mill Road

Auckland Council issued resource consent DIS603608700 which authorised landfill discharges associated with the relocation of ~35,000 m³ of material from a pre-load stockpile located at 38 Mill Road to the land at Sections 1 and 2 SO 514297. Part of 38 Mill Road is located within the Project Site. The landfill consent was required due to the stockpiled soil containing low-levels of asbestos which did not meet the definition of cleanfill or managed fill under the AUP.

The resource consent conditions 23 to 28 required the management of contamination during the placement of soil, and specified that the activity was to comply with the following documents:

- Contaminated Land DSI – Redoubt Road Reservoir Complex, prepared by Beca, dated 14 July 2020; and
- CSMP, prepared by Beca, dated 14 July 2020 (or subsequent iteration).

The CSMP noted that the characterised fill material was impacted by anthropogenic activities, with heavy metals above soil background ranges, and a small number of detections of PAH, Total petroleum hydrocarbons (TPH), and asbestos. With the exception of asbestos, contaminant concentrations were all below concentrations which would be considered a risk to human health or the environment. One area was identified where asbestos concentrations were assessed as at a level that unmitigated could pose a risk to human health. It was noted that the heterogenous distribution of contaminants and sampling completed at the time meant that additional contamination may be present and exposed during development works.

A site closure report, or similar, which would detail how material was placed within the site, any capping or long-term management controls, and/or revised contaminated soil risk assessment, has not been sourced at the time of writing. However, the aerial image review confirms that this material was placed within a portion of the site.

Review of correspondence between Watercare and Darroch Limited (acting as agents for NZTA), stated that asbestos containing soils were not imported to site for stockpiling, as per the agreement between Watercare and NZTA. The stockpiled material was subsequently removed, and the site reinstated to a standard satisfactory to Darroch Limited.

6 SITE INSPECTION

A visual inspection of accessible properties was undertaken alongside intrusive investigation across a 5-week period from 27 May 2025 until 2 July 2025. Visual inspection of properties was undertaken by a Beca Environmental Scientist.

Over 60 properties were inspected during this period, and it is not practical or beneficial to summarise the site observations for each of these properties. Five properties were the location of HAIL activities, with the balance of properties inspected as part of soil sampling investigations. The inspection of these properties was limited to access being provided by affected landowners or residents, and was biased to the residential properties encompassed by Segment A.

The following sections summarise site observations where properties contained high-risk soil contamination activities were noted during the visual inspection have been identified as the likely location of current or historic location of a HAIL activity.

6.1 2 Wastney Road

This property is used for drystock grazing, with the site crossing the eastern section of 2 Wastney Road, intersecting several paddocks. At the time of the visual inspection, the property was vacant with no stock or other land use present.

The property comprised of long grass and unpaved access tracks. The southeastern section of the property features a small section of land with dense vegetation of trees and gorse separated from the rest of the property by a vegetated stream. The topography is undulating with gullies/streams.

Intrusive investigations found consistent underlying geology across the site, comprising dark brown silty topsoil overlying light brown silt and this geology was noted on the exposed earth on the sides of gullies. No refuse, fill material, or other evidence of potential soil contamination was identified. In some locations as hand augers were advanced, surface water filled the holes.

6.2 242 Redoubt Road

Visual inspection identified that gravel hardstand had been placed across the majority of the western half of the site, to facilitate the parking and movement of heavy haulage trucks. No bulk fuel storage was evident; however, the on-site maintenance of vehicles was occurring with one vehicle being actively maintained.

There were two used oil drums present, along with an intermediate bulk container of AdBlue, a urea-base diesel exhaust treatment. Several boxes of used air, fuel, and oil filters were stored in the open with evidence of residual fuel and oil being released to the gravel hardstand either through leakage, or from exposure and mobilisation during rainfall. These boxes were scattered across the southern half of the property, covered an approximate 2-3 m² cumulative area. Due to the gravel hardstand, the ability to excavate shallow test pits in these areas was limited, however one shallow test pit located next to one of these boxes did note the presence of separate phase hydrocarbons within water perched within the hardstand at this location, indicated by a light rainbow sheen on the water surface. No gross hydrocarbon was noted, such as raw fuel or oil products not mixed with water.

In the centre of the property was a residential dwelling and sheds, inspection of these and the wider property did not identify any further storage of used vehicle parts, bulk hydrocarbon storage, or other visual or olfactory indicators of contamination.

6.3 1345 Alfriston Road

The northeastern section of the property comprised building foundations, a shed without walls and hardstand flooring and demolished building rubble. The southern section was well maintained paddocks that exhibited surface level flooding and the northwestern section of the property comprised of paddocks, a stockpile of broken roof tiles, and an assumed wetland characterised by dense vegetation, surface level flooding.

Due to the presence of demolished building rubble on the northeastern section of the property, only shallow test pits could be advanced in that area. However, in the paddocks hand auger bores could be advanced to the target depth in most locations.

6.4 38 Mill Road

The property consisted primarily of long grasses, with some areas of gorse present. At the entrance, a paved driveway was observed, which transitioned into gravel further into the property. The site features a decline in elevation from the eastern section down towards the western boundary.

A stream was observed on the site adjacent to the road with several overland flow paths. There was evidence of minor fly-tipping adjacent to the driveway however this was not widespread. No other evidence of contamination was observed on site.

Some isolated areas in the western section of the site, adjacent to Mill Road, had surface level flooding. Several hand augers advanced in this area would immediately fill up with surface water. The soil observed was topsoil with rocks, underlain by light brown and brown silt in the western section of the property at the location of the former woolshed located outside of the designation.

The eastern section of the property was observed as being situated at a higher elevation compared to the western section. This area of the property was identified as previously containing a large stockpile (~35,000 m³) from the Watercare reservoir site. It appears slightly undulated with no significant sign of a raised stockpile. Most hand augers advanced were on relatively flat ground. The soil geology generally observed topsoil underlain by a mixture light brown silty clays and grey silty clays in the eastern section. A fragment of black plastic lining was observed in 0.5 m bgl in one of the hand augers advanced in the eastern section.

6.5 Corner Hilltop and Redoubt Road

This property was heavily vegetated at the time of inspection, limiting access to large portions of the property. Vegetative cover consisted of large established trees, kikuyu grass, blackberry and gorse. It was only possible to access the southeastern and western thirds of the property.

No fill material was evident at surface; however, the south-western quarter of the property appeared to have been infilled at some stage due to a 'dome' of material in this location being varied from the topography compared to the remainder of the property, which appears as a gully. Hand augered boreholes were advanced along the western boundary, the presence of fill material to depths greater than 1m below ground level (bgl) was noted, with wire, plastic, and glass fragments observed within the hand auger boreholes. Hand auger boreholes advanced to a depth of 1 m bgl in the south-eastern quarter of the property were advanced directly into light brown silty clay with no evidence of fill material.

A gully intersected the centre of the property with a stream present. There was evidence of fly-tipping along the western half of the property, however this was not widespread. No stressed vegetation, staining, or leachate was noted within the accessible portions of the property inspected.

7 PRELIMINARY CONCEPTUAL SITE MODEL FOR POTENTIAL SOIL CONTAMINATION

Following review of the information in sections 3 to 6, Table 7-1 below summarises the identified sources of potential contamination within the Project Site, contaminants of concern, and anticipated contaminant distribution. This Conceptual Site Model is developed based on the desk-based information to inform further site investigation (soil testing) an updated CSM utilising a combination of the desktop information and the soil testing results is provided in section 10.

Table 7-1: Preliminary Conceptual Model for Potential Soil Contamination

Site	HAIL Code/Identified Potential Soil Contaminant Source	Contaminants of Concern	Anticipated Contaminant Distribution
Residential Properties	Residential development across most of the site occurred between the 1970s and 1990s. The use of asbestos containing materials and lead-based paint, treated timber, and zinc galvanised metals were commonplace building materials in the 1940s through to the 1960s and were being phased out during the period of the majority of the residential development on this site. The deterioration and maintenance of these materials over time and/or poor demolition practices have the potential to release contaminants to the surrounding soil. Where the burning and/or burial of residential refuse occurs, this may also represent a potential contamination source, depending on the materials disposed of. These potential contamination sources are considered encompassed under HAIL I.	Asbestos Heavy Metals	Soil contamination associated with residential properties is generally limited to the immediate footprint of structure/activity. Any contamination generally is limited to shallow soils and attenuates with depth and distance from the feature. Residential houses are often considered to have a surrounding halo of soils that are more likely to be impacted by building materials. This halo is typically considered to be between 1-2 m wide and 150mm to 300mm deep.
Road Verge	Redoubt Road and Mill Road are high volume traffic roads and have been for 50 years. Contaminants from exhaust residues, fuels, oils, and tyre compounds are known to gradually accumulate on road verges. Accumulation of contaminants present a risk to the environment and human health. Given the above, there is potential for contamination to accumulate in the road verge areas, however, it is the experience of Beca across many NZ based roading projects that soil in road verge areas very rarely contains contamination from the above sources to a sufficient level that it would be considered as presenting a significant risk to human health or the environment. It is therefore not considered a HAIL but is considered for soil management purposes	Heavy Metals TPH PAH	Contamination relating to road verges generally is limited to shallow surface contamination and attenuates with depth with the exception of oil/fuel spill events. It is expected that any soil contamination would be relatively uniform along the alignment on the road verges.

Site	HAIL Code/Identified Potential Soil Contaminant Source	Contaminants of Concern	Anticipated Contaminant Distribution
Corner of Hilltop Road and Redoubt Road	The western section of this property has undergone recontouring and infilling between the 1960s and the 1980s. This property is recorded by the Auckland Council Closed Landfill Team as being a closed landfill and noted the presence of bulk asbestos containing materials. Therefore, it is likely that HAIL G3 and HAIL I have occurred on this site.	Dependent on fill material source, however commonly: Asbestos Heavy Metals PAH TPH	Contamination would be concentrated to where fill material has been placed, and natural ground/fill material interface. Hotspots may occur depending on the fill source and when this was placed.
38 Mill Road	Historical aerial imagery has indicated the property was historically used as pasture and had stockyards present as noted in 1960s and these stockyards were removed in the 1980s. Given the period in which these stockyards were present, there is a potential this property would have had a sheep or livestock dip. Due to the age of the structures, if there was livestock dipping occurring, it is unlikely this included the use of organochlorine pesticides as these were phased out for livestock use by 1961. Fill material containing limited known asbestos was placed in the south-western quarter of the property. Given the above, it is possible that HAIL A8 from the stockyards and the placement of fill material may be considered as HAIL G3 or HAIL I. Anecdotal evidence of the stockpile's removal (by Watercare) has been presented but not confirmed.	Asbestos Heavy Metals PAH TPH	Contamination associated with livestock dips is concentrated to the footprint of the dip, with potential for a contamination plume to extend from the dip location where treated stock left the dip. Contamination associated with fill material given its known constituents would be limited to where fill material has been placed, and natural ground/fill material interface.
1345 Alfriston Road	This property has been subject to several potential soil contaminating activities overtime. Buildings have been present on the property since the earliest aerial imagery review in the late 1930's with the building having been removed between 2015 and 2025. Historical aerial imagery has also identified an orchard in 1988, storage of heavy equipment and filling occurring in 2015. Additionally, a consent in 2010 indicated the property was used as a small contractor's yard for truck parking. Given the above, the potential HAIL activities to have occurred on the property are HAIL A10 from the orchard and HAIL F8 for the transport depots and yards.	Asbestos Heavy Metals TPH PAH OCPs (as the most likely pesticide type)	Contamination associated with historic structures, placement of fill material, and heavy vehicle storage is expected to be hotspots, concentrated to the location of the activity. Contamination risk from historic orchard activity is associated with the bulk use and application of persistent pesticides. Resulting contamination is expected to be uniform to the footprint of historic orchard activity and concentrated to the soil surface.

Site	HAIL Code/Identified Potential Soil Contaminant Source	Contaminants of Concern	Anticipated Contaminant Distribution
2 Wastney Road	This property was subject to a consent issue relating to earthworks associated with the infilling of a gully. According to the 2021 SGA report, the property has been identified as having potential for HAIL I and HAIL G3 activities.	Asbestos Heavy Metals TPH PAH	Contaminants are most likely to be present in the gullies where filling would have occurred. Contamination is expected to be concentrated to the fill material, and interface with the underlying natural ground.
242 Redoubt Road	Visual inspection of the property noted the property was being used for the storage and maintenance of heavy haulage trucks. Activities include outdoor storage of used vehicle parts, including oil and fuel filters. Based on observations, the property has been identified as being used for HAIL A4 or HAIL A8	Heavy Metals TPH/BTEX PAH	Contamination is expected to be concentrated in hotspots at the locations of vehicle maintenance, and outdoor storage of used vehicle parts. Contamination is expected to attenuate with distance and depth, except where hydrocarbons have been left to percolate into the soil over an extended period

Notes:

HAIL A4: Corrosives including formulation or bulk storage

HAIL A8: Livestock dip or spray race operations

HAIL A10: Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds

HAIL F8: Transport depots or yards including areas used for refuelling or the bulk storage of hazardous substances

HAIL G3: Landfill sites

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

7.1 Asbestos Containing Materials - East Tamaki/Flatbush area

The former Manukau City Council Operative District Plan 2002 (now superseded by the AUP) identified the East Tamaki/Flatbush area as potentially containing ACM within soil. This document contains useful information around known asbestos distribution within the Flatbush area and included the mapped 'Flatbush Asbestos Areas 1 and 2' as shown in Figure 7-1 below. Segment A of the Project Site has some overlap with these mapped areas. Consequently, information relating to the Flatbush Asbestos Areas (including properties on Thomas Road discussed in section 3.1 that interface the Project Site) are relevant to this assessment.

The likely presence of ACM within soil of the properties in the Flatbush Asbestos Areas 1 and 2 is not considered to be elevated beyond the considerations already provided for all properties in this assessment (see section 11.1.2). ACM within the Flatbush area was often related to wet or low-lying areas including accessways, feed troughs, farm gates or structure footprints, which are not as likely at the properties within Segment A of the Project Site. All demolition works should be accompanied by an asbestos assessment.

Further assessment of this risk is not considered necessary as part of this DSI, with any risk from potential accidental soil contamination discovery during development suitably managed through the implementation of contaminated soil management controls.

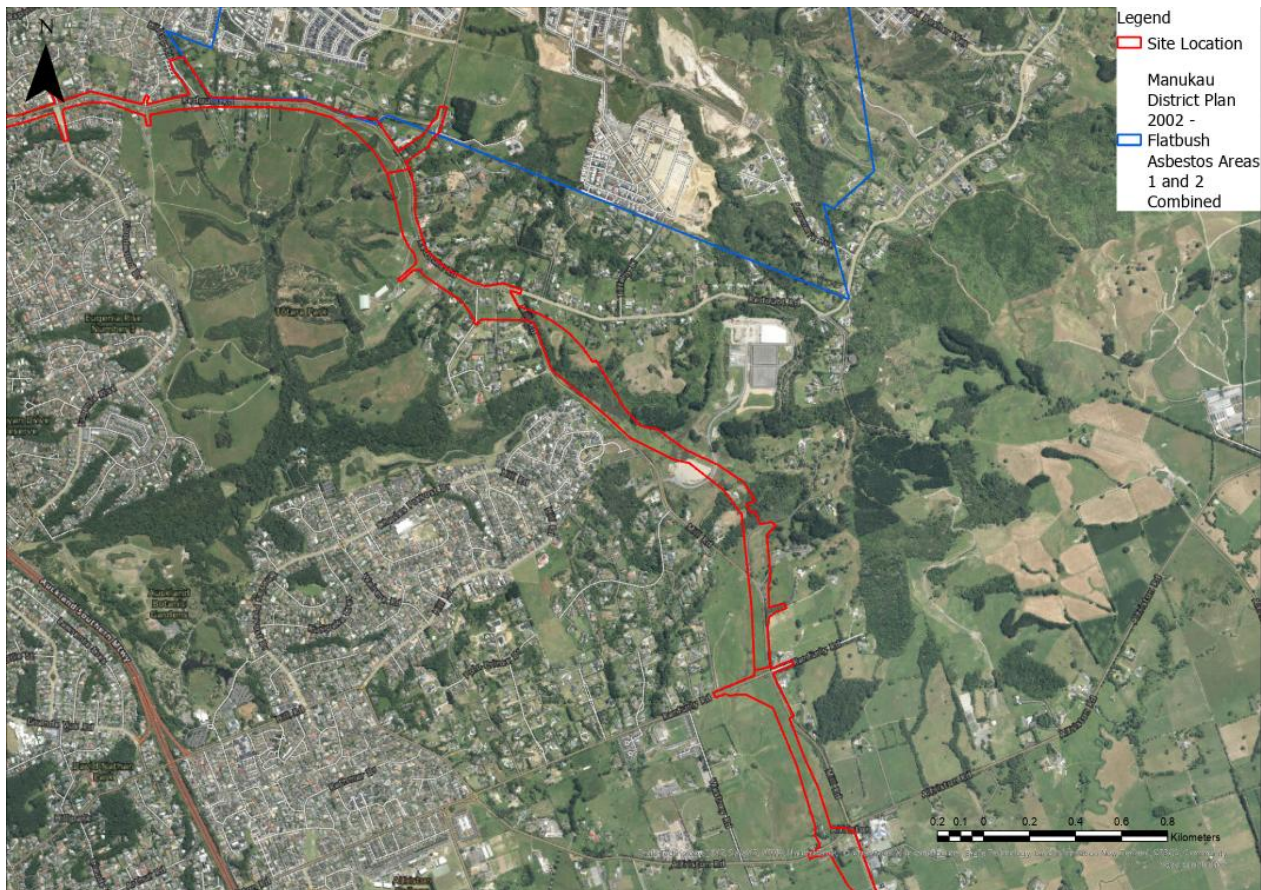


Figure 7-1: Areas 1 and 2 (in blue outline) relating to the management of asbestos containing materials under the previous Manukau District Plan 2002 – Chapter 17.10 provisions (Figure 17.10.27) relative to the proposed Project site (in red outline).

7.2 Coal Tar

Coal tar was a byproduct of the coal gasification process. Coal tar has historically been used as part of road construction in New Zealand, primarily as binder in subbase materials. Its use is reported up until the 1980s, however its use reduced significantly by the 1970s as a result of the closure of the majority of gasworks. Coal tar contains high concentrations of PAH, which are identified as having the potential to

pose a risk to human health. The risk from coal tar within roading corridors drops significantly where the entire road surface and subbase has been renewed, however risk remains for roads where such renewals have not been undertaken, or where roads have been progressively built up over time burying older road layers.

The WasteMinz Guidelines for Assessing and Managing Coal Tar Contamination in Roding (Dec 2023) identifies that coal tar should be assessed by a project when the following four conditions are met:

- The original road was formed before 1980, AND
- The road has not been rehabilitated, AND
- No testing has been carried out to confirm that coal tar in roading material is not present, AND
- If coal tar has been found in nearby roads constructed at a similar time.

The guidelines also note that resurfacing of roads does not require characterisation unless previous investigations have confirmed the presence of coal tar at the road surface.

Although the majority of formed roads in the Project Site were constructed prior to 1980, no evidence was identified that indicated roads were constructed using coal tar. The risk of coal tar is considered low but possible. The assessment of the presence of coal tar within the pavement and subbase materials of existing roads to be disturbed has therefore been excluded from this investigation.

Handling and disposal controls for any active road corridor should be refined during construction stage soil testing. Assessment should be undertaken by a suitably qualified and experienced practitioner (SQEP), when it is possible to safely access large portions of the active road corridor.

Where coal tar is identified, the construction stage SQEP and the contractor should develop suitable management controls that manage the risks identified. This is likely to include revision of the CSMP.

8 INTRUSIVE INVESTIGATION

The sampling program was undertaken within the Project Site.

The sampling plan was not designed to be exhaustive and fully characterise soil contamination of each property. Instead, it was designed to assess the likely risks associated with groupings of common land uses across the site (road verges, residential houses, rural land etc), with more detailed assessment undertaken where specific soil contamination risks were identified by the preliminary conceptual site model.

Table 8-1 below details the sampling and analysis plan undertaken and describes the contaminants of concern identified as a screen of potential risk.

Table 8-1: Sampling and Analysis Plan he investigation rationale for the different sampling locations.

Sampling Location	Methodology	CoC Screening Suite Analysed
Residential Properties	Soil samples were evenly distributed within the portions of residential properties located within the designation and may require soil disturbance during development. Up to 6 soil samples were collected from accessible residential properties, with sample numbers for small properties, areas of accessible soil, or obstructions (i.e. structures, underground services). Samples were generally not collected within 1 m of any existing structures, with soil in this location assumed to be removed or managed during any structure removal.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) and asbestos presence and absence initially. Semi-quantitative asbestos sampling held at lab.
Road Verge	Soil samples were collected approximately every 100m along the southern side of Redoubt Road between the Southern Motorway and Murphys Road.	Heavy metals suite, PAH, TPH, and asbestos presence and absence

Sampling Location	Methodology	CoC Screening Suite Analysed
	This portion of Redoubt Road was identified as being the oldest and highest traffic portion of the site. Soil samples were collected from the soil surface. Where no underground services were present, soil samples were also collected from 0.3 m and 0.5 m bgl.	initially. Semi-quantitative asbestos sampling held at lab.
Corner of Hilltop and Redoubt Road	Soil samples were collected from portions of the property which were accessible and identified as the possible location of fill material placement. The density of vegetation and topography prevented safe access to portions of the property to complete a planned grid sampling of the property. Samples were collected at regular intervals up to a depth of 1 m bgl, based visual observations.	Heavy metals suite, TPH, PAH, asbestos presence and absence initially. Semi-quantitative asbestos sampling held at lab.
1345 Alfriston Road	Sample locations targeted the locations of former structures, small scale contractors' yard activities, fill material locations, and historic orchard activity. Soil samples were collected from the soil surface, and from up to 1 m bgl, unless prevented by subsurface obstructions.	Heavy metals suite, organochlorine pesticides (OCPs) and asbestos presence and absence initially. Semi-quantitative asbestos sampling held at lab.
2 Wastney Road	Soil samples were collected from 10 targeted locations from areas where potential filling may have occurred. Samples were collected from soil surface, 0.3 m, and 0.5 m bgl, with surface samples analysed in the first instance.	Heavy metals suite and asbestos presence and absence initially. Semi-quantitative asbestos sampling held at lab.
38 Mill Road	Soil samples were collected on a grid-based pattern within two areas. The first area was the location of a former woolshed and associated yards, to assess potential soil contamination which may be present from any livestock races or dips that may have been historically present. Samples were collected from surface soil, 0.3 m and 0.5 m bgl, with surface soils samples analysed in the first instance. The second area was the location of a recent stockpile of fill material (thought to have been removed by Watercare) to assess any remaining fill material. Samples were limited to the top 1 m of the surface.	Heavy metals suite and asbestos for the former woolshed location. Heavy metals, PAH, and asbestos presence and absence initially for the stockpile location. Semi-quantitative asbestos sampling held at lab. Based on sampling from previous reporting from the movement of material onto the site stockpile.
232 Redoubt Road	Soil samples collected from the southern half of the property were targeted to areas where the storage of used vehicle parts were located, and the soil surface was accessible following the removal of hardstand cover. Soil samples from the northern half were collected on an approximate grid, biased towards historic structure features to assess the potential presence of ACM. Surface soil samples initially tested for all locations, with deeper soil samples (0.3 and 0.5 m bgl) collected, but held at the lab.	Heavy metals suite and asbestos presence and absence initially. TPH and PAH analysis of soil samples from the southern half of the property.

8.1 Soil Sampling

Soil sampling was undertaken across a 5-week period. Sampling commenced 27 May 2025 and was concluded on 2 July 2025. Soil sampling was undertaken within the footprint of the site boundary for Mill Road Stage 1 as per the sampling and analysis plan detailed in Table 8-1 above.

Soil samples were collected from 341 sampling locations within the site boundary, with each sample location cleared for underground services prior to the collection of any samples below surface soils.

Samples were collected using a hand spade and/or hand auger for all locations. Samples were collected directly from the auger spoon or spade and placed into laboratory supplied glass or plastic containers depending on the analysis required. Sample containers were labelled with a unique sample identifier, depth, date, and initials of sampler and placed into chilly-bin packed with icepacks for transport to the laboratory.

At the end of each day, samples were delivered direct to RJ Hill Laboratories Ltd (Hill Laboratories) in Parnell for analysis or cold storage. Samples delivered alongside a chain of custody form detailing the laboratory analysis required, and cold storage requirements.

Soils encountered during the sampling were logged for environmental purposes.

Soil sample location plans and laboratory COC and results have been provided to Auckland Council and are available upon request.

8.2 Field Screening

Soil samples were visually screened for potential soil contamination indicators (i.e. staining, refuse, building materials, ACM fragments, or other atypical characteristics) as these were collected. The presence of any odours which were apparent during sample collection were noted if evident during the advancement of hand auger boreholes.

8.3 Quality Assurance and Quality Control

Hand tools were decontaminated prior to sampling and between each sample location. Equipment was decontaminated by removing encrusted materials, if any, using a scrubbing brush and tap water. After a change of disposable nitrile gloves, equipment was scrubbed with brushes and 2% cleaning solution (Decon90 detergent mixed with Type 1 water). Equipment was then rinsed with Type 1 water.

Each sample was collected using a clean pair of nitrile gloves. Samples were then placed into laboratory supplied sample containers. Each sample was given a unique sample identification number, and the location the sample was collected from was digitally recorded in the field. Following collection, all samples were placed directly into chilly bins with ice and transported, under standard CoC procedures, to the laboratory for analysis so that samples are analysed within the appropriate holding times for each analyte.

One duplicate sample was collected per 15 samples or part thereof for each sample media due to the large volume of soil samples collected.

Field sampling and relevant sampling management procedures were undertaken in accordance with the MfE CLMG No. 5 – Site Investigation and Analysis (2021) and the GAMAS.

9 INVESTIGATION ASSESSMENT CRITERIA

The assessment criteria used for the intrusive investigation have been selected in accordance with the MfE, 2011. CLMG No. 2 - Hierarchy and Application in New Zealand of Environmental Guideline Values.

9.1 Soil Criteria

9.1.1 Human health

A mix of residential and commercial/industrial land use scenario has been selected for assessing potential risk to human health. The following assessment criteria have been adopted:

- For priority contaminants, the NESCS residential land use with 10% homegrown produce and commercial/industrial outdoor worker (outdoor) soil contaminant standards.⁵
- For hydrocarbons, the MfE, 2011. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Tier 1 soil acceptance criteria for TPH all pathways. 'SILTY CLAY' soil type at <1 m depth.⁶
- For asbestos, the GAMAS soil guideline values.⁷

9.1.2 Environmental

The following environmental criteria have been adopted:

- The AUP permitted activity soil acceptance criteria.⁸
- For hydrocarbons, the MfE, 2011, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Table 4.20, Soil acceptance criteria for Protection of Groundwater Quality, 'SILTY CLAY', Surface (<1 m) contamination, Depth to Groundwater 2 m.⁹

10 SAMPLING RESULTS

10.1 Field Observations

A summary of fieldwork observations is provided below. Fieldwork logs have been provided to Auckland Council and are available on request.

Residential property sampling locations

- Ground conditions generally consisted of topsoil underlain by silty clay.
- 16 sampling locations did not reach target depth due to the presence of subsurface obstructions (i.e. concrete, rock, or underground services). Surface samples were collected from these locations where depth samples were not possible.
- Charcoal, plastic, weedmats, roof tile fragments, piping, clothesline material, and brick fragments were identified during sampling.
- Residential dwellings varied in age and condition, and level of maintenance. With the outdoor storage of domestic refuse and isolated areas of burning within drums evident at some properties.

Road verge sampling locations

- Ground conditions generally consisted of topsoil underlain by silty clay.
- 21 sampling locations did not reach target depth due to the presence of underground services.
- Plastics, clothes, mesh, and glass fragments were identified within the soil profile sampling at some locations.
- A former telecom shed at 231 Redoubt Road was in poor condition and had been subject to vandalism. Fibre cement fragments, consistent with ACM were noted as being on the soil surface and spreading 5 m from the structure footprint. The roof of this structure appeared to be of 'Super Six', a known ACM. No other evidence of soil contamination was noted. No samples were taken of the suspected ACM fragments; however, soil samples were collected adjacent these fragments.

⁵ MfE. 2012. Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.

⁶ MfE (1999) - Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Revised 2011).

⁷ BRANZ (2024) - New Zealand Guidelines for Assessing and Managing Asbestos in Soil, dated October 2024.

⁸ Auckland Council – Auckland Unitary Plan, Chapter E.30 Contaminated Land, Table E30.6.1.4.1 Permitted activity soil acceptance criteria.

⁹ MfE (1999) - Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Revised 2011).

Corner of Hilltop and Redoubt Road

- Fill material was encountered in the western half of the property. Fill material was noted to contain plastic, wire, paint chips, glass, and charcoal. No odours were noted, or evidence of leachate generation.

1345 Alfriston Road

- Ground conditions generally consisted of topsoil underlain by silty clay.
- 13 sampling locations did not reach target depth as hand auger met refusal from encountering sub-surface obstructions during sampling.
- Large rocks, broken ceramics, roofing materials, concrete slabs were encountered during sampling, consistent with the recorded property history.
- Perched water was noted within sampling boreholes, however as it was raining frequently during sampling, it is likely the water represented drainage or perched water rather than the groundwater table.

The following details the perched water encountered within boreholes during sampling:

- Perched water was encountered in three sampling locations in residential properties (MRS1_SS04, MRS1_SS06, MRS1_SS01)
- Perched water was encountered in six sampling locations at Segment A. (MRS1_SS139, MRS1_SS143, MRS1_SS140, MRS1_SS132, MRS1_SS146, MRS1_SS1290)
- Perched water was encountered in three sampling locations at Segment B. (MRS1_SS150, MRS1_SS157, MRS1_SS152)
- Perched water was encountered in three sampling locations at Segment C. (MRS1_SS167, MRS1_SS168, MRS1_SS171)

10.2 Soil Analytical Results

A summary of the analytical result findings is provided in the sections below.

Analytical results for the intrusive investigation, laboratory transcripts, and chain of custody forms have been provided to Auckland Council and can be provided on request.

10.2.1 Heavy Metals

A total of 363 soil samples were analysed for a suite of heavy metals, of which:

- 9 soil sample locations returned at least one heavy metal concentration which exceeded the AUP Permitted Activity Soil Acceptance Criteria.
- 22 soil samples returned at least one heavy metal concentration exceeding the NESCS residential 10% soil contaminant standard.
- 5 soil sample locations returned heavy metal concentrations which exceeded the NESCS commercial/industrial soil contaminant standards.

Of the identified exceedances 35% of these were contained to the HAIL property located at the corner of Hilltop and Redoubt Road, and 17% located at 1345 Alfriston Road.

Table 10-1 below details the identified heavy metal environmental or human health exceedances.

Table 10-1: Identified Heavy Metal Human Health and Environmental Exceedances

Above Environmental Criteria	Above Human Health Criteria
Residential Properties	
MRS1_SS105_0.0 – Lead MRS1_SS188_0.0 – Chromium, and Nickel MRS1_SS343_0.0 – Lead	MRS1_SS11_0.0 – Arsenic (Residential) MRS1_SS116_0.0 – Lead (Residential) MRS1_SS188_0.0 – Chromium (Residential) MRS1_SS218_0.0 – Arsenic (Residential) MRS1_SS222_0.0 – Arsenic (Residential) MRS1_SS201_0.0 – Arsenic (Residential) MRS1_SS343_0.0 – Lead (Residential)
Road Verges	
No recorded exceedances	MRS1_SS360_0.0 – Arsenic (Residential) MRS1_SS365_0.0 – Arsenic (Residential) MRS1_SS369_0.0 – Arsenic (Residential) MRS1_SS375_0.0 – Lead (Residential)
HAIL 1 – 1345 Alfriston Road	
MRS1_SS138_0.0 – Nickel MRS1_SS147_0.0 - Arsenic, Copper, and zinc	MRS1_SS127_0.0 – Arsenic (Residential) MRS1_SS147_0.0 – Arsenic (Residential/Commercial) and Lead (Residential)
Corner of Hilltop and Redoubt	
MRS1_SS254_0.0 – Lead MRS1_SS255_0.0 – Lead and Zinc MRS1_SS255_0.3 – Lead and Zinc MRS1_SS255_0.5 – Lead and Zinc MRS1_SS255_1.0 – Cadmium, Copper, Lead, Nickel and Zinc. MRS1_SS258_0.5 - Copper, Lead, Nickel and Zinc MRS1_SS258_1.0 - Cadmium, Copper, Lead, Nickel and Zinc	MRS1_SS254_0.0 – Lead (Residential/Commercial) MRS1_SS255_0.0 – Lead (Residential) MRS1_SS255_0.3 – Lead (Residential/Commercial) MRS1_SS255_0.5 – Lead (Residential/Commercial) MRS1_SS255_1.0 – Arsenic, Cadmium and Lead (Residential) MRS1_SS258_0.5 – Arsenic and Lead (Residential) MRS1_SS258_1.0 – Arsenic, Cadmium, and Lead (Residential)
Telecom Shed (231 Redoubt Road)	
MRS1_SS177_0.0 – Lead MRS1_SS177_0.3 – Arsenic and Lead	MRS1_SS177_0.0 – Arsenic (Residential/Commercial) and Lead (Residential) MRS1_SS177_0.3 – Arsenic (Residential/Commercial) and Lead (Residential)

Notes:

Residential exceeds the NESCS Residential 10% soil contaminant standard, Commercial exceeds the NESCS Commercial/Industrial Worker soil contaminant standard.

The number suffix at the end of each sample location indicates sample depth, i.e. 0.0 = a sample collected from the soil surface, 0.3 = a sample collected from 0.3 m below ground level, etc.

10.2.2 Asbestos

Asbestos was detected in four out of 315 samples submitted for asbestos analysis. These samples were MRS1_SS90_0.0, MRS1_SS232_0.0, MRS1_SS254_0.0 and MRS1_SS178_0.0.

Sample MRS1_SS232_0.0, located at a residential property, reported concentration of Combined Fibrous Asbestos + Asbestos Fines (**FA-AF**) above the GAMAS residential and commercial and industrial guidelines. The three remaining sample locations complied with the applied GAMAS criteria.

10.2.3 Polycyclic Aromatic Hydrocarbons

All samples analysed for PAH reported concentrations below the applied human health and environmental screening criteria.

35 of the 63 samples reported PAH concentrations above the laboratory limit of detection.

10.2.4 Organochlorine Pesticides

All samples analysed for OCP reported concentrations below the adopted human health and environmental screening criteria.

Of the samples analysed, only one sample returned a detection of Σ DDT above the laboratory limit of reporting.

10.2.5 Total Petroleum Hydrocarbons

18 out of 52 samples analysed for TPH returned concentrations above the laboratory limit of reporting. No samples returned TPH concentrations with exceeded the applied environmental or human health criteria.

10.3 Quality Assurance and Quality Control

22 duplicate soil sample(s) were analysed as part of the investigation to allow the relative percentage difference (**RPD**) to be calculated. The RPD ranged from 7.7 to 137%.

The average RPD suggests a sufficient level of confidence in the soil sampling methods employed on site and the results are considered appropriate for the purposes of this assessment given the data objectives. The 137% RPD indicates either significant variability in soil contamination concentrations within sample locations and/or issues within the sampling/testing process. Given the type of contamination being tested for is likely to be unevenly distributed in soil it is considered more likely that this is the cause of the high RPD. Consideration has been given to this level of possible uncertainty in the results when making risk and management decisions.

11 DISCUSSION

As a general observation the site is relatively free from significant or widespread contamination when compared to similar lengths of road construction projects within rural residential areas (in the experience of the author of this report). The following sections discuss the findings of this investigation, and the implications for the construction works proposed.

11.1 Residential Properties

The soil within the assessed properties generally complies with applied human health and environmental criteria, with isolated areas containing contaminant concentrations which will require management if disturbed during development works.

Three locations which exceed the applied environmental criteria and one location where asbestos was detected in soil above applied human health criteria, will require specific contaminated soil management controls to mitigate or remove the risk posed by these soils if disturbed during development. A further five locations will require soil disturbed in these locations to be reused in an area of less sensitive land use, such as road verges or reserves.

11.1.1 Ongoing Occupation and Removal of Structures

As the affected residential properties are currently occupied, the ability to undertake soil sampling of all affected properties was restricted to those accessible at the time of investigation. There is a risk that unidentified contamination may be present at properties not assessed, and that the soil contamination profile of assessed properties may change due to their ongoing occupation. It is possible the new contamination is introduced to already assessed properties between the date of assessment and the start of construction. Any such contamination will need to be managed as part of a CSMP.

This investigation has not assessed under the footprint of structures within residential properties. However, similar large scale residential investigations have identified that soil within a 1 m 'halo' of residential structures may contain contaminant concentrations of Lead and Asbestos that may require management. To manage this risk, an accepted practice (as included for Kainga Ora properties agreed with Auckland Council) has been to remove soil within this 'halo' to 0.2 m bgl, to 2 m width where possible as part of demolition clearance. This also removes soil which may contain residual demolition materials that could limit its safe reuse. The CSMP contains controls to manage this risk.

A large proportion of structures within the site were established when use ACM was commonplace. Therefore, it is recommended that prior to the removal or demolition of structures constructed prior to 2001, an asbestos demolition survey should be conducted to identify the presence of ACM in accordance with the Health and Safety at Work (Asbestos) Regulations 2016. Where ACM is identified, this shall be removed by licenced asbestos removalists.

11.1.2 Asbestos in Soil Risk

There is a risk for accidental soil contamination discoveries for ACM through the historic use of ACM as a hardfill within the wider area, or from poor demolition/removal practices. This risk can be suitably managed through the implementation of accidental soil contamination discovery protocols as provided in the CSMP.

The risk from existing structures can be further managed through appropriately detailed asbestos demolition surveys, and use of reputable asbestos removalists to remove ACM prior to any demolition of structures.

11.2 Road Verge

Road verges can be subject to an accumulation of contamination from exhaust, fuels, oils and tyre compounds over a period of time, with this risk greater for high-volume traffic roads like Redoubt Road and Mill Road.

Intrusive investigation work completed identified localised exceedances of the NESCS residential 10% soil contamination standard, however no exceedance of applied environmental criteria or NESCS commercial/soil contaminant standards were recorded. Based on the analytical results obtained, the soil contamination risk from this soil is assessed as low, and soil which has been assessed within the road corridor may be repurposed within the proposed development.

Where there are localised exceedances of the NESCS residential 10%, this soil should be isolated and not placed within an area of future residential land use.

11.2.1 Coal Tar Risk

Due to the era of construction, there is potential that coal tar was used in the construction process within the road corridor or accessways on properties. Roding material is not soil and therefore not captured by the NESCS but soil immediately beneath coal tar can be impacted by PAH. The highest risk locations are:

- Areas where road rehabilitation has not been completed since establishment
- Underneath existing road surfaces which have been built up over time.

The presence of coal tar has not been assessed within the road corridor; however, controls should be included within any CSMP to manage the potential risk from this material and assist in its appropriate handling and disposal if identified and disturbed during development works.

11.3 Corner of Hilltop Road and Redoubt Road

The corner of Hilltop and Redoubt Road has historically been utilised as a landfill. No olfactory evidence of contamination was observed during intrusive investigations, nor were there any indicators of gas or leachate generation (i.e. distressed or dying vegetation). Fill material consistent with domestic refuse was encountered within hand auger boreholes, which included plastic, aggregate fragments, paint chips, wire, and glass fragments.

Soil samples returned exceedances of both residential and commercial industrial worker human health protection standards, and applied environmental criteria, with deeper soil samples up to 1 m bgl samples containing the greatest concentrations. Soil at this property is considered to pose a risk to land users (including workers) and potentially to the receiving environment.

The Auckland Council records identify this site as a bulk asbestos fill, this was not confirmed by this investigation, however the potential for bulk asbestos containing materials being present in pockets needs to be allowed for.

Further soil observations and testing work will be required to delineate the extent of fill material within the earthworks area, and the extent of material which exceeds applied human health and environmental criteria. Once this is undertaken, an options analysis will be required to inform the level of any remediation of the delineated contamination, or other encapsulation/management as part of the proposed development. As part of this process the Construction Stage SQEP will be required to update the CSMP.

11.4 1345 Alfriston Road

This property is the historic location of horticultural activity and used as a small contractors' depot, the latter included localised fill activity and storage of construction materials. The northeastern section contains building foundations, rubble, and a shed. Due to ground conditions, the collection of soil samples was limited to surface samples only.

Of the 21 samples analysed for heavy metals on this property, two samples had concentrations of at least one heavy metal exceeding the human health guidelines for residential 10% produce, two samples exceeding the applied environmental criteria. The four samples analysed for OCPs, one only sample had detectable OCP concentrations.

The sampling density undertaken is considered sufficient to the likely nature of risks and effects, however further observations and testing will be required to determine the depth and extent of material at this site requiring removal or management.

The implementation of appropriate contaminated soil management controls which include accidental contamination soil discovery protocols can suitably manage the risks identified at this property, along with any localised bespoke management determined as part of further testing. As part of this process the Construction Stage SQEP will be required to update the CSMP.

11.5 2 Wastney Road

This property had a consent issued for earthworks associated with infilling of a gully and was identified as having had a HAIL I and HAIL G3 use, based on the 2021 SGA report.

Review of historic aerial images, visual inspection of the property, along with advancement of hand auger boreholes, did not identify any areas of fill. Soil samples collected as part of this investigation did not identify any contaminants of concern which indicate a risk to human health or the receiving environment.

Based on the findings of this investigation, the soil contamination risk at 2 Wastney Road is considered to be low. However, a risk remains that unidentified fill may be encountered during development earthworks. The risk from this can be suitably managed through the implementation of accidental soil contamination discovery procedures which are provided in the CSMP.

11.6 38 Mill Road

This property is identified as being the location of emplaced fill material that was placed under an existing resource consent by Watercare. This material was reported in the consent documents to contain

asbestos (limited concentrations) and other contaminant concentrations which may require management if disturbed.

Anecdotal evidence from pers. comm with Mr Chris Marton, Design and Delivery Manager, Mill Road Package 1 at NZTA indicated an arrangement between NZTA and Watercare was made for time-limited use of this area and that that arrangement had now expired. Watercare has provided correspondence that this stockpile was removed and reinstated to a level acceptable to the satisfaction of NZTA's agents.

Onsite observations indicate the stockpile has likely to have been removed or mostly removed as per the correspondence provided, with soil testing in this location not returning any detections of asbestos. Regardless, once design and construction have been confirmed, the SQEP engaged for the design and construction phase of the project should consider whether further assessment is required, and where necessary any amendments to the CSMP.

This may include undertaking further assessment of this soil to inform handling and disposal requirements, along with any requirements that may be necessary to maintain compliance with resource consent conditions that permitted the placement of this fill material.

11.7 Updated Conceptual Site Model

Following completion of the site investigation, Table 11-1 below provides an updated conceptual site model for soil contamination at the site.

Table 11-1: Updated Conceptual Site Model

Site	Source / Screening Contaminants of Concern	Pathway	Completeness of Pathway
Residential Properties	Asbestos containing materials and lead-based paint, treated timber, and zinc galvanised metals Burning and/or burial of residential refuse Screening Contaminants of Concern Asbestos Heavy Metals	Exposure of workers to contaminants in soils during construction (i.e. via dermal contact, ingestion, or inhalation of dust).	Potentially Complete – Low Risk Only one sample location returned a contaminant concentration (asbestos) which exceeded applied commercial/industrial worker values. Risk can be suitably managed through implementation of appropriate controls through a CSMP during the project.
		Exposure of end land users to contaminants.	Potentially Complete – Low Risk Several properties returned contaminant concentrations exceeding applied residential criteria. Long-term site users may be exposed if contaminated soil is inappropriately repurposed or disposed of during development works. The implementation of a CSMP which address handling and removal of these soils where necessary during the project can suitably manage this risk Soils are considered consistent with typical residential exposure scenarios, and do not represent an elevated level of risk.
		Environmental Receptors	Incomplete Pathway While exceedances of applied environmental criteria, the location and the residential use of these properties remove them from sensitive ecological receptors. Appropriate CSMP controls for the handling of this soil to prevent placement of this soil within sensitive receiving environment during the project.
Road Verge	Contaminants from exhaust residues, fuels, oils, and tyre compounds are known to gradually accumulate on road verges.	Exposure of workers to contaminants in soils during construction (i.e. via dermal contact, ingestion, or inhalation of dust).	Incomplete Pathway No exceedance of applied commercial/industrial criteria recorded.

Site	Source / Screening Contaminants of Concern	Pathway	Completeness of Pathway
	Screening Contaminants of Concern Heavy Metals TPH PAH	Exposure of end land users to contaminants	Incomplete Pathway No exceedance of applied commercial/industrial criteria recorded. The implementation of a CSMP which addresses the handling and removal of these soils where necessary during the project can suitably manage the risk of this soil in more sensitive land uses where contaminant concentrations exceed the residential criteria.
		Environmental Receptors	Incomplete Pathway No exceedance of applied environmental criteria recorded.
Corner of Hilltop Road and Redoubt Road	Contaminants from historic landfill activity. Screening Contaminants of Concern Asbestos Heavy Metals TPH PAH Disposed of Objects	Exposure of workers to contaminants in soils during construction (i.e. via dermal contact, ingestion, or inhalation of dust).	Complete – High Risk Contaminant concentrations exceed applied commercial/industrial worker criteria. CSMP controls required to manage construction workers during the proposed works, general public from dust that could be generated during the works.
		Exposure of end land users to contaminants (Only related to the area directly covered by the project works).	Potentially Complete – High Risk Contaminant concentrations exceed applied commercial/industrial worker criteria, unknown fill present. CSMP controls required to manage this risk long term if soil retained onsite.
		Environmental Receptors	Complete – High Risk Contaminant concentrations exceed applied environmental criteria. Disturbance of soil in this location may mobilise contaminants to surface water (stream) via sediment movement, while long term contaminants may leach from soil into adjoining waterway.
38 Mill Road	Emplaced Fill Material Screening Contaminants of Concern Asbestos PAH (minor) (based on Watercare reporting of their stockpile)	Exposure of workers to contaminants in soils during construction (i.e. via dermal contact, ingestion, or inhalation of dust).	Potentially Complete – Medium Risk It is uncertain if asbestos impacted soil has been removed from this location. Risk can be managed through CSMP controls required to manage soil handling and disposal if soil remains.
		Exposure of end land users to contaminants	Potentially Complete – Low Risk Risk from asbestos contaminated soils (if present) can be managed through controls of CSMP that lead to reinstatement to erosion resistant state and maintained under current land use.

Site	Source / Screening Contaminants of Concern	Pathway	Completeness of Pathway
		Environmental Receptors	Incomplete Pathway No exceedance of applied environmental criteria recorded during this investigation.
1345 Alfriston Road	Historic contractor yard activity, placement of fill, orchard activity, and former structures. Screening Contaminants of Concern Asbestos Heavy Metals PAH OCP Potential for objects or other inground fill material, and/or range of other contaminants not tested for.	Exposure of workers to contaminants in soils during construction (i.e. via dermal contact, ingestion, or inhalation of dust).	Potentially Complete – Low Risk One sample location returned a contaminant concentration (arsenic) which exceeded applied commercial/industrial worker values. Risk can be suitably managed through implementation of appropriate controls through a CSMP during the project.
		Exposure of end land users to contaminants	Potentially Complete – Low Risk Several sampled returned contaminant concentrations exceeding applied residential criteria. Long-term site users may be exposed if contaminated soil is inappropriately repurposed or disposed of during development works. The implementation of a CSMP which address handling and removal of these soils where necessary during the project can suitably manage this risk
		Environmental Receptors	Incomplete Pathway While exceedances of applied environmental criteria, this property is separated from nearby surface locations by existing road infrastructure. Appropriate CSMP controls for the handling of this soil to prevent placement of this soil within sensitive receiving environment during the project will manage any long-term risks.
232 Mill Road	Ongoing use of property for the storage and maintenance of heavy haulage trucks. Screening Contaminants of Concern Heavy Metals TPH PAH	Exposure of workers to contaminants in soils during construction (i.e. via dermal contact, ingestion, or inhalation of dust).	Incomplete Pathway No exceedances of applied human health or environmental criteria recorded.
		Exposure of end land users to contaminants	
		Environmental Receptors	

Site	Source / Screening Contaminants of Concern	Pathway	Completeness of Pathway
2 Wastney Road (included in this CSMP as it was part of the preliminary CSMP)	No HAIL activity identified (revised based on observations and results of investigations). To be addressed as unexpected discovery if found	Exposure of workers to contaminants in soils during construction (i.e. via dermal contact, ingestion, or inhalation of dust).	Incomplete Pathway No exceedances of applied human health or environmental criteria recorded.
		Exposure of end land users to contaminants	
		Environmental Receptors	
232 Mill Road	Ongoing use of property for the storage and maintenance of heavy haulage trucks. Screening Contaminants of Concern Heavy Metals TPH PAH	Exposure of end land users to contaminants	Incomplete Pathway No exceedances of applied human health or environmental criteria recorded.
		Environmental Receptors	
		Exposure of workers to contaminants in soils during construction (i.e. via dermal contact, ingestion, or inhalation of dust).	

11.8 Soil Reuse and Disposal

Soil disturbed during the development will be retained and reused on site as far as practicable as part of the development to promote sustainable practices for the reuse of soil onsite and satisfy cultural requirements expressed during consultation. This practice aligns with recent direction from Auckland Council where they wish to promote soil reuse and limit the landfill disposal of soils.

To support this approach soil is to be characterised by its risk, which in turn informs the scale and type of management and/or reuse that is needed for a particular classification of soils, where they are to be disturbed during development works.

The categorisation framework to reuse soils differs to current industry practice where soil which does not meet the strict definition of cleanfill as defined by the AUP, is often removed to a landfill or managed fill facility if it needs to be removed from a location. This results in the removal of soil to landfill or managed fill which may otherwise be suitable for reuse under certain land use scenarios (i.e. residential land use, parks, landscape gardens, bulk fill material).

By promoting onsite soil reuse, this provides pathways for soil to be reused in a manner where its value as a finite resource can be maximised and limiting the consumption of limited and expensive landfill space. The sustainability benefits are supported by the economic benefits of not incurring otherwise unnecessary landfill disposal costs, and costs for the importation of quarry sourced fill material. The retention of soil is also valuable in achieving Mana Whenua desires of not transferring soil and/or 'waste' to another rohe and making this another iwi or hapu's problem.

Table 11-2 defines the four management categories established within the CSMP. This framework will support the sustainable reuse of soil onsite, while managing the risks from soil contamination to end land users and the receiving environment.

Appendix H details the soil categorisation for the development. This is subject to change based on any further assessment completed.

Table 11-2: Soil Categorisation Definitions

Classification	Definition	Onsite Use	Offsite Disposal
Cleanfill	Soil which contains trace element concentrations at or less than the background concentration in Auckland soils ¹ and consistent with the AUP definition of cleanfill material.	Reuse across the project without restriction	Cleanfill – Where suitable sampling density exists and the Construction stage SQEP confirms acceptance with the receiving site
Unrestricted Use	Soil which contains contaminant concentrations above the soil background concentrations ¹ , but complies with the NESCS residential 10% ² and AUP environmental criteria ³ , or other criteria suitable for a residential land use assessed as applicable by the SQEP using the CLMG No.2 hierarchy ⁴ .	Reuse across the project without restriction.	Managed Fill and /or Landfill – Subject to SQEP decisions and receiving facility acceptance criteria.
Controlled Use	Soil which contains contaminant concentrations above the soil background concentrations ¹ and the NESCS residential 10% ² , but complies with NESCS commercial/industrial ⁵ ,	Reuse of soil limited to parks, road verges, landscaping, below roads or other non-residential land uses.	Managed Fill and /or Landfill – Subject to SQEP decisions and receiving facility acceptance criteria.

Classification	Definition	Onsite Use	Offsite Disposal
	and AUP environmental criteria ³ , or other criteria for a commercial/industrial/recreation land use assessed as applicable by the SQEP using the CLMG No.2 hierarchy ⁴ .	Not permitted for reuse within residential properties	
Restricted Use	Soil which contains contaminant concentrations above the soil background concentrations ¹ , and the NESCS commercial/industrial ⁵ , and/or AUP environmental criteria ³ , or other criteria for a commercial/industrial/recreation land use assessed as applicable by the SQEP using the CLMG No.2 hierarchy ⁴ .	Requires specific onsite management or containment designed to provide a suitable level of protection to human health and the environment. This could include an onsite encapsulation cell, or managing soil with low levels of asbestos under the road construction profile. Requires SQEP Approval of specific site location and controls.	Landfill disposal

Notes:

1. Auckland Unitary Plan – Chapter E30, Table E30.6.1.4.2 Background ranges of trace elements in Auckland soils sources from Table 3 of TP153:2001 Background Concentrations of Inorganic Elements in Soils from the Auckland Region

2. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health – Soil contaminant standard for a residential land use with 10% homegrown produce consumption.

3. Auckland Unitary Plan – Chapter E30, Chapter E30, Table E30.6.1.4.1 Permitted activity soil acceptance criteria

4. Ministry for the Environment - Contaminated Land Management Guidelines (CLMG) No. 2 - Hierarchy and Application in New Zealand of Environmental Guideline Values (Revised 2011)

5. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health – Soil contaminant standard for commercial / industrial workers (outdoor unpaved).

6. Where soil contamination concentration is referred to this includes the application of 95% UCL of the mean of contaminants in the same population for all categories where appropriate.

11.8.1 Uncharacterised Soils

Where soil quality is uncharacterised, these soils can generally be considered to be unrestricted soils. This is due to there being a lack of identified HAIL activities within all of the uncharacterised areas, and the significant volume of soil samples in similar analogous assessed areas showing the majority of soils to be of 'unrestricted' quality. The Construction Stage SQEP shall use their judgement to inform whether further soil sampling is required depending on the proposed use of the soils. The CSMP provides further guidance on the use of uncharacterised soils.

12 CONCLUSION AND RECOMMENDATIONS

This investigation has been completed in general accordance with the MfE Contaminated Land Management Guidelines. The vast majority of the Project Site has been shown to be free from contamination at a level likely to cause an unacceptable risk to human health or the environment. While this DSI has identified that soil contaminant concentrations vary across the investigation area, the highest risk of contamination to human health and the environment are limited to two properties (1345 Alfriston Road and the Corner of Hilltop Road and Redoubt Road).

Overall, it has been concluded that the risk to human health and the environment from soil contamination identified onsite can be suitably managed during development, this management will be achieved through the implementation of the CSMP. The CSMP details the controls and procedures to be implemented during development to manage the identified soil contamination risks, alongside promoting the sustainable reuse of soils as part of the Project.

13 LIMITATIONS

This report has been prepared by Beca solely for NZTA (Client). Beca has been requested by the Client to provide a DSI at for the Mill Road RoNS Stage 1 area. This report is prepared solely for the purpose of assessing potential soil and groundwater contamination for consenting purposes (Scope). The contents of this report may not be used by the Client for any purpose other than in accordance with the stated Scope.

This report is confidential and is prepared solely for the Client. Beca accepts no liability to any other person for their use of or reliance on this report, and any such use or reliance will be solely at their own risk.

In preparing this report Beca has relied on key information supplied by the Client, third party reports, and council supplied information. This report contains information obtained by inspection, sampling, testing or other means of investigation. Unless specifically stated otherwise in this report, Beca has relied on the accuracy, completeness, currency and sufficiency of all information provided to it by, or on behalf of, the Client or any third party, including the information listed above, and has not independently verified the information provided. Beca accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the information provided. Publicly available records are frequently inaccurate or incomplete.

The contents of this report are based upon our understanding and interpretation of current legislation and guidelines ("Standards") as consulting professionals, and should not be construed as legal opinions or advice. Unless special arrangements are made, this report will not be updated to take account of subsequent changes to any such Standards.

This report should be read in full, having regard to all stated assumptions, limitations and disclaimers.

APPENDIX A STATEMENT OF QUALIFICATIONS AND EXPERIENCE AND CODE OF CONDUCT

My full name is Phillip John Ware. I am the author of this report. I am a Technical Director at Beca Limited (Beca). I have held lead technical verification roles in contaminated land and environmental projects across New Zealand.

I hold a Bachelor of Science (Honours) with a double major in Geology and Geography from the University of Otago. I am a Certified Environmental Practitioner and accredited Contaminated Site Specialist. I am a member of the Environmental Institute of Australia and New Zealand the Australasian Land and Groundwater Association. I operate as a Suitably Qualified and Experienced Practitioner as required under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

I have over 20 years' experience working as an environmental consultant. During that time, I have specialised in hydrogeology and contaminated land investigations, focusing on assessment and management. My work has included undertaking site contamination assessments for a variety of large and small projects across a range of industries. I have authored and reviewed more than 200 soil contamination investigation reports both in New Zealand and overseas.

Some of the key infrastructure projects where I have led the contaminated land assessment include:

- SH1 MacKays to Peka Peka (Kāpiti Coast);
- SH1 Puhoi to Warkworth (Auckland);
- SH1 Peka Peka to Otaki;
- America's Cup AC36 infrastructure;
- Te Ara Tukutuku redevelopment; and
- Remediation of the Wynyard Tank Farm on the Auckland waterfront

I have also presented evidence at the hearings for Plan Change 94 Auckland (Old Unitec site), Trig Road (as part of Supporting Growth), and the Penlink Project.

Although this matter is not before the Environment Court, I confirm that I have read the Code of Conduct for Expert Witnesses as contained in section 9 of the Environment Court Practice Note 2023. I also confirm that I have complied with that Code of Conduct in the preparation of this report. My qualifications as an expert are set out above. I am satisfied that the matters which I address in this assessment are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

I confirm also that the work completed for this Project in relation to contaminated land has been completed in general accordance with the MfE CLMG No.1 and No. 5.

s9(2)(a)

Phillip Ware

August 2026

APPENDIX B HISTORIC AERIAL IMAGES

**APPENDIX C AUCKLAND COUNCIL CONTAMINATED LAND
ENQUIRY**

APPENDIX D SOIL SAMPLE LOCATIONS

APPENDIX E LABORATORY TRANSCRIPTS AND CHAIN OF CUSTODY FORMS

APPENDIX F FIELD NOTES

APPENDIX G RESULTS ASSESSMENT TABLE

APPENDIX H SOIL CATEGORISATION