



12 October 2021

David Moore  
Director  
Golf Strategy Group Ltd  
60 Clearwater Avenue  
**CHRISTCHURCH 8051**

Dear David,

## **MURIWAI DOWNS GOLF PROJECT: UPDATED PRELIMINARY SITE INVESTIGATION**

### **1.0 Introduction and Background**

Pattle Delamore Partners Limited (PDP) has been engaged by Golf Strategy Group Limited (GSG) to undertake a Preliminary Site Investigation [PSI] of the properties located at 451, 610, 614, 670, 680 and 697 Muriwai Road, Waimauku ('the site'). The PSI works have been undertaken to support the consenting of the proposed Muriwai Downs Golf Project ('the project'). PDP understand GSG has been appointed by The Bears Home Project Management Limited ('the Applicant') to manage the project.

This version of the report is an update of the original PSI report (completed on 12 February 2021; PDP, 2021) following the acquisition of 614 and 680 Muriwai Road, and confirmation of the water reservoir site being located adjacent to the south of Muriwai Road straddling (the northeastern corner of) 697 and (the southern section of) 451 Muriwai Road. Accordingly, the assessment for 451 and 697 Muriwai Road is limited to the location of the proposed water reservoir site as the remainder of both properties are not included in the project.

The site has been used as farming land/pastureland since the early 1900s (based on property file information). The current land use at the site continues to be agricultural and farming activities, including rural residential dwellings and ancillary buildings/structures. This report investigates and summarises the actual and/or potential contaminated land issues identified, associated with the current and historical use(s) of the site (based on available records) and has been prepared to satisfy the requirements of the following regional and national contaminated land regulations:

- ∴ Auckland Unitary Plan: Operative in Part (AUP:OP) (AC, 2021).
- ∴ Resource Management (*National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*) Regulations 2011 ('the NESCS').

This PSI has been directed and reviewed by Suitably Qualified and Experienced Practitioners (SQEPs) with respect to contaminated land and has been undertaken in accordance with the Ministry for the Environment's (MfE's) *Contaminated Land Management Guidelines (CLMG) No.1 – Reporting on Contaminated Sites in New Zealand* (MfE, 2021a) and the relevant sections of *CLMG No.5 – Site Investigation and Analysis of Soils* (MfE, 2021b). A certifying statement to this effect is provided in Appendix A.

## 2.0 Objectives

The key objectives of the PSI are to:

- ∴ Undertake a high-level contaminated land assessment (focusing on those areas of the site where intense development/soil disturbance works are proposed) to confirm known and identify potential HAIL<sup>1</sup> uses/areas;
- ∴ Identify potential contaminated land risks that may require specific management (e.g. contaminated soils that may require special handling/disposal and consents) in the context of the proposed development; and
- ∴ Assess the requirements/likelihood for potential consents in relation to the NESCS and the Contaminated Land rules within the AUP:OP.

## 3.0 Scope of Work

The scope of work undertaken by PDP, as agreed with the GSG, included:

- ∴ A desktop review of a selection of publicly available historical aerial images, property files<sup>2</sup> and an Auckland Council (AC) site contamination enquiry for the site;
- ∴ Identification of actual or potential contamination sources/HAIL land uses/areas, and its location, at the site;
- ∴ Site visits in December 2020 and August 2021 to 'ground truth' features noted during the desktop review and identify any additional actual or potential contamination sources and their locations at the site;
- ∴ An interview while onsite with Mr Paul Mackie (Farm Manager, Muriwai Downs Limited) and Mr Ryan Brandeburg (Director, GSG);
- ∴ Development of a preliminary Conceptual Site Model (CSM) to indicate the potentially complete source-pathway-receptor linkages which may be present at the site; and
- ∴ Provision of this updated PSI letter report summarising the findings and identifying any areas where further assessments may be required to assess actual/potential contaminant impacts to ground at the site (i.e. such as a Detailed Site Investigation [DSI]), including a summation of potential risks should the development take place and requirements for consents in the context of contaminated land matters.

## 4.0 Site Investigation

### 4.1 Site Description

The site is located in Muriwai, with rural/residential properties, farmland and Muriwai Valley Road forming the site boundary to the south; Okiritoto Stream and farmland to the north; rural/residential properties including horticultural activities along Muriwai and Hamilton Roads to the east; and bush/forestry land to the west (as shown in Figure 1). Muriwai Road runs through the middle of the site.

---

<sup>1</sup> The Hazardous Activities and Industries List (HAIL) is a compilation of activities and industries that are considered likely to cause land contamination resulting from hazardous substance use, storage or disposal. The HAIL is intended to identify most situations in New Zealand where hazardous substances could cause, and in many cases have caused, land contamination. The most recent version of the HAIL was published by the Ministry for the Environment (MfE) in 2011.

<sup>2</sup> All relevant property files (obtained in 2020) were provided to PDP by Mitchell Daysh Limited.

The collection of properties that make up the site comprise multiple addresses and legal descriptions as listed in Table 1.

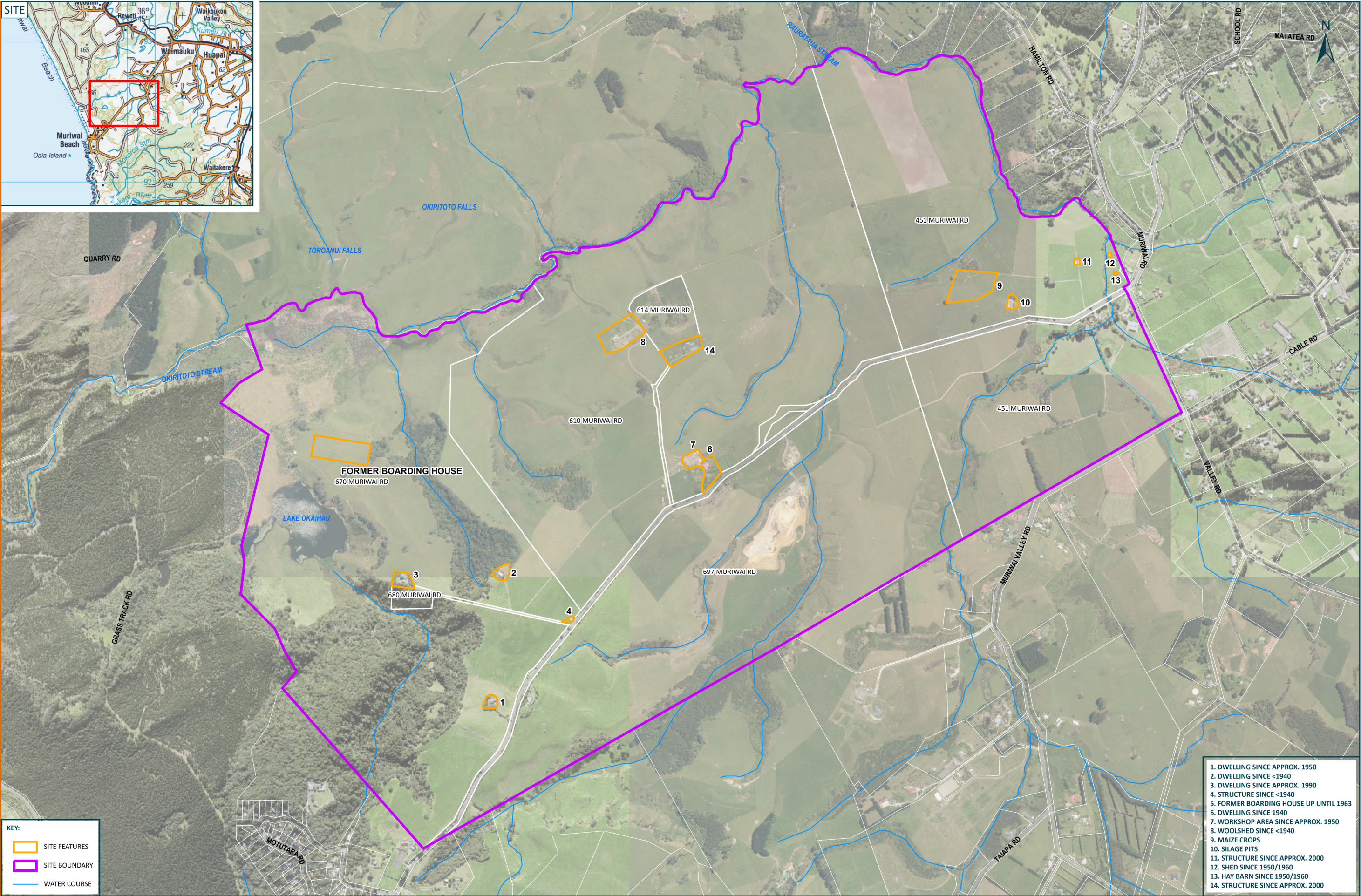
Table 1: Muriwai Downs Property Information		
Site Address	Description	Titles
451 Muriwai Road <sup>1</sup>	Lot 3 DP 196479, Lot 4 DP 187060, Sec 3 SO 41485	NA117B/171, NA125C/443
610 Muriwai Road	Lot 2 DP 196478	NA125C/442
614 Muriwai Road	Lot 1 DP 196478	NA125C/441
670 Muriwai Road	Lot 1 DP 187057	NA117B/168
	Lot 1 DP 191137 and Section 1 SO Plan 69201	NA134D/135
680 Muriwai Road	Lot 1 DP 163736	NA98D
697 Muriwai Road <sup>2</sup>	Lot 5 DP 187061	NA117B/172
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. This property includes land to the north and south of Muriwai Road. As per the agreed scope with GSG, this investigation only covers the part of this address that lies to the north of Muriwai Road and immediately adjacent to the south of Muriwai Road.</li> <li>2. Only the northeastern corner of this property is included in this investigation as it is the part that is proposed for development works.</li> </ol>		

The site area is approximately 500 Hectares (5,000,000 m<sup>2</sup>) in size. The site is currently largely pastoral land with accompanying dwellings and structures including five residential houses with associated garages and sheds, a workshop area containing multiple structures, a woolshed and a small number of barns and ancillary farm sheds. There is a small quarry in the middle of the 697 Muriwai Road property, which is excluded from the project and therefore has not been assessed as part of this PSI.

Surrounding land use appears to be largely rural residential. Bush/forestry land exists to the west of the site. Refer to Section 4.6 for a full description of the site and surrounds observed during the site visits.

#### 4.2 Geology, Hydrogeology and Topography

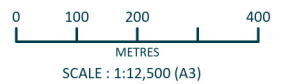
The Geological Map of Auckland (Edbrooke, 2001) indicates that the site area is underlain by multiple geological units. The majority of the site is underlain by sandstone of the Awhitu Group, which is characterised by moderately to poorly consolidated cross-bedded, plane-parallel and ripple-laminated sandstone with paleosols, lignite and carbonaceous mudstone and sandstone. The eastern section of the site is underlain by alluvial and colluvial deposits of sand, silt, mud and clay with local gravel and peat beds while the western/northwestern section of the site is underlain by mobile dunes of loose sand in active, unvegetated or sparsely vegetated dune fields and deflation zones. In the central-east of the site is an area underlain by the Waatarua Formation, which is characterised by basalt flows, pillow lavas, hyaloclastites and associated intrusives with minor basic andesite. Lastly, an area within the Okiritoto Stream in the northern section of the site is underlain by the Nihotupu Formation, which is characterised by submarine volcanoclastic grit, sandstone and siltstone.



**KEY:**

- SITE FEATURES
- SITE BOUNDARY
- WATER COURSE

1. DWELLING SINCE APPROX. 1950
2. DWELLING SINCE <1940
3. DWELLING SINCE APPROX. 1990
4. STRUCTURE SINCE <1940
5. FORMER BOARDING HOUSE UP UNTIL 1963
6. DWELLING SINCE 1940
7. WORKSHOP AREA SINCE APPROX. 1950
8. WOOLSHED SINCE <1940
9. MAIZE CROPS
10. SILAGE PITS
11. STRUCTURE SINCE APPROX. 2000
12. SHED SINCE 1950/1960
13. HAY BARN SINCE 1950/1960
14. STRUCTURE SINCE APPROX. 2000



THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THE DRAWING.

B	FINAL	OCT 21	NE
A	ISSUED FOR REVIEW	AUG 21	MS

**SOURCE:**  
 1. AERIAL IMAGERY (FLOWN 2010 TO 2017) SOURCED FROM THE LINZ DATA SERVICE [www.linz.govt.nz/about/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data](http://www.linz.govt.nz/about/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data) AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 NEW ZEALAND LICENCE.  
 2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

**CLIENT**  
 GOLF STRATEGY GROUP LIMITED

**FIGURE**  
 FIG 1: SITE LAYOUT PLAN

**PROJECT**  
 MURIWAI DOWNS GOLF PROJECT - UPDATED PRELIMINARY SITE INVESTIGATION



The site has a topographic high in the southwestern corner of the site (~130 m RL) and slopes away to a topographic low of ~10 m RL at the Okiritoto Stream in the northwestern corner of the site. The remainder of the site is largely undulating with a slope towards either the Raurataua Stream in the east, Okiritoto Stream in the north or Lake Okaihau in the west. The surrounding land to the north and east is steep and hilly, and generally elevated compared to the adjacent land on the site. Lake Okaihau is in the western section of the site at around 32 m RL.

Borehole records from AC for the site and surrounding area indicates a measured groundwater level of 100 m below ground level at 75 Motutara Road (located to the southwest of the site). Groundwater in the east of the site is expected to generally flow in an east-northeast direction towards Raurataua Stream while groundwater under the rest of the site is expected to flow generally in a north/northwest direction towards Okiritoto Stream and Lake Okaihau.

### 4.3 Proposed Development

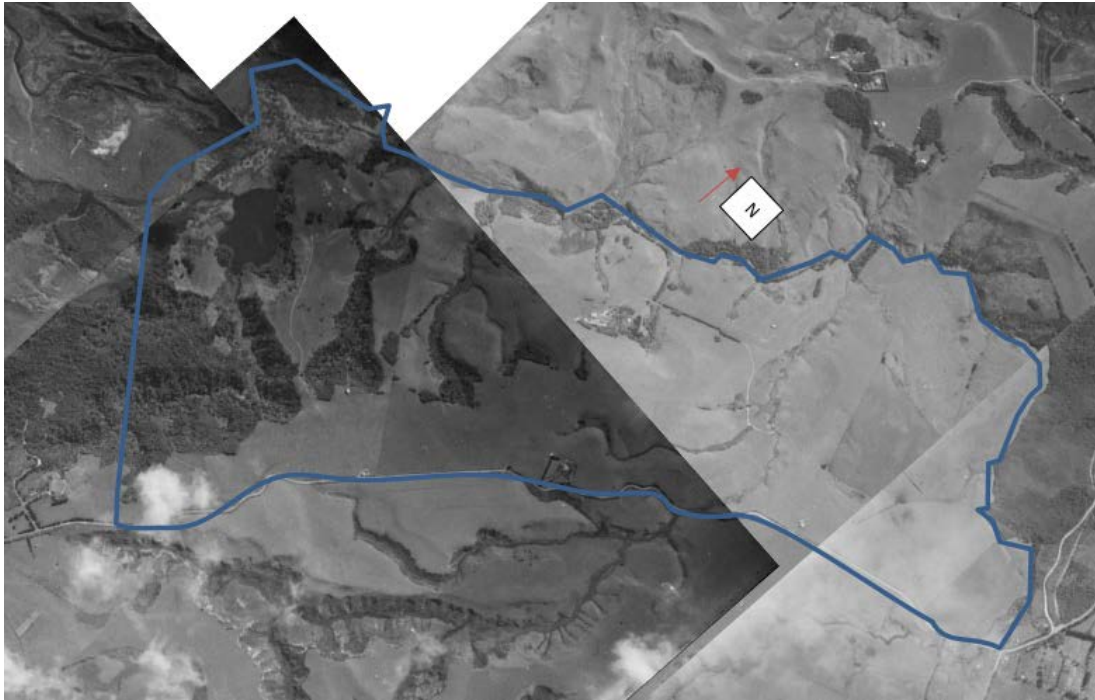
PDP understands the project intends to establish a golf resort facility with short-stay accommodation, and associated clubhouse and built facilities. The project is described as the construction, operation and maintenance of:

- ∴ A 19-hole golf course with warm-up fairway and short-game practice area;
- ∴ A clubhouse;
- ∴ A sports academy (including an academy building, driving range, practice green, 9-hole short course, and indoor and outdoor tennis facilities);
- ∴ A golf and property maintenance complex;
- ∴ A luxury lodge;
- ∴ Groundwater and surface water abstraction facilities;
- ∴ Off-stream water storage reservoir;
- ∴ Significant ecological restoration and enhancement works; and
- ∴ Various supporting infrastructure associated with the above.

PDP understands that the golf course and associated facilities will operate in tandem with the site's current use as a farm.

### 4.4 Historical Aerial Photographs

A selection of publicly available historical aerial images were obtained and reviewed in order to identify any land features or activities at the site that could indicate potential HAIL activity and/or contaminated land impacts to ground. Aerial photographs from 1940 to 2004 were accessed via the Retrolens website (<http://retrolens.nz/> accessed December 2020), the 2010/2011 aerial was accessed from the Auckland Council GIS viewer (<https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>) and the 2019 aerial was accessed via Google Earth. A review of the available historical aerial imagery for the site was undertaken zoomed in on the below images and is summarised in Table 2.

**Table 2: Historical Aerial Review****1940 Aerial**

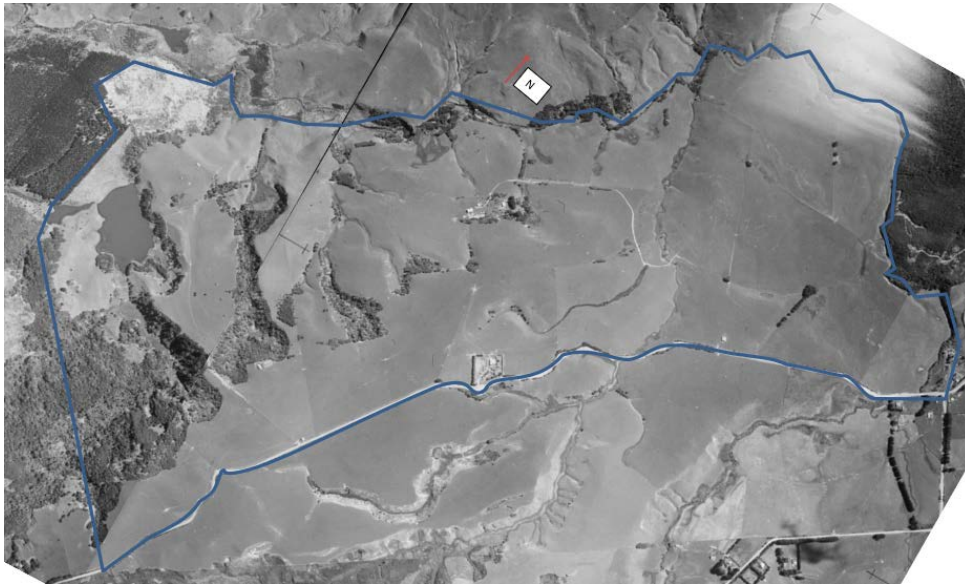
The 1940 aerial is the oldest photograph obtained for the site. The site appears to be largely pastoral with bush present in many gullies and large areas in the western section of the site. Multiple structures/dwellings are visible onsite (two structures in the southwest, one dwelling and ancillary structures in the central south of the site along Muriwai Road, one structure further northeast along Muriwai Road and one structure in the far eastern corner of the site).

A large structure (possibly a woolshed) with associated yards and ancillary structures is present near the centre of the site. Immediately northeast of the potential woolshed is a dwelling and ancillary structure. Another structure is located further to the northeast of the potential woolshed structure.

A few buildings/structures (one of which could be the former boarding house noted in the Request for Proposal [RfP] [Mitchell Daysh, 2020]) are located near Lake Okaihau in the western section of the site. Some unidentifiable items are also visible adjacent to one of the structures.

The surrounding land appears to be largely pastoral with rural/residential dwellings sparsely present around the entire site.

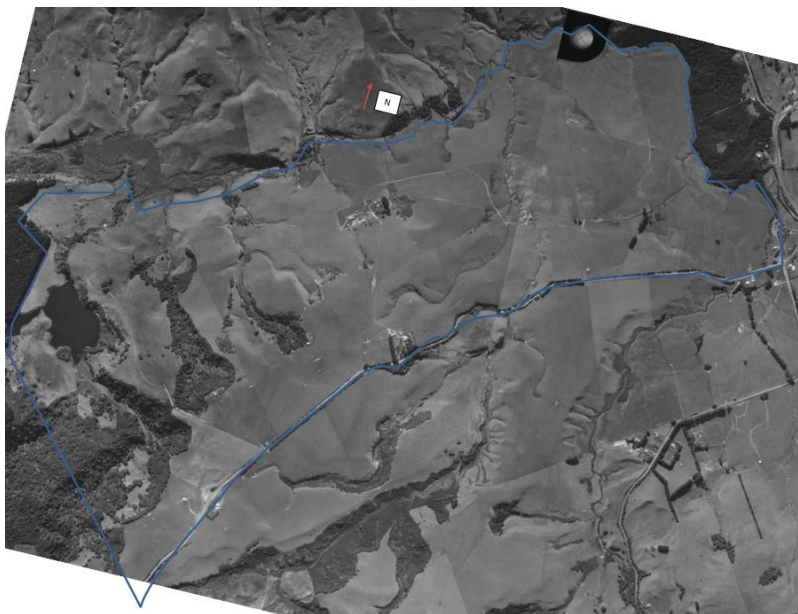
**Table 2: Historical Aerial Review**



**1950 Aerial**

The site is largely as described in 1940; however, the structure formerly located further to the northeast of the woolshed and the unidentifiable items formerly located adjacent to a structure near Lake Okaihau are no longer visible.

The surrounding land remains largely as described for 1940.



**1963 Aerial**

The site is largely as described in 1950; however, all buildings/structures formerly located near Lake Okaihau are no longer visible, and there is one new dwelling in the southwestern corner of the site, one additional structure in the central western and central eastern parts of the site and two new structures in the eastern section of the site and additional ancillary structures (in the known workshop area) associated with the dwelling in the central south of the site (described in the 1940 aerial).

The surrounding land is largely as described for 1950.

**Table 2: Historical Aerial Review****1975 Aerial**

The site is largely as described for 1963, but there is an additional ancillary structure associated with the dwelling in the central south of the site (described in the 1940 aerial), one additional structure immediately to the southwest of the same dwelling and one additional structure in the northwestern section of the site. The land to the west and southwest of the workshop area (adjacent on both sides of Muriwai Road) appear to be possibly used for horticulture. Additionally, a small area of land to the east of the workshop area (adjacent to the south of Muriwai Road) appears to be disturbed (likely to be the start of the small quarry operations on the 697 Muriwai Road property).

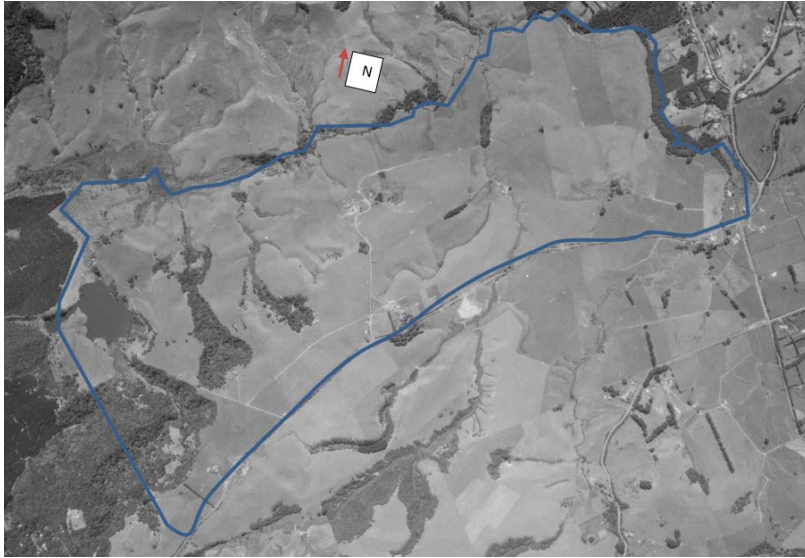
The surrounding land is largely as described for 1963; however, large areas of land to the northeast (just visible in the northeast corner of the above image) of the site appear to be being utilised for horticultural use.

**1980 Aerial**

The site remains largely as described for 1975; however, the structure next to Muriwai Road in the east of the site and the structure in the central eastern part of the site are no longer visible. Unknown items are present immediately to the west of the workshop area. Additional areas of pastures within the 697 Muriwai Road property appear to be possibly used for horticulture.

The surrounding land is largely as described for 1975.



**Table 2: Historical Aerial Review****1988 Aerial**

The site and surrounding land remain largely as described for 1980. However, the land to the southwest of the workshop area no longer appears to be utilised for horticultural use.

**2003/2004 Aerial**

The site remains largely as described for 1988; however, there are two new dwellings with ancillary structures – one in the southwestern section of the site (680 Muriwai Road) and one to the east of the woolshed (614 Muriwai Road). One of the structures to the west of the workshop area is no longer visible. There are also two new structures present in the eastern section of the site. Some paddocks in the central and eastern sections of the site appear as if they could be used for horticulture. The small quarry within 697 Muriwai Road has extended to the south.

The surrounding land use remains largely as described for 1988.

**Table 2: Historical Aerial Review**



**2010/2011 Aerial**

The site remains largely as described for 2004; however, the small quarry within 697 Muriwai Road has extended further to the south.

The surrounding land use remains largely as described for 2004.



**2019 Aerial**

The site and surrounding land use remains largely as described for 2010/2011; however, some cropping is evident adjacent to the south of Muriwai Road straddling (the northeastern corner of) 697 and (the southern section of) 451 Muriwai Road. The small quarry operations on 697 Muriwai Road has again extended to the southwest.

## 4.5 Auckland Council Information

### 4.5.1 Property Files

Copies of the property files were reviewed for relevant information pertaining to four of the properties (451, 610, 670 and 697 Muriwai Road) that comprise the site<sup>3</sup>.

There are various documents pertaining to resource and building consents at 697 Muriwai Road, although these are related to the quarry and not for the area of interest in this report (i.e. the northeastern corner of 697 Muriwai Road). However, although some of these files were helpful in building a good understanding of the site history, no pertinent information relating to ground contamination was found in the property files.

### 4.5.2 Site Contamination Enquiry & Contaminated Land Database Search

A combined Site Contamination and HAIL Enquiry was submitted to Auckland Council on 2 December 2020 and was received on 3 December 2020. There was no contamination information held within Council's records for 451, 614, 670 and 680 Muriwai Road<sup>4</sup>. Council's records indicate that the property at 610 Muriwai Road has possibly been subject to HAIL category (A8) – Livestock dip or spray race operations. It also noted a number of unknown materials being stored next to the buildings in the south of 610 Muriwai Road and that Council records indicate the northern building of those structures is used as a workshop. The enquiry noted the need to engage a competent asbestos surveyor to survey any buildings that may have asbestos containing materials (ACM) prior to their demolition. It also noted properties up until mid-1970s routinely contained lead from lead-based paint and recommended that soils affected by old, peeling/flaking paint be assessed. The Site Contamination Enquiry also identified four bore consents (one expired and status of the other three unknown), one active wastewater discharge consent (two have been replaced), eight surface water take consents (all cancelled/replaced/surrendered/expired), one recently expired land use consent (for the control of sediment from quarrying and associated earthworks) and one current permitted activity (for the Muriwai Downs Farms to discharge dairy wash water) within 200 m of the site. The site contamination enquiry response is provided in Appendix B.

The relevant contents from the Site Contamination Enquiry are included in Table 3 (and can be provided in full, upon request).

---

<sup>3</sup> 614 and 680 Muriwai Road have both been subdivided from 610 and 670 Muriwai Road, respectively.

However, no property files have been provided for 614 and 680 Muriwai Road since they were subdivided.

<sup>4</sup> A site contamination enquiry was not obtained for 697 Muriwai Road as the aerial image review showed that the area of the proposed Option 2 water reservoir site [Reservoir 1] in the northeastern corner of the property) has been pastoral land only throughout the history of the site.

**Table 3: Site Contamination Records**

Date	File Reference	Comment	Consent Holder/Address
Various	Various	<p><b>Local Groundwater Bores:</b></p> <p>Bore for the Presbyterian Church of Aotearoa drilled to a total depth of 204 metres for camp water supply. Static water level reported at 100 metres. Bore is located at 75 Motutara Road, immediately adjacent to the southwest of the site. The consent for this bore has expired.</p> <p>Three other historical bores (drilled pre-1987) are registered to be within and immediately surrounding the site. Other listed depths of boreholes range from 152 to 158 metres. Consent holders and uses are not listed, although one is listed as being associated with the Houghton Valley Bush Camp. It is not known whether these bore consents have expired.</p>	Presbyterian Church of Aotearoa Unknown
Various	Various	<p><b>Wastewater Discharge Consent:</b></p> <p>Three consents to discharge wastewater produced by camping facilities to ground soakage at Houghton Bush Camp adjacent to the southwest of the site. All three consents are for the same location with one active consent having replaced the other two.</p>	Presbyterian Church of Aotearoa
Issued: 02/2002  Expired: 02/2003	C512-12-2856	<p><b>Bore Consent:</b></p> <p>Authorise the construction of a bore for camp water supply at Houghton Bush Camp adjacent to the southwest of the site. Consent is expired.</p>	Presbyterian Church of Aotearoa
Issued: 10/2000  Expired: 10/2020	15064	<p><b>Land use Consent:</b></p> <p>Sediment control for quarrying and associated earthworks over approximately 2 hectares of land at the Quarry located within 697 Muriwai Road. The consent has recently expired.</p>	SJ & LS Houghton
06/2017	FON 1452	<p><b>Permitted Activity:</b></p> <p>Proposed dairy farm washwater discharge to land located in the far east/southeast of the site. Consent status is listed as occurring.</p>	Muriwai Downs Farms T/a Selwyn John Houghton, Hilary Joan Houghton, Lotan Stuart Houghton

#### 4.6 Site Visits

An initial site visit was completed under the direction of a SQEP on 7 December 2020 to physically inspect parts of the site for potential ground contamination/HAIL use/areas highlighted by the desktop information review works. Refer to Figure 1 for the location areas described.

Another site walkover was completed under the direction of a SQEP on 4 August 2021 following the acquisition of 614 and 680 Muriwai Road, and confirmation of the water reservoir site being located adjacent to the south of Muriwai Road straddling (the northeastern corner of) 697 and (the southern section of) 451 Muriwai Road. To this effect, the additional walkover covered 614 Muriwai Road and only the area that is proposed to be used for the water reservoir.

The findings of the site visits are summarised in Table 4 with associated photographs with items of note shown in Appendix C. Some comments have been made regarding the potential presence of ACM on the buildings; it is important to note that these are only general comments and do not constitute an asbestos survey.

**Table 4: Summary of Site Visits**

<p><b>General Site Observations</b></p>	<p>The site is bordered by Muriwai Valley Road, rural/residential properties and farmland to the south; Okiritoto Stream and farmland to the north; rural/residential properties including horticultural activities along Muriwai and Hamilton Roads to the east; and bush/forestry land to the west.</p> <p>The site is generally used as a large dairy and sheep farm and comprises 5 primary dwellings with ancillary structures. A woolshed and ancillary structures exist in the northern central part of the site. Various other structures (sheds/hay barns, etc.) are present at various locations on the site. The site is generally undulating with a slope towards either Raurataua Stream in the east, Okiritoto Stream in the north or Lake Okaihau in the west.</p> <p>In general, the initial site visit noted evidence of:</p> <ul style="list-style-type: none"> <li>∴ Fuel storage (un-bunded diesel and petrol aboveground storage tanks [ASTs] and 44-gallon drums with associated minor staining of ground surface surrounding these features) and chemicals in the workshop area (further details provided below); and</li> <li>∴ A recent (as of December 2020) spill from the diesel AST, which had impacted the ground surface (i.e. visual evidence of dead grass).</li> </ul> <p>There was no evidence of any waste disposal to land (i.e. farm dumps), stockpiles of soil, and/or uncontrolled fill material.</p>
<p><b>Western Site Observations</b></p>	<p>One dwelling (part of 670 Muriwai Road) and associated structures in the southwestern corner of the site (Feature 1 on Figure 1). The dwelling is constructed of brick with a painted corrugated iron roof. The soffits appeared to be possible ACM although the dwelling was not surveyed in detail.</p> <p>One dwelling (also part of 670 Muriwai Road) and associated structures to the north of the above dwelling (Feature 2 on Figure 1). These buildings are constructed of painted timber and corrugated iron. No significant (i.e. &gt;10 m<sup>2</sup>) asbestos-containing building materials or fibre cement was noted.</p>

**Table 4: Summary of Site Visits**

	<p>One dwelling (located at 680 Muriwai Road) and ancillary structures (Feature 3 on Figure 1). The dwelling is constructed of brick and timber (not painted), with a painted corrugated iron roof. No significant (i.e. &gt;10 m<sup>2</sup>) asbestos-containing building materials or fibre cement was noted.</p> <p>One structure adjacent to Muriwai Road (Feature 4 on Figure 1). This building is constructed of painted timber. Some old household equipment was stored inside this structure. No significant (i.e. &gt;10 m<sup>2</sup>) asbestos-containing building materials or fibre cement was noted.</p> <p>The area in which the former boarding house was potentially located is currently farmland with no visible evidence of the former buildings/structures (Feature 5 on Figure 1).</p> <p>Adjacent land-uses in this area comprise bush/forestry land to the west, and farmland to the north. To the south (across Muriwai Road) is farmland/rural residential. Immediately to the east is the remainder of the site.</p>
<p><b>Central Site Observations</b></p>	<p>One dwelling (part of 610 Muriwai Road) and associated structures adjacent to Muriwai Road (Feature 6 on Figure 1). The buildings are constructed of painted timber and corrugated iron. No significant (i.e. &gt;10 m<sup>2</sup>) asbestos-containing building materials or fibre cement was noted.</p> <p>Group of four buildings that make up the workshop area (also part of 610 Muriwai Road; Feature 7 on Figure 1). No significant (i.e. &gt;10 m<sup>2</sup>) asbestos-containing building materials or fibre cement was noted. The buildings and surrounds contained the following:</p> <ul style="list-style-type: none"> <li>⋆ Northern building: Constructed of painted corrugated iron. No concrete on ground. Building is largely used for storage of farm equipment/machinery with some storage of timber noted. Small area of unknown white powder noted on ground (Photograph 1).</li> <li>⋆ Eastern building: Constructed of painted timber and corrugated iron with a timber floor. Building appears to be a woodworking workshop.</li> <li>⋆ Southern building: Constructed of painted corrugated iron with a concrete floor. Building used for general storage (a few small containers of farm chemicals observed). An old disused blacksmith forge was observed. Out the front of this building was a 44-gallon drum that has been used to burn materials (Photograph 2). Some staining on ground immediately surrounding this drum was observed.</li> <li>⋆ Western building: Constructed of painted corrugated iron with a concrete floor. Used for storage of farm equipment including an old lathe. There were 44-gallon drums of fuel and lubricant oil and staining was evident on the concrete surrounding the drums (Photograph 3). There were also some small containers of farm related chemicals (i.e. paint, oils and grease, methylated spirits etc.). At the front of this building, a small area of staining was noted on the ground with some associated scrap metal (Photograph 4).</li> <li>⋆ Hazardous chemical storage shed: Constructed of concrete with concrete floor (Photograph 5). Storage of agrichemicals, 44-gallon drums marked as poison, herbicide, pesticide, marking dye/foam and orchard oil.</li> </ul>

**Table 4: Summary of Site Visits**

- ⋆ Petrol and diesel ASTs: Both un-bunded (Photograph 6). The petrol AST is ~200 L<sup>5</sup> and diesel AST is ~1500 L (personal communication with Mr Paul Mackie and Mr Ryan Brandeburg). There was evidence of staining on the ground and dead grass from a recent spill of diesel AST (Photograph 7) – as observed in December 2020. There were old 44-gallon steel and plastic drums of fuel and oil stored adjacent to the ASTs. This area was not bunded and some staining was evident on the ground surrounding these drums (Photograph 8).
- ⋆ Small building adjacent to the western and southern buildings: Constructed of timber and corrugated iron with remnants of old paint. This building had a concrete floor and was noted to be empty.
- ⋆ Small building to the southwest of the workshop area: Constructed of concrete, fibre cement and corrugated iron with remnants of old paint. This building had a concrete floor and was noted to be empty. The fibre cement cladding appears to be possible ACM.
- ⋆ Storage of treated timber was observed in the paddocks to the west of the workshop area (Photograph 9).

A woolshed and ancillary structures and yards (Feature 8 on Figure 1). No significant (i.e. >10 m<sup>2</sup>) asbestos-containing building materials or fibre cement was noted. The buildings and surrounds contained the following:

- ⋆ The woolshed: Constructed of painted corrugated iron with wooden floors. Still in use for shearing sheep. Storage of small containers of drenching chemicals.
- ⋆ Small shed: Constructed of painted timber and corrugated iron. Hay stored inside.
- ⋆ Outhouse: Small brick unpainted timber and corrugated iron structure. Still functioning as an outhouse.
- ⋆ Sheep dip: Old, derelict and disused shower sheep dip in the yard area to the east of the woolshed (Photograph 10).
- ⋆ Derelict structure to the east of woolshed and yard area. The structure appears to be constructed of timber and corrugated iron. While no significant (i.e. >10 m<sup>2</sup>) asbestos-containing building materials or fibre cement was noted, the buildings were not surveyed in detail.

A modern (i.e. built between 1999 and 2003/2004 according to aerial images) house and ancillary structures at 614 Muriwai Road (Feature 14 on Figure 1). The dwelling is constructed of bricks and stained timber. The soffits appeared to be constructed of fibre cement boards (good condition); however, due to the age of this structure they are not presumed to be ACM. The dwelling surrounds contained the following:

- ⋆ Coloursteel garden shed, which contained multiple buckets/tins of paint and timber stain.

<sup>5</sup> The petrol AST appeared to be larger than the estimated and quoted 200 L.

**Table 4: Summary of Site Visits**

	<ul style="list-style-type: none"> <li>∴ Five animal shelters that were constructed of corrugated iron and timber (mostly painted). These structures were empty, although some of them had small amounts of hay on the ground.</li> </ul> <p>Adjacent land-uses in this area comprise farmland to the north, rural/residential and a quarry to the south (across Muriwai Road). To the east and west are the remainder of the site.</p>
<b>Eastern Site Observations</b>	<p>An approximately 6 Hectare (60,000 m<sup>2</sup>) cropping paddock (Feature 9 on Figure 1). The paddock looks to contain corn and/or maize.</p> <p>Two silage pits with associated plastic sheeting and tyres to the southeast of the cropping paddock (Feature 10 on Figure 1). No silage was observed in the pits during the walkover.</p> <p>Two structures constructed of painted corrugated iron with thin plastic ceilings (Feature 11 on Figure 1). These structures were empty, and their use is unknown.</p> <p>A structure constructed of unpainted concrete, fibre cement board and corrugated iron (Feature 12 on Figure 1; Photographs 11 and 12). There was no flooring, with the ground being dirt/mud and grass. Storage of old disused farm equipment, tyres, empty plastic drums and general farm scraps/waste. Significant (i.e. &gt;10 m<sup>2</sup>) asbestos/fibre cement products (i.e. soffit and basement walls) were assumed to be present but the building was not surveyed in detail.</p> <p>An old painted structure comprising of timber and corrugated iron (Feature 13 on Figure 1). Structure was empty during the December 2020 site visit; however, it looks as if it would generally be used for hay storage. No significant (i.e. &gt;10 m<sup>2</sup>) asbestos-containing building materials or fibre cement was noted. Minor farm refuse (e.g. timber, corrugated iron, old drums, metal scraps, and an old ute canopy) was noted next to structure.</p> <p>The area that is proposed to be used for the water reservoir (adjacent to the south of Muriwai Road straddling [the northeastern corner of] 697 and [the southern section of] 451 Muriwai Road) is currently open pastureland (as observed in August 2021). No structures or other potential sources of contamination were observed.</p> <p>Adjacent land-uses in this area comprise rural residential sites to the immediate east and south (including horticultural activities to east and dairy farming activities to the south). To the north is a mixture of rural residential and farmland while to the west is the remainder of the site.</p>

#### 4.7 Interviews

An interview with Mr Paul Mackie and Mr Ryan Brandeburg was conducted during the initial site visit on 7 December 2020. Paul Mackie has been the Farm Manager at the site for around one year and resides in the dwelling located next to the workshop area. Ryan Brandeburg is a GSG Director who has spent a significant amount of time on the ground at the site since the project began. It should be noted that no one with a long history of the site was able to be interviewed for the purposes of this investigation at the time. With regards to potential ground contamination, Mr Mackie and Mr Brandeburg noted the following general points:

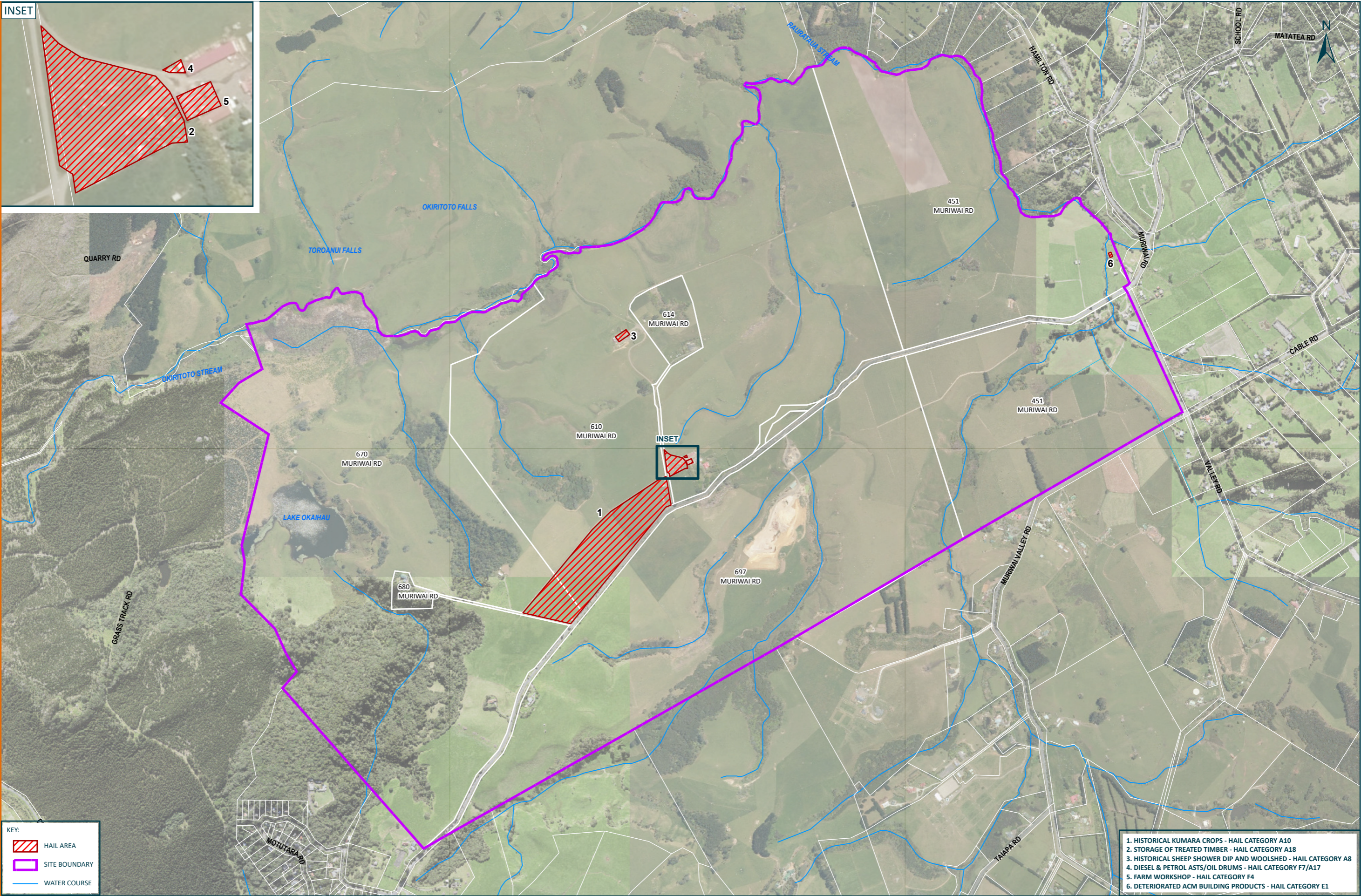
- ∴ They had no knowledge of extensive market gardens or horticultural activities at the site. However, they noted that paddocks to the southwest of the workshop area, and next to an old timber structure known as the “Kumara shed”, have historically been used for growing kumara (approximate area marked as Feature 1 on Figure 2).



- ∴ There is storage of fuel and chemicals at the site. A diesel and petrol AST (both un-bunded) are present in the workshop area. 44-gallon drums of fuel and oil are also stored in the workshop area. Farm chemicals are stored in a hazardous chemicals shed in the workshop area and small containers of drenching chemicals are stored in the woolshed.
- ∴ They had knowledge of a spill from the diesel AST within the last three months. The spill had travelled down slope over the ground and killed some grass in the adjacent paddock (see Photograph 7). Sand had been used to cover the spill. They were not sure of the volume of the spill.
- ∴ They had knowledge of an old shower sheep dip near the woolshed. This has not been in use for many years as far as they are aware.
- ∴ They had not seen any evidence of a historical offal pit that supposedly existed at the site (as noted by the farm management consultant in the RfP [Mitchell Daysh, 2020]).
- ∴ There is no evidence of a former boarding house that used to exist in the western section of the site (as noted in the RfP [Mitchell Daysh, 2020]).
- ∴ They had no knowledge of any historical dumping or burial of refuse at the site.

Follow up emails and phone correspondence with Mr Brandeburg and Mr Mackie also suggested that:

- ∴ The diesel AST is ~1500 L and the petrol AST is ~200 L (note these are estimates and the tanks appeared to be larger than this during the site visit);
- ∴ The kumara crops were grown about “35 or more years ago”;
- ∴ There is about 6 Hectares of maize currently in the ground at the site which is used for silage. Maize is planted and then harvested from paddocks which are then left to regenerate with the next lot of maize being planted in a different paddock;
- ∴ Modern herbicides and pesticides are used at the site over the maize crops and also to spray thistles;
- ∴ The treated timber on the paddocks to the west of the workshop area has been there since before the site was purchased (i.e. at least a year as of December 2020); and
- ∴ There is some timber stored under the woolshed. It is unknown whether this timber is treated or how long they have been stored there.



**KEY:**

- HAIL AREA
- SITE BOUNDARY
- WATER COURSE

1. HISTORICAL KUMARA CROPS - HAIL CATEGORY A10
2. STORAGE OF TREATED TIMBER - HAIL CATEGORY A18
3. HISTORICAL SHEEP SHOWER DIP AND WOOLSHED - HAIL CATEGORY A8
4. DIESEL & PETROL ASTS/OIL DRUMS - HAIL CATEGORY F7/A17
5. FARM WORKSHOP - HAIL CATEGORY F4
6. DETERIORATED ACM BUILDING PRODUCTS - HAIL CATEGORY E1



0 100 200 400  
METRES  
SCALE : 1:12,500 (A3)

THIS DRAWING REMAINS THE PROPERTY OF PATTLE DELAMORE PARTNERS LTD AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT WRITTEN PERMISSION. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THE DRAWING.

NO.	REVISION	DATE	BY
B	FINAL	OCT 21	NE
A	ISSUED FOR REVIEW	AUG 21	MS

**SOURCE:**  
1. AERIAL IMAGERY (FLOWN 2010 TO 2017) SOURCED FROM THE LINZ DATA SERVICE [www.linz.govt.nz/about/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data](http://www.linz.govt.nz/about/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data) AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 NEW ZEALAND LICENCE.  
2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

CLIENT  
**GOLF STRATEGY GROUP LIMITED**

FIGURE  
**FIG 2: HAIL AREA PLAN**

PROJECT  
**MURIWAI DOWNS GOLF PROJECT - UPDATED PRELIMINARY SITE INVESTIGATION**

Another interview with Mr Paul Mackie was conducted during the site walkover of the additional areas on 4 August 2021. The interview related to 614 Muriwai Road and the area to be used for the water reservoir (adjacent to the south of Muriwai Road straddling [the northeastern corner of] 697 and [the southern section of] 451 Muriwai Road). Mr Mackie gained some additional input from Mr Glen Houghton in relation to past activities at 451 and 697 Muriwai Road. Mr Houghton has lived at 680 Muriwai Road his whole life and his family were the previous owners of Muriwai Downs Farm. With regards to potential ground contamination, Mr Mackie and Mr Houghton noted the following general points:

- ∴ They had no knowledge of extensive market gardens or horticultural activities in the additional site areas. When asked about the cropping seen in the 2019 historical aerial in the southern section of 451 Muriwai Road, they could not specifically recall any crops in that specific area; however, they noted that most paddocks have had maize cropping in them at some point.
- ∴ They had no knowledge of farm dumps, bulk storage of fuels/chemicals, sheeps dips/sprays or any other potentially contaminating activities in the additional site areas. They noted that effluent is usually sprayed on the paddocks at 451 and 697 Muriwai Road.

## 5.0 Information Summary

The information gathered during this PSI and site walkover regarding the current and historical land use of the site relating to potential ground contamination can be summarised as follows with areas of potential and/or actual HAIL shown on Figure 2:

### General Farm/Agriculture Use of the Site

Since the early 1900s, the site has been used for pastoral/agricultural purposes. Ancillary structures such as sheds and barns are currently, and have historically been present in discrete locations across the site (based on aerial images) which could have been used to store farming/agricultural equipment (e.g. vehicles/machinery, etc.), chemicals (i.e. herbicides and pesticides, etc.) and fuel (i.e. petrol and diesel). Personal communication with Mr Paul Mackie has indicated that no storage of fuel or chemicals has happened outside of the workshop and woolshed area. Therefore, with the exception of these buildings, other buildings/structures on site are not anticipated to be categorised as HAIL in relation to chemical/fuel storage.

No specific evidence has been provided or observed to demonstrate the possible presence of localised waste disposal to land (i.e. infilling of gullies/HAIL Category G3), or significant localised management of waste materials by burning.

Horticultural use was noted during the December 2020 site visit in the form of corn/maize (confirmed as maize via email after the site visit) crops in the eastern and central section of the site which covers an area of ~60,000 m<sup>2</sup>. Phone communication with Mr Paul Mackie indicates that the maize is planted and then harvested from paddocks which is then left to regenerate, with the next lot of maize being planted in a new paddock. This correlates with aerial images which indicates various paddocks across the central, southern and eastern parts of the site being used for cropping since ~2004 (including the likely maize cropping noted in the 2019 historical aerial straddling [the northeastern corner of] 697 and [the southern section of] 451 Muriwai Road). The maize is periodically sprayed with modern pesticides and herbicides. Due to the relatively recent (i.e. post 2000) use of these areas for horticultural purposes and the state of horticultural practises at the time, it is not expected that the toxic and persistent chemicals historically associated with horticultural land use (e.g. organochlorine pesticides (OCPs) such as DDT, acid herbicides (AHs), etc.) will have been used as part of this horticultural land-use.

Personal communication with Paul Mackie also indicated that the land between the workshop area and the kumara shed had historically been utilised for growing crops of kumara (rough area shown as Feature 1 on Figure 2). Aerial images suggest that the land between the workshop area and the kumara shed was being utilised for growing crops of kumara during the 1970s and 1980s, and email communication with Mr Ryan Brandeburg after the December 2020 site visit suggests that kumara was grown here “35 or more” years ago. The 1975 and 1980 historical aerial images also suggest that different paddocks within 697 Muriwai Road (adjacent to the south of Muriwai Road) may have been used for horticulture as corroborated during the site interviews. Due to the age of the horticultural activities in these areas, it is possible toxic and persistent chemicals historically associated with horticultural land use could have been used as part of this horticultural land use (potential HAIL Category A10). However, as these areas are not being developed as part of the project, they have not been assessed further or added to the HAIL map (Figure 2).

Four boreholes have been listed as being present on and near to the site. Based on AC records, one bore located adjacent to the southwestern boundary of the site reported a depth to groundwater of 100 m bgl. However, it is expected that bore is not screened to pick up any shallow groundwater present in this location based on its total depth (204 m bgl) and intended use as a potable supply bore. All of the local bores are drilled to depths of greater than 150 m bgl, and as such it is expected that shallow groundwater in the area is unlikely to be of a quality and/or yield suitable for use.

### **Workshop Area**

The workshop area is located in the central south of the site and contains four main structures that were constructed prior to 1975 (based on aerial images) and is used for storage of farm equipment and machinery, storage of chemicals and bulk storage of fuel (petrol and diesel). Some storage of timber was also noted in one of the structures.

The main workshop had a concrete floor and is used for the general service of farm vehicles and machinery (HAIL Category F4). There is general storage of fuels, oils, lubricants, and agrichemicals (used, in use and waiting to be used). Staining on the concrete was noted surrounding the drums of fuel and oil. In front of the workshop was a small area of stained ground with associated scrap metals, as well as an old drum which has been used for the burning of rubbish. This drum appeared to have cardboard in it at the time of the December 2020 site visit. Some staining was noted on the ground surrounding the drum.

Two un-bunded ASTs (one petrol and one diesel [HAIL Category F7]) and old (empty) fuel and oil drums were located immediately adjacent to the west of the workshop area (HAIL Category A17). Some staining of the ground was noted surrounding these drums. Personal communication with Mr Paul Mackie indicated a spill had occurred from the diesel AST approximately three months prior to the December 2020 site visit and staining of the ground and dead grass surrounding and downgradient of the AST could be seen at that time.

To the west of the ASTs was a concrete, bunded hazardous chemical storage shed used for general storage of agrichemicals (herbicides, pesticides, insecticides and marking dye/foam) and a steel drum marked as “poison” (HAIL Category A17).

There were piles of treated timber stored in the paddocks to the west of the workshop area observed during the December 2020 site visit. Email communication with Mr Ryan Brandeburg suggests the timber has been there since the land was purchased in early 2020. Historical aeriels suggest that these paddocks have been used for storage purposes since ~1980; however, what items have been present there is unknown. The current storage of timber and the storage of unknown items (which could have comprised treated timber) on these paddocks since the 1980s potentially means this area could conservatively be classified under HAIL Category A18 on the proviso that treated timber has been stored on unsealed ground at the same location for about 40 years.

## Woolshed and Yards

The woolshed and yards are located in the northern centre of the site. In the woolshed itself, storage of drenching chemical containers was mentioned by Mr Paul Mackie and observed during the December 2020 site visit. Mr Mackie mentioned this storage was temporary. Some timber has also been stored under the woolshed. It is not known whether this timber is treated or how long they have been stored there.

To the east of the woolshed was an old, disused shower sheep dip (HAIL Category A8) which was identified in the Contaminated Site Enquiry, confirmed in communication with Mr Paul Mackie and then observed during the December 2020 site visit. Due to the age and possibility of old sheep spray/dip chemicals being stored in the woolshed, the woolshed building itself should conservatively be classified under HAIL Category A8 along with the area surrounding the shower sheep dip.

## Other Onsite Buildings

The site contains numerous buildings/structures (e.g. dwellings, garages, hay barns and sheds) of varying age, with dwellings present onsite from at least as early as the 1940s (based on publicly available aerial images) and perhaps as early as the 1900s (property file information), and various buildings/structures throughout the history of the site – all of which appear to have been constructed before 1 January 2000<sup>6</sup>. Based on the historical aerial photograph review, some of these buildings/structures have been previously demolished.

It is expected that, given the age of these buildings/structures (including the former boarding house), they could have (and/or do) contain ACMs in their building products (potential HAIL Category E1 if the asbestos is in a deteriorated condition) and may also be/have been painted with lead-based paint products (potential HAIL Category I) – especially prevalent in buildings constructed prior to the mid-1970s. During the site walkover, the only structure that was observed to have visibly deteriorated ACM was the shed in the far eastern part of the site (Feature 6 on Figure 2).

## Small Quarry

Based on the historical aerial images, the small quarry operations within 697 Muriwai Road began between 1963 and 1975 and has continued to extend further to the south/southwest over the years. As the location of the small quarry operations has not been included in the project, a site walkover/interview was not undertaken of this area; however, ancillary activities associated with rock quarrying for building stones are included in the HAIL (e.g. above/underground storage tanks for fuel – Category A17, workshops – Category F4, commercial refuelling facilities – Category F7, etc.).

## 6.0 Conceptual Site Model

A Conceptual Site Model (CSM) is a means of summarising the identified sources of contamination at the site, along with the potential migration pathways for contaminants, and the receptors (people or environmental) that could be exposed to the contamination. In order for a risk from contamination to exist, a complete linkage must be identified between a source and a receptor. The CSM below summarises the potential sources of contamination identified from the PSI. The CSM further details the potential mechanism of contamination, the potential receptors, and the potential exposure pathways that could be present at the site. Incomplete pathways, such as those justified above (e.g. no evidence of chemical storage and collaborative information from landowner, only recent application of horticultural chemicals,

---

<sup>6</sup> Under the Health and Safety at Work (Asbestos) Regulations, buildings constructed before 1 January 2000 have the potential to contain asbestos building products (i.e. ACMs) and, as such, require surveys to identify the presence and location of any ACMs before refurbishment or demolition.

the temporary nature/insufficient quantity of drenching chemical storage and storage of chemicals within a concrete hazardous chemical storage shed) are not considered as part of this CSM.

**Table 5: Conceptual Site Model for Muriwai Downs**

Source	Pathway	Receptor	Pathway Linkage
Un-bunded storage of petroleum hydrocarbons (diesel and petrol ASTs) and storage of fuel, oil, and chemical containers - HAIL Categories F7 and A17	Ingestion of soil	Site users	Potentially complete – subject to further testing. Complete if contaminated soils are confirmed as present (and appropriate controls are not and have not been put in place to minimise exposure).
	Dermal contact with soil	Site users	
	Inhalation of vapours	Site users	Potentially complete if significant spills related to filling/dispensing of ASTs occur. Otherwise, incomplete/minimal as source is located outdoors.
	Infiltration to groundwater	Groundwater users	Likely incomplete – subject to further testing (to assess the source) and confirmation that groundwater is only abstracted from a deep aquifer (i.e. >100 m bgl) in the vicinity of the site. Could be impacts to a shallow non-utilised aquifer if a significant source is present (i.e. from spills and leaks, poor handling and disposal practises). Appropriate controls should be put in place to minimise future exposures/discharges.
	Runoff to surface water	Surface water	Potentially complete – subject to further testing. Any stormwater at this location could runoff into the head of a gully located ~50 m away and subsequently into the stream that forms lower down the gully. Appropriate controls should be put in place to minimise future exposures/discharges).
Storage of potentially treated timber (potential contaminants could include Pentachlorophenols (PCPs), copper, arsenic, chromium, boron, Polycyclic Aromatic Hydrocarbons (PAHs) and Organochlorine Pesticides (OCPs) – HAIL Category A18	Ingestion of soil	Site users	Potentially complete – subject to further testing. Complete if contaminated soils are confirmed as present (and appropriate controls are not or have not been put in place to minimise exposure).
	Dermal contact with soil	Site users	
	Infiltration to groundwater	Groundwater users	Likely incomplete – subject to further testing (to assess the source) and confirmation that groundwater is only abstracted from a deep aquifer (i.e. >100 m bgl) in the vicinity of the site. Could be impacts to a shallow non-utilised aquifer if a significant source is present in the ground (i.e. from the long-term storage of treated timber products, in the same location on unsealed ground).

**Table 5: Conceptual Site Model for Muriwai Downs**

Source	Pathway	Receptor	Pathway Linkage
	Runoff to surface water	Surface water	Potentially complete – subject to further testing. Any stormwater at this location could runoff into the head of a gully located ~80 m away and subsequently into the stream that forms down-gradient of the gully. Complete if contaminated soils are confirmed as present (and appropriate controls are not put in place to minimise discharges).
Application of agrichemicals to crops (old kumara plantations) (potential contaminants could include OCPs, acid herbicides, arsenic, lead and copper) – HAIL Category A10	Ingestion of soil	Site users	Potentially complete – subject to further testing. Complete if contaminated soils are confirmed as present (and appropriate controls are not or have not been put in place to minimise exposure).
	Dermal contact with soil	Site users	
	Infiltration to groundwater	Groundwater users	Likely incomplete – subject to further testing (to assess the source) and confirmation that groundwater is only abstracted from a deep aquifer (i.e. >100 m bgl) in the vicinity of the site. Could be impacts to a shallow non-utilised aquifer if a significant source is present in the ground (i.e. from spills and leaks, poor handling and disposal practises and general chemical application processes).
	Runoff to surface water	Surface water	Incomplete/minimal – any runoff at this location is expected to percolate into the ground before reaching the nearest significant surface water receptor (~150 m away).
Farm workshop including associated storage of fuels, oils and chemicals, staining of ground and burning of refuse in steel drum (potential contaminants of concern could include heavy metals and hydrocarbons) – HAIL Category F4	Ingestion of soil	Site users	Potentially complete – subject to further testing. Complete if contaminated soils are confirmed as present. Staining observed on gravel at some locations (in front of the main workshop building and surrounding steel drum used for burning refuse) and on concrete pad of workshop. Appropriate precautions should be put in place to minimise future exposures/discharges.
	Dermal contact with soil	Site users	
	Infiltration to groundwater	Groundwater users	Likely incomplete – subject to further testing (to assess the source) and confirmation that groundwater is only abstracted from a deep aquifer (i.e. >100 m bgl) in the vicinity of the site. Could be impacts to a shallow non-utilised aquifer

**Table 5: Conceptual Site Model for Muriwai Downs**

Source	Pathway	Receptor	Pathway Linkage
			if a significant source is present in the ground (i.e. from spills and leaks, poor handling and disposal practises).
	Runoff to surface water	Surface water	Potentially complete – subject to further testing. Any stormwater at this location could runoff into the head of a gully located ~70 m away and subsequently into the stream that forms lower down the gully. Complete if contaminated soils are confirmed as present (and appropriate controls are not put in place to minimise exposure).
Old shower sheep dip and woolshed (potential contaminants could include arsenic, organochlorines (including DDT, lindane, dieldrin and aldrin) and organophosphates) – HAIL Category A8	Ingestion of soil	Site users	Potentially complete – subject to further testing. Complete if contaminated soils are confirmed as present around the sheep dip and woolshed (unless appropriate precautions are or have been put in place to minimise exposure).
	Dermal contact with soil	Site users	
	Infiltration to groundwater	Groundwater users	Likely incomplete – subject to further testing (to assess the source) and confirmation that groundwater is only abstracted from a deep aquifer (i.e. >100 m bgl) in the vicinity of the site. Could be impacts to a shallow non-utilised aquifer if a significant source is present in the ground (i.e. from spills and leaks, poor handling and disposal practises).
	Runoff to surface water	Surface water	Incomplete/minimal – any runoff at this location is expected to percolate into the ground before reaching the nearest significant surface water receptor (~120 m away).
Lead based paint (surrounding painted structures onsite) – potential HAIL Category I	Ingestion of soil	Site users	Potentially complete – subject to further testing. Complete if contamination is confirmed as present in the soil at a sufficient quantity to represent a risk to human health or the environment (and appropriate controls are not or have not been put in place to minimise exposure).
	Dermal contact with soil	Site users	
	Infiltration to groundwater	Groundwater users	Likely incomplete – subject to further testing (to assess the source) and confirmation that groundwater is only abstracted from a deep aquifer (i.e. >100 m bgl) in the vicinity of the site. Could



**Table 5: Conceptual Site Model for Muriwai Downs**

Source	Pathway	Receptor	Pathway Linkage
			be impacts to a shallow non-utilised aquifer if a significant source is present in the ground; however, lead is relatively immobile in soils (i.e. should be localised to near surface soils only).
	Runoff to Surface Water	Surface Water	Potentially complete (for some structures) – subject to further testing. Potentially complete for structures that are close (< 100 m) to surface water receptors if contaminated soils are confirmed as present in the fill (and appropriate controls are not put in place to minimise discharges).
Asbestos building products in a deteriorated condition – HAIL Category E1	Inhalation of air borne asbestos fibres	Site users	Potentially complete – subject to further testing. Complete if there is progressive deterioration or active disturbance/ maintenance of asbestos containing materials (or soils containing asbestos in the vicinity of these buildings) or uncontrolled demolition of historical structures (and appropriate controls are not or have not put in place to minimise exposure).

## 7.0 Planning Assessment

The CSM, and the positive identification of HAIL land uses at discrete areas across the site (as outlined above), indicates that the NESCS applies to the piece of land where these sources/activities have been identified for activities regulated by the NESCS, which could include change in land use, soil disturbance, and removal/replacement of a fuel storage system (if underground components exist).

Based on the anticipated area and volume of soil disturbance that may occur for the proposed works, the contaminated land rules of the AUP:OP may also be applicable to the proposed development of the site if concentrations of contaminants are found to exceed the Permitted Activity criteria from Section E30 of the AUP:OP in those HAIL areas identified.

## 8.0 Conclusions and Recommendations

PDP has been engaged by GSG to undertake a high-level contaminated land assessment (similar to a PSI) to support the consenting of the project, which encompasses properties located at 451, 610, 614, 670, 680 and 697 Muriwai Road, Waimauku. In summary, the PSI has identified the following sources, uses or activities that could have resulted in ground contamination within the site, and which represent a potentially complete source-pathway-receptor linkage. These have been identified as comprising:

- ∴ Potential impacts of various contaminants (including persistent organic pollutants) from historical horticultural activities (kumara crops) in the central south of the site (current paddocks between the workshop area and the “Kumara Shed”);
- ∴ Potential impacts of various contaminants from storage of timber (including the long-term storage of treated timber in the paddocks to the west of the workshop area as well as the timber stored within a building in the workshop area and under the woolshed);

- ∴ Potential impacts of various contaminants (including persistent organic pollutants) from the shower sheep dip located near the woolshed and the potential historical storage of these chemicals in the woolshed itself;
- ∴ Potential hydrocarbon impacts from bulk storage of diesel and petrol in un-bunded ASTs in the workshop area;
- ∴ Potential hydrocarbon impacts from the storage of old fuel drums in workshop and adjacent to ASTs (including a recent spill from the diesel AST);
- ∴ Potential heavy metal and hydrocarbon impacts from the storage of fuel/chemicals and burning of refuse in (and with respect to the refuse; adjacent to) the main workshop building;
- ∴ Potential impacts of various contaminants from storage of chemicals in the hazardous chemicals storage shed located in the workshop area;
- ∴ Localised lead (and potentially arsenic) impacts from painted surfaces on current/historical houses/structures (including the former boarding house) constructed prior to the mid-1970s; and
- ∴ Asbestos/ACM impacts to soils from current/historical building materials that are observed to be in a deteriorated condition or removed (including from the former boarding house) using inappropriate practises (and not to current standards).

The conclusion that some of these HAIL land-uses are more-likely-than-not to have occurred at discrete locations across the site indicates that the NESCS and its regulations apply to the piece of land where these sources have been identified, and would be triggered by the proposed activities anticipated to be undertaken in the future, which are expected to include: change of land-use (from rural to a combination of residential, rural residential, commercial or recreational) and soil disturbance. Based on the anticipated area and volume of soil disturbance that is expected to be required for the proposed works, the contaminated land rules of the AUP:OP may also be applicable to the proposed development of the site if concentrations of contaminants are found to exceed the Permitted Activity criteria from Section E30 of the AUP:OP within those HAIL areas identified.

The potential HAIL and ground contamination impacts resultant from the above land uses/activities are considered to comprise discrete, localised areas immediately surrounding the source feature (i.e. adjacent to and immediately surrounding areas as shown in Figure 2 and features of interest identified in Figure 1), rather than representing broad, extensive areas of potentially impacted soils (such as paddocks/fields).

Based on the result of this assessment, large areas of the site are confirmed as representing non-HAIL areas and will therefore be exempt from further requirements of the NESCS (as described in Regulation 5 (7)) and the contaminated land provisions of the AUP:OP. The actual/potential contaminated land issues identified by this PSI are expected to be able to be addressed using standard contaminated land management practises, beginning with a Detailed Site Investigation (DSI) of the identified potential contamination sources to determine the nature and extent of impacts to ground as a result of these current/historical activities; and if necessary, seeking resource consents and provision of supporting documents such as a Site Management Plan (SMP) and/or Remedial Action Plan (RAP).

In addition, as noted Under the Health and Safety at Work (Asbestos) Regulations, buildings constructed before 1 January 2000 have the potential to contain asbestos building products (i.e. ACMs) and, as such, require surveys to identify the presence and location of any ACMs before refurbishment or demolition.

## 9.0 References

- AUP:OP, 2021. Auckland Unitary Plan: Operative in Part. Updated 11 June 2021. Auckland Council.
- Edbrooke, S.W., 2001. *Geology of the Auckland Area*. Institute of Geological and Nuclear Sciences 1:250,000 geological map 3.
- MfE, 2021a. *Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand*. Ministry for the Environment.
- MfE, 2021b. *Contaminated Land Management Guidelines No.5 – Site Investigation and Analysis of Soils*. Ministry for the Environment.
- Mitchell Daysh, 2020. *Request for Proposal: Contaminated Land Review – Muriwai Downs Golf Project*. Mitchell Daysh Limited.
- NESCS, 2011. *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011*. Ministry for the Environment.

## 10.0 Limitations

This document has been prepared by Pattle Delamore Partners Ltd (PDP) on the basis of information provided by Golf Strategy Group Ltd and others (not directly contracted by PDP for the work), including Auckland Council, Mitchell Daysh Ltd and Muriwai Downs Ltd. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the document. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

Owing to the limited nature of this assessment (as described in the Objectives and Scope of Work sections), there could be soil and/or groundwater contamination conditions at the site that have not been identified and that have not been considered in this document. Thus, although the assessment has shown knowledge of possible sources of contamination, there is a risk that other sources of contamination could have existed, which have not been identified by the assessment. This risk could be reduced by undertaking further research or subsoil investigation.

This document has been prepared by PDP on the specific instructions of Golf Strategy Group Ltd for the limited purposes described in the document. PDP accepts no liability if the document is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

© 2021 Pattle Delamore Partners Limited.

Yours faithfully,

### PATTLE DELAMORE PARTNERS LIMITED

Prepared by



**Tom Harvey**

Environmental Consultant

Reviewed by



**Stefan Yap**

Service Leader - Contaminated Land

Approved by



**Erin Richards**

Technical Director - Contaminated Land

## Appendix A: Certifying Statement

I, Erin Richards of Pattle Delamore Partners, certify that this preliminary site investigation meets the requirements of the Resource Management (*National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*) Regulations 2011 ('the NESCS') because it has been:

- a. Done by a suitably qualified and experienced practitioner;
- b. Reported on in accordance with the current edition of the Ministry for the Environment's (MfE's) *Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand*; and
- c. Certified by a suitably qualified and experienced practitioner.

Evidence of the qualifications and experience of the suitably qualified and experienced practitioner(s) who have done this investigation and certified this report is provided below.

This certification applies to the date of this report.

Signed



**Erin Richards**

Technical Director - Contaminated Land

**Erin Richards – Project Director**

Erin is a geologist with over 19 years of experience in geological and contaminated land assessments. She has a MSc in Geology (1<sup>st</sup> class hon) from the University of Auckland. Erin has extensive experience in contaminated land assessments and has undertaken as a consultant (either directly herself or as a project manager/director) hundreds of assessments across a variety of contaminated sites, which have ranged from greenfield sites (identified for development) through to complex brownfield assessments, including assessment/decommissioning of bulk storage fuel depots/terminals and large-scale redevelopment of commercial/industrial sites. Assessments have been widespread and have involved soil, groundwater and soil-gas investigations, resource consenting (NESC through to long term discharge consenting under regional rules), spill response works, remediation (including development of remedial options assessments), dewatering assessments, development of management plans, Tier 2 risk assessments and ongoing compliance monitoring works. Erin was a primary author of the 2021 Contaminated Land Management Guidelines: CLMG No.1 and contributed to the updates of CLMG No.5. As such, she has a good familiarity with and understanding of the current contaminated land regulations and practice in New Zealand including assessments against the NESC.

**Stefan Yap – Project Manager and Preliminary Site Investigation Report Reviewer**

Stefan is an environmental scientist with over 19 years of diverse experience within the environmental field throughout New Zealand and Asia Pacific with practical expertise in contaminated land management, environmental regulatory compliance and hazardous waste management. He has a BEnvSc (Hons) from Murdoch University. Stefan has prepared detailed assessments of contaminated sites, conceptual site models, remedial action plans, long-term management & monitoring plans and risk assessments. He has worked as a contaminated land specialist with small and large clients across a wide variety of industries including large-scale infrastructure, transport, oil & gas, energy, telecommunication, construction, education, manufacturing, recreation, agriculture & horticulture, and solid waste.

**Tom Harvey – Investigation Field Operative and Author**

Tom is an environmental geologist with 3 years' experience in undertaking environmental and contaminated land assessments. He has a BSc in Geology and Environmental Science and an MSc in Physical Geography (1<sup>st</sup> Class Hons) from Victoria University of Wellington. Tom has practical experience in a variety of contaminated land assessment techniques and has gained relevant experience in carrying out (and recently leading) and reporting on both Preliminary and Detailed Site Investigations.



## Appendix B: Site Contamination Enquiry

3 December 2020

**Pattle Delamore Partners**  
235 Broadway  
**AUCKLAND 1023**  
**Attention: Tom Harvey**

Dear Tom

**Site Contamination Enquiry – 451, 610, 614, 670 and 680 Muriwai Road, Muriwai Valley**

This letter is in response to your enquiry requesting available site contamination information within Auckland Council records for the above site. Please note this report does not constitute a site investigation report; such reports are required to be prepared by a (third-party) Suitably Qualified and Experienced Practitioner.

The following details are based on information available to the Contamination, Air & Noise Team in the Resource Consent Department. The details provided may be from former regional council information, as well as property information held by the former district/city councils. For completeness the relevant property file should also be requested to obtain all historical records and reports via 09 3010101 or online at:

<https://www.aucklandcouncil.govt.nz/buying-property/order-property-report/Pages/order-property-file.aspx>.

**1. Hazardous Activities and Industries List (HAIL) Information**

This list published by the Ministry for the Environment (MfE) comprises activities and industries that are considered likely to cause land contamination as a result of hazardous substance use, storage, and/or disposal.

Council's records indicate this site has possibly been subject to the following activity that falls within the HAIL:

- HAIL Item (A.8) – Livestock dip or spray race operations.

There is no contamination information held within Council's records for the site 451 Muriwai Road, Muriwai Valley.

There is no contamination information held within Council's records for the site 610 Muriwai Road, Muriwai Valley. However, aerial records indicate sheep farming activities occurring on site and a potential spray race operation as seen in the below aerial. Additionally, a number of unknown materials appear to be stored outside to the east of the buildings in the southern portion of the site. Furthermore, consent records indicate the northern building of these structures is utilised as a workshop.





There is no contamination information held within Council's records for the site 614 Muriwai Road, Muriwai Valley.

There is no contamination information held within Council's records for the site 670 Muriwai Road, Muriwai Valley.

There is no contamination information held within Council's records for the site 680 Muriwai Road, Muriwai Valley.

Previous correspondence within Council's records indicate there were two sheep dips located on these properties. The location of both dips is unknown.

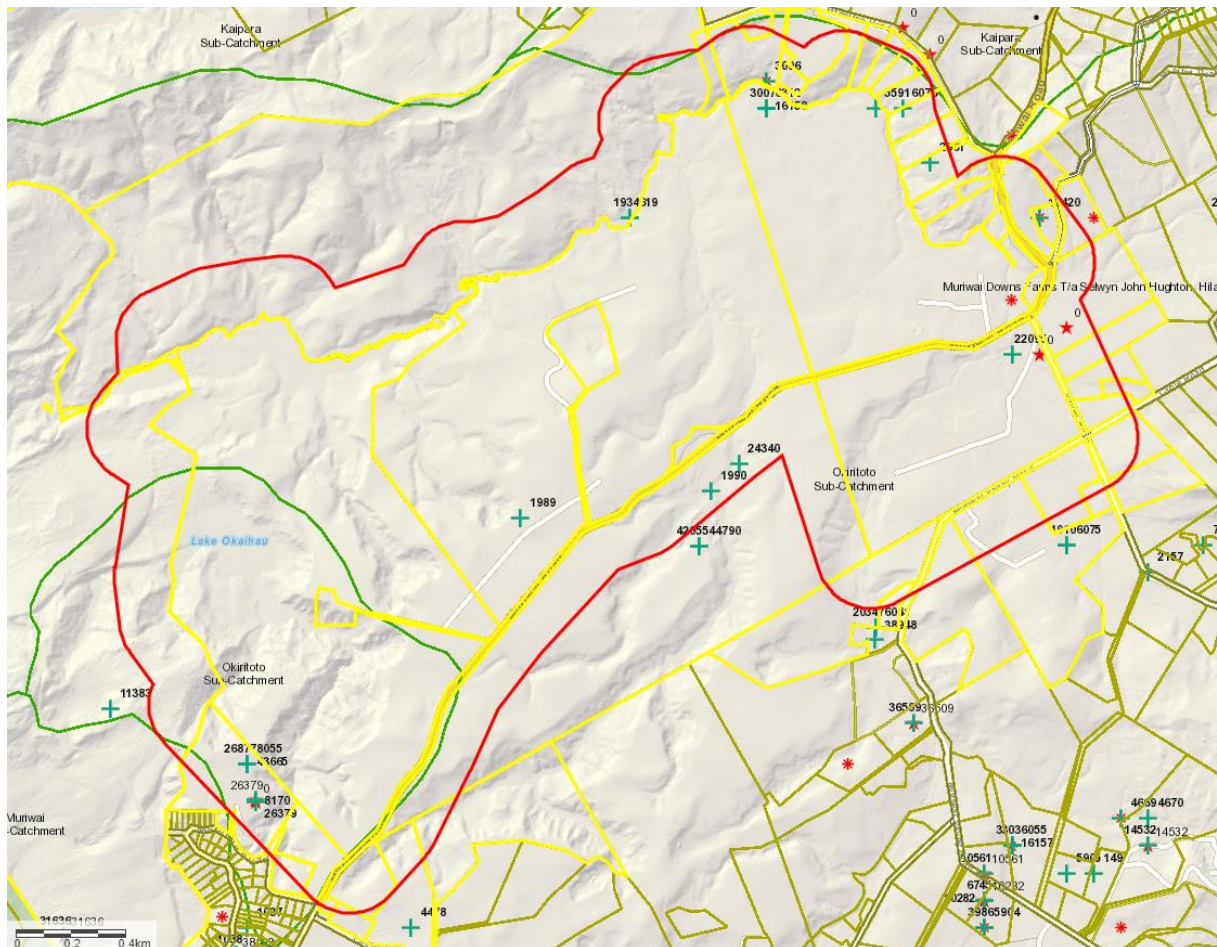
Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Asbestos) Regulations 2016 for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
- *Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. You are advised to ensure that soils affected by old, peeling or flaking paint are assessed in relation to the proposed use of the property, including high risk use by young children.*

## 2. Consents and Incidents Information (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site:

- Pollution Incidents (including air discharges, oil or diesel spills)
- Bores
- Contaminated site and air discharges, and industrial trade process consents
- Closed Landfills
- Air quality permitted activities



### Legend:

All Consents +	Closed Landfill (Auckland Council owned) □
All Applications ■	Closed Landfill (Privately owned) ■
All Permitted Activities *	
All Bores ★	

Relevant details of any pollution incidents and consents are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

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

If you wish to clarify anything in this letter that relates to this site, please contact [contaminatedsites@aucklandcouncil.govt.nz](mailto:contaminatedsites@aucklandcouncil.govt.nz). Any follow up requests for information on other sites must go through the online order process.

Should you wish to request any of the files referenced above and/or listed in the attached spreadsheet for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice to ensure the files will be available).

Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for \$128 for the time involved in this enquiry will follow shortly.

Yours Sincerely,

**Contamination, Air and Noise Team  
Specialist Unit | Resource Consents  
Auckland Council**



## Appendix C: Site Photographs



**Photograph 1: White powder on ground in northern building of the workshop area.**



**Photograph 2: Steel drum in the workshop area used for burning material.**



Photograph 3: Example of fuel/oil drums in the main workshop building. Note the staining on the ground surrounding the drums.



Photograph 4: Staining on ground in front of main workshop building.



**Photograph 5: Photograph showing the bunded concrete hazardous chemicals storage shed.**



**Photograph 6: Un-bunded petrol (left) and diesel (right) ASTs in the workshop area. Un-bunded storage of fuel drums to the right of diesel AST (shown closer in Photograph 7).**



**Photograph 7: Ground staining and dead grass from recent diesel AST spill.**



**Photograph 8: Staining on ground surrounding un-bunded storage of fuel/oil drums next to ASTs.**





**Photograph 9: Some of the piles of treated timber stored on the paddock to the west of the workshop area.**



**Photograph 10: Old shower sheep dip in yard area next to woolshed.**



**Photograph 11: Shed in the eastern section of the site. Note the fibre cement cladding (likely ACM).**



**Photograph 12: View from inside the above shed showing storage of old, disused farm equipment and machinery.**