New Zealand
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Whakaari Conservation Area

Heritage impact assessment for proposed drilling and minimum impact exploration activities on EP40547, Glenorchy.

Report Prepared for New Zealand Tungsten Mining Ltd
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29/11/2015

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Project Details

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Ownership and Disclaimer

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Executive Summary

New Zealand Tungsten Mining (NZTM) is proposing to undertake diamond core drilling and minimum impact exploration activities for minerals exploration permit 40547 (EP40547). This permit area overlaps with the Whakaari Conservation area managed by the Department of Conservation.

The area has a long history of mining and exploration activities dating back to the 1880's meaning the area is littered with mining remnants from the 100 plus years of activity. Mining is most recently known to have been undertaken in 1980, and diamond drilling exploration in 1989.

To facilitate NZTM applying for an access arrangement with the Department of Conservation, New Zealand Heritage Properties Ltd (NZHP) has surveyed the physical area and documented records in order to understand the potential impacts of these activities upon the heritage landscape.

Research has identified 15 mining related sites recorded on the New Zealand Archaeological Association site recording scheme (archsite) that fall solely within the Whakaari conservation area. A NZHP survey has identified these and other sites (n=94) and has categorized the types of sites present into three categories;

- primary evidence; adits, stopes and sluiced faces,
- secondary evidence; waste rock, tailings, and artefacts
- and tertiary evidence of water races, terraces and other supporting services.

NZHP has determined that the proposed activities can be located in such a way as to avoid recorded and unrecorded archaeological and heritage sites. Therefore, the proposed NZTM activities are considered to have no effect upon the heritage and archaeological sites in the area with works subject to the following recommendations.

- Operators are first briefed by an archaeologist/heritage professional on what constitutes archaeology and how to identify it.
- Site establishment works are monitored by an archaeologist to ensure sites are avoided.
- Periodic or as needed monitoring of exploration works by an archaeologist.
- And an accidental discovery protocol is adopted by operators to ensure unexpected finds are protected and managed.

1 Introduction

New Zealand Heritage Properties Ltd (NZHP) has been commissioned by New Zealand Tungsten Mining Ltd (NZTM) to undertake a Heritage Impact Assessment for a proposed exploration programme involving minimum impact activities (as defined by the Crown Minerals Act 1991) and diamond core drilling. The exploration programme is to assess the geology and levels of mineralisation within minerals exploration permit 40547 (EP40547) at Glenorchy which overlaps Wyuna Station and the Whakaari Conservation area. This report forms the basis of Heritage Impact Assessment to accompany an access arrangement application to the Department of Conservation (DoC).

The project area is located approximately two kilometres east of Glenorchy, Otago (Figure 1-1) at the head of Lake Wakatipu. EP40547 extends over numerous land parcels, including Section 1 SO 369025, Section 4 SO 369025, Section 7 SO 369025, Section 13 SO 369025, Section 14 SO 369025, and Section 19 SO 369025. The project falls within the Whakaari Conservation Area, which is managed by the Department of Conservation.

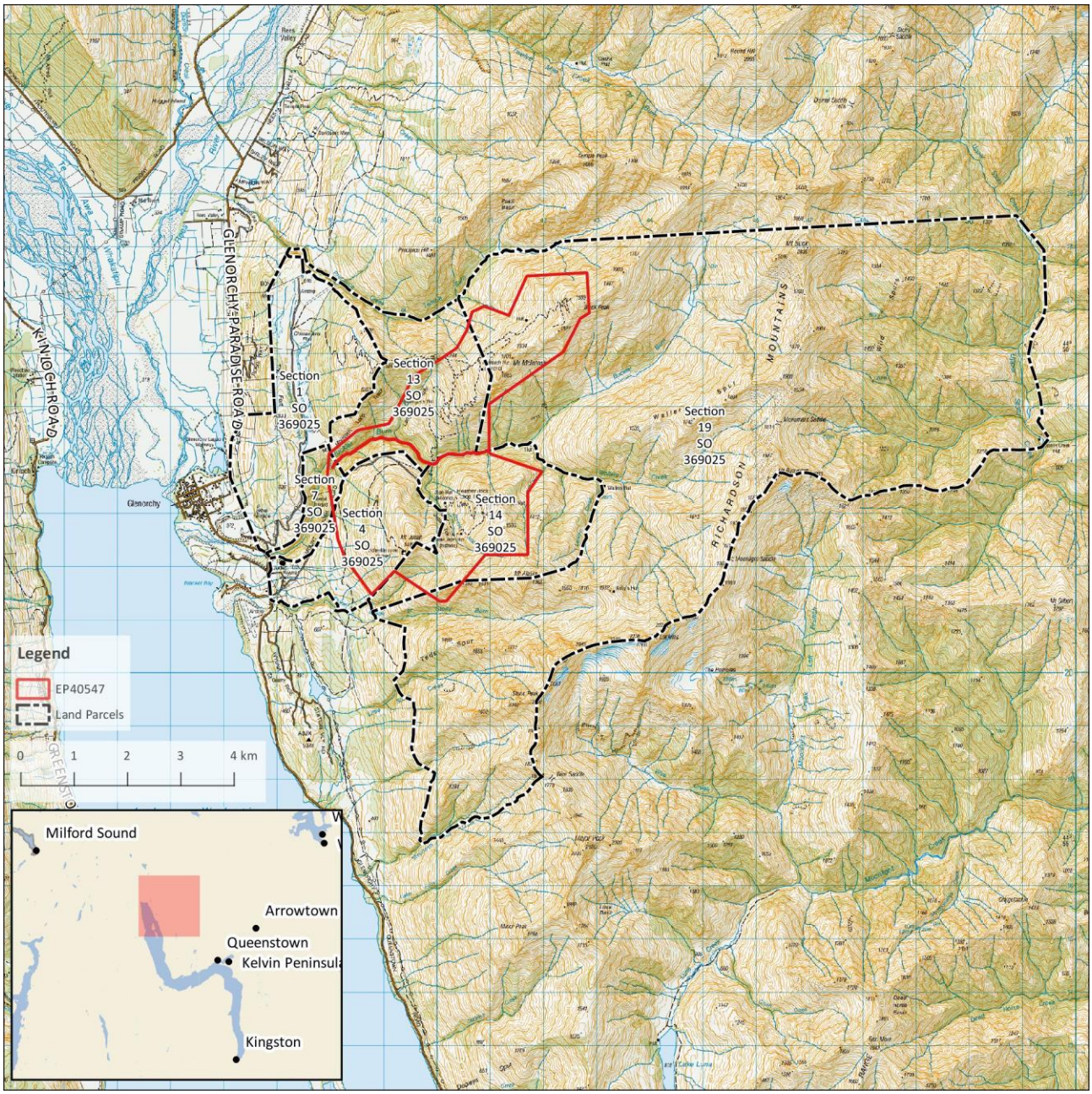

Figure 1-1. Location of EP40547, near Glenorchy, Otago.

There are 17 mining related sites (E41/208-E41/224) within EP40547 that are registered on ArchSite, New Zealand Archaeological Association's (NZAA) archaeological site recording scheme. These sites relate to the long history of scheelite mining in the area; however, most of the sites are post-1900 and are not immediately protected by the Heritage New Zealand Pouhere Taonga Act (2014). They do, however, represent the many phases of scheelite mining activities and reflect the changes in technology and mining methodology that have occurred since the practice was established in the area in the 1880's. In the Mt McIntosh area surface mining continued until 1980, and exploration drilling by Restech Ltd until 1989. While most sites are not considered archaeological, and thus, are not immediately protected under the legislation, they are considered here together as a heritage *mining complex* in light of the wax and wane of scheelite mining in Glenorchy.

Within the Whakaari conservation area, there are two sites scheduled on the QLDC district plan. One is number 46, the scheelite battery, Glenorchy (Mt Judah) which has a category 3 value. Another is number 238 E. Barnetts Hut, which is on Wyuna Station and within the scheelite mining area. It has a category 3 designation.

1.1 Project Background

The latest phase in the mining cycle is being proposed by New Zealand Tungsten Mining Ltd (NZTM). NZTM is to investigate the level of tungsten and gold mineralisation within the lodes that run through the exploration permit area. Part of the investigation will involve diamond core drilling and sampling of these lodes across a range of sites.

These lodes were first mined in the mid 1880's (Bradshaw, 1997) with consecutive phases of mining continuing into the twentieth and twenty-first centuries. Given that modern exploration or mining will operate in the same areas that were mined during each previous phases of mining, there is the potential for heritage and archaeological resources to be disturbed by the proposed drilling programme.

Minimum impact activities as defined under the Crown Minerals Act 1991 (CMA) will be undertaken that mostly involve geological mapping and sampling across the permit area. Samples will be taken using hand held methods from rock outcrops. Surface geophysical surveys may also be undertaken that will involve the disturbance of a small area (approximately 1 m^2) of vegetation and associated surface soils (pers. comm. Gary Gray 2015). The CMA defines Minimum Impact Activity as the following:

> (a) geological, geochemical, and geophysical surveying:
> (b) taking samples by hand or hand held methods:
> (ba) taking small samples offshore by low-impact mechanical methods:
> (c) aerial surveying:
> (d) land surveying:
> (e) any activity prescribed as a minimum impact activity:
> (f) any lawful act incidental to any activity to which paragraphs (a) to (e) relate — to the extent that it does not involve any activity that results in impacts of greater than minimum scale and in no circumstances shall include activities involving—
> (g) the cutting, destroying, removing, or injury of any vegetation on greater than a minimum scale; or
> (h) the use of explosives; or
> (i) damage to improvements, stock, or chattels on any land; or
> (j) any breach of the provisions of this or any other Act, including provisions in relation to protected native plants, water, noise, and historic sites; or
> (k) the use of more persons for any particular activity than is reasonably necessary; or
> (l) any impacts prescribed as prohibited impacts; or
> (m) entry on land prescribed as prohibited land

The diamond core drilling will be undertaken by small teams of people (up to four) using a diesel - powered drilling rig. The rig itself will be airlifted onto site by helicopter. Where tracks already exist, the rig may travel between drill sites under its own power. The drill holes will be less than 12cm in diameter, and the working area required is approximately 6m x 12m. The drilling operation is largely self-contained and water will be will be abstracted from the nearest stream to each drilling site via a combination of gravity feed and pumping and then recycled as much as possible on site. Some water containing drill cuttings and/or drilling mud will be discharged to land as a permitted activity under the Otago Regional Council's 'Regional Plan: Water for Otago. Drill core will be recovered and transported off site. The proposed areas subject to drilling are shown in Figure 1-2.

While each drilling site is relatively small, there is the potential for this activity to have an impact upon existing heritage and archaeological resources (see Cropper and Cawte (2015) and Jones (2014) for an extensive review of heritage and archaeological sites within the project area). The objective here is to consider the potential impacts of the exploration activities upon these resources.

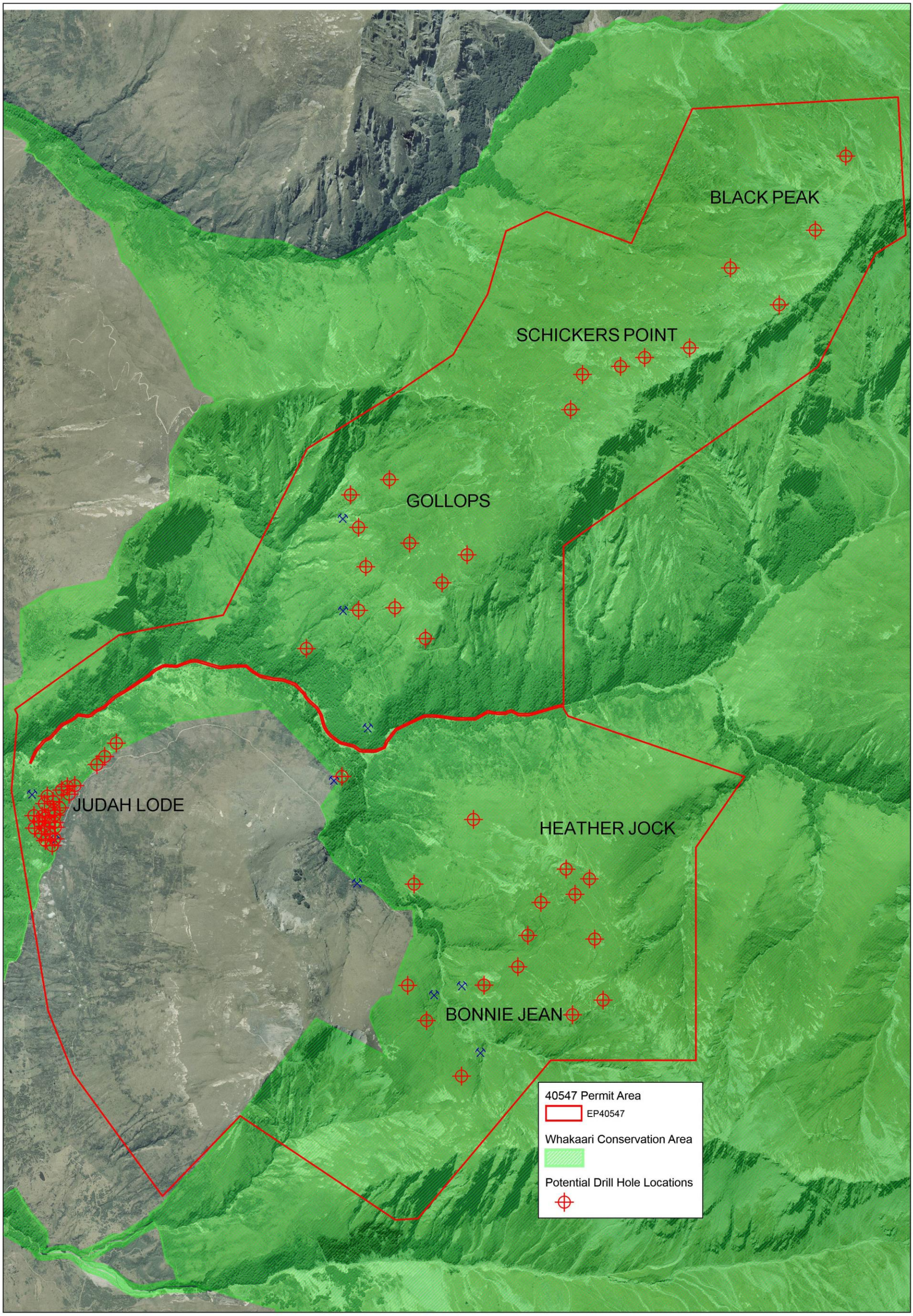

Figure 1-2. Map of the potential drill hole locations in EP40547 (map supplied by NZTM).

2 Identification of Sites

Sites and areas of archaeological or heritage value were identified through a two stage process; examination of historical records, DoC tenure review documents, an assessment of previously recorded archaeological sites and an extant site survey (Cropper & Cawte, 2015). Previously recorded archaeological sites are documented in Section 5. The purpose of the historical inquiry is to provide a historical context for the heritage and archaeology of the area. The site survey is to identify any extant archaeological features or any other features/structures of heritage value. Research has shown that there are three site types present within EP40547;

- **Category 1:** Features in this category are considered primary evidence of mining. This includes, mine entrances, adits, stopes, , and sluiced areas.
- **Category 2:** Features in this category are considered secondary evidence of mining. This includes waste rock, tailings, and artefacts.
- **Category 3:** Features in this category are considered tertiary evidence of mining. This includes, water races (head and tail), reservoirs/dams, terraces, support services, mining roads, and fluming/chutes, and processing areas. Other non-mining features were also coded as category 3.

2.1 Assessment of Heritage and/or Archaeological Value

The assessment of value relates to the site categories outlined above whereby extant heritage and/or archaeology is evaluated for its heritage or archaeological value. This value is assessed against the following criteria and given a value of low, medium, or high.

- **Condition:** This is an assessment of heritage or archaeological condition based on appearance. This makes no assumption of actual structural integrity.
- **Rarity/uniqueness:** A site's rarity or uniqueness is determined by how many similar sites exist on a local, regional, and national level.
- **Contextual Value:** Is an assessment of the importance of the site's physical location amongst its surroundings and the relationship it shares with other sites, features, and context. Consideration was given to the relationship between sites and the categories identified above. For example, could a feature be considered to be a part of a complex of sites that include examples from all categories.
- **Information Potential:** Representation of the quality and quantity of data a site would provide if it was investigated.
- **Amenity Value:** Representation of a site's contribution to social experiences that people may enjoy.
- **Aesthetics/Character quotient:** This is an assessment of the visual impact and the character contribution of a site on the surrounding landscape.
- **Significance:** A site's significance is determined by the levels given above. A majority of 'high' responses suggests a site of considerable significance. A majority of 'low' responses suggests a site of little or no significance.

Assessing these attributes allows for the identification of particularly important or significant sites thus, understanding their relationship with the proposed works and within the broader landscape.

3 Physical Environment and Setting

EP40547 is located approximately two kilometres east of Glenorchy, Otago at the head of Lake Wakatipu in the Richardson Mountains (Figure 3-1 and Figure 3-2).

EP40547 covers 1476 hectares of mountainous terrain, with the Buckler Burn stream running west to east through the centre of which 1136 hectares are within the Whakaari Conservation Area. There are steep mountains to the north and south of Buckler Burn, with prominent peaks including Mt McIntosh (1701m asl) and Mt Judah (1410m asl). Black Peak (1989m asl) in the north-east is the highest peak within the permit area. Mt Alaska (1965m asl) is immediately south-east of the permit area. The area was glaciated during the Pleistocene, and as a result there are fluvio-glacial and glacio-lacustrine gravels and moraines within the stream valleys and on Mt Judah (below approximately 800m) (Jeffery, 1986, p. 6).

The rocks of the Glenorchy area include two primary groups: quartzo-feldspathic schists of the Haast Schist Group and late Quaternary superficial deposits (Mutch, 1969, p. 11). The schists are further subdivided with quartzo-feldspatic psammites on the western facies (around Mt Judah through to the McIntosh-Rocks area) and politic schists and greenschists on the eastern facies (east of Mt McIntosh on the eastern side of the Alaska spur;) (Jeffery, 1986, p. 6). Thin quartz-scheelite lodes formed within the schist near Glenorchy (Mutch, 1969, p. 13). These main lodes are near horizontal, but there are also smaller branch lodes (Jeffery, 1986, p. 7).

Figure 3-1. Photograph of Glenorchy with Blanket Bay in the foreground and the Richardson Mountains in the background.

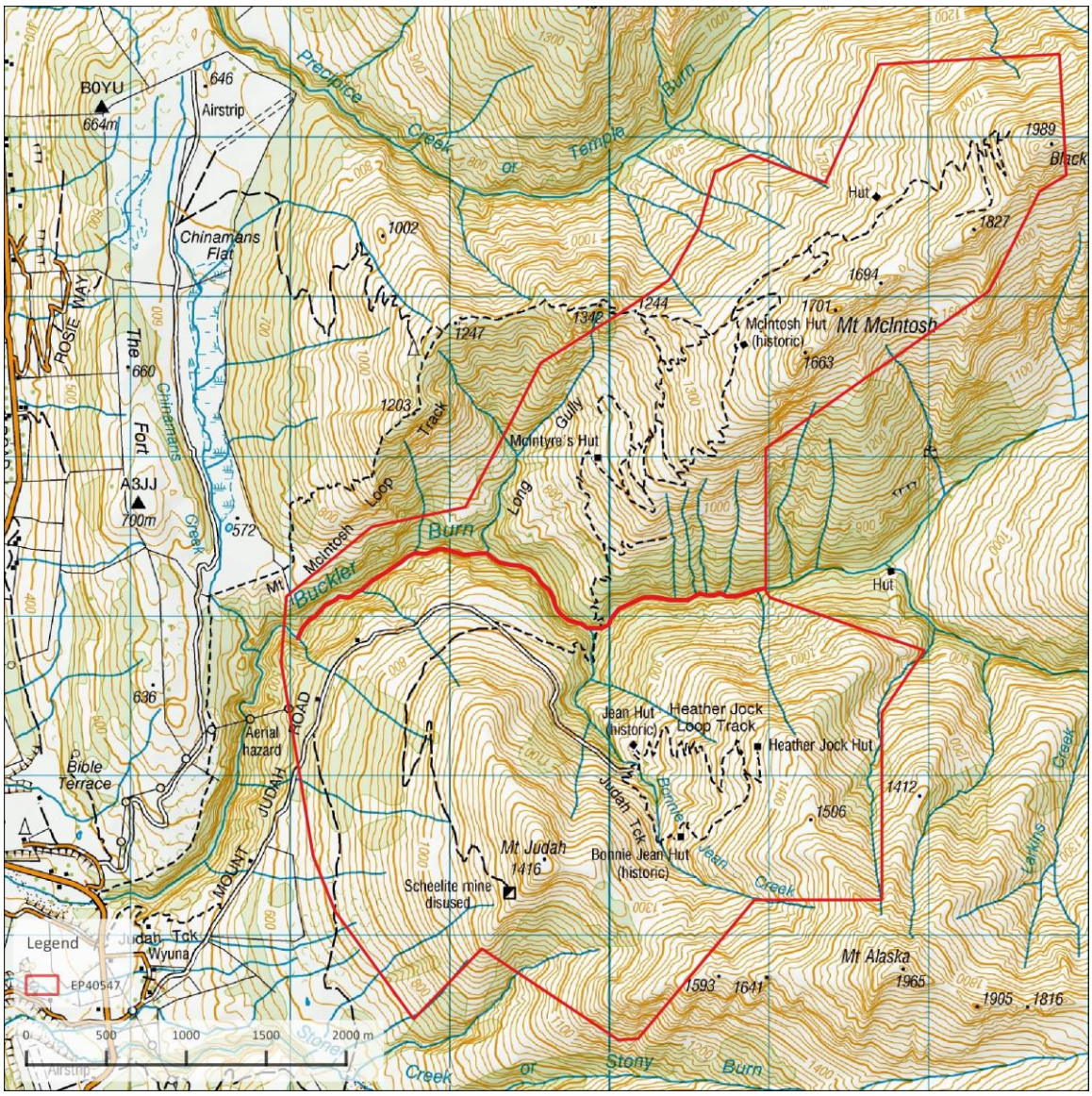

Figure 3-2. Topographic map showing the location of EP40547.

4 Historical Background (summary)[1]

Mining activities have occurred in the permit area since the 1880's in response to the normal cycles of market demand and commodity prices. The most recent surface mining operations occurred circa 1980, and exploration drilling activities as recently as 19989 (pers. Comm. Gary Gray 2015). World-wide there are a number of historic tungsten mines currently being evaluated and reopened following a lull of 30-40 years.

Following the great Central Otago gold boom in the early 1860's, it was not long before gold fever hit the area at the top of the Wakatipu that would eventually become Glenorchy. However, Glenorchy was a small and isolated township, with limited access, and soon many people vacated the area in search of the promising gold resources of the West Coast. It was not until the mid-1880's that the township expanded rapidly with the discovery of scheelite in conjunction with a bustling tourism industry to the region.

While the existence of scheelite in the area was known in the 1860's, it was not until its commercial mining two decades later in the mid-1880's that scheelite mining eclipsed gold mining and pastoralism and became the primary industry of the region. Scheelite (an ore of tungsten) is a critical and at times valuable resource that is

[1] Summarised and taken from Cropper and Cawte 2015

found and currently mined in only a select few countries. Its unique 'heaviness' and hardness lends itself well as an ingredient to produce strong, yet malleable alloys which are important for many international industries.
While modest in comparison with other townships around the South Island, scheelite mining brought people and industry to Glenorchy. The pre-1900 scheelite mining at Glenorchy peaked in the late 1880's before the market slumped around the end of the century. The commercial mine closed, leaving only small-scale mining activities to continue on. Scheelite mining continues to be dictated by demand, thus creating sporadic bursts of working in the Glenorchy region. At the turn of the 20th century, there was a renewed interest in scheelite mining as demand for the metal increased. Scheelite mining has continued throughout the twentieth century, however, waning demand in conjunction with the limited access into Glenorchy has left the region largely under developed and relatively isolated.

The tenure review of the Wyuna Pastoral Lease in the early 2000's led to the establishment of the Whakaari Conservation Area (Figure 4-1) which, in turn, has meant the protection of many post-1900 mining related paraphernalia. The establishment of the conservation area invites adventure enthusiasts into the region for tramping and short walks. These walks take in the mining history of the area allowing visitors to understand changes in size and scale as well as mining technique.

Figure 4-1. Location of the project area in relation to the Whakaari Conservation Area.

Historical research and heritage survey has shown the area to be a complex of sites that include the primary evidence for mining in terms of mine entrances, adits and sluiced areas, the mining by-products of waste rock and tailings, and the necessary mining infrastructure such as processing areas, roads and water races. For the 130 plus years of mining in the area, evidence shows extraction swings between small scale and industrial operations. The small, single adits with tailings are likely to represent these intermediary periods of mining activity between periods of larger scale mining. The exploration activities proposed by NZTM will use similar methods to previous exploration in the area, and represent the newest phase of mining activity in the area.

5 Heritage and Archaeological Sites within EP50547

5.1 Previously Recorded Archaeological Sites within EP50547

There are 17 sites (E41/208-E41/224) within EP40547 that are registered on ArchSite, New Zealand Archaeological Association's Archaeological Site Recording Scheme. These sites are listed in Table 5-1, and the distribution of the sites is presented in Figure 5-2. All of the sites in EP40547 were recorded by Peter Bristow

during a four-day survey of historical sites on the Wyuna pastoral lease (Bristow, 1995). The survey was commissioned by the Department of Conservation as part of a series documenting the historic values of pastoral leases in the Central Otago high country. Bristow (1995, p. 1) notes that due to the high number of sites and time constraints, he did not record all sites, but "an effort was made to record all the major (in terms of longevity of production and output) workings". Because the survey was focused on recording the mining sites, no Maori sites were recorded during the survey. Bristow (1995, p. 1) suggests there is a high probability for Maori sites given the close proximity of sites in Glenorchy. However, recent surveys have not yet identified Maori sites or material (*c.f.* Jones, 2014; Cropper and Cawte, 2015).

The sites in EP40547 primarily represent twentieth century (post-1900) mining. Generally, post-1900 mining sites are not protected under the *Heritage New Zealand Pouhere Taonga Act* 2014 unless they have been declared archaeological sites by Heritage New Zealand. None of the post-1900 sites recorded in EP40547 are declared sites.

Of the 17 sites in the permit area, only the Government or State Mine (EP41/208; Figure 5-1) has documented evidence of pre-1900 use of which half of the site is on Wyuna Station and not within the Whakaari . This site was the main mine at Glenorchy, and after being taken over by the government in 1942, it was often referred to as the State or Government Mine (Bristow, 1995, p. 7). Bristow (1995, pp. 7–8) does not identify if any of the features recorded in Figure 5-1 date to the initial period of mining. Heritage New Zealand notes that scheelite mining sites are uncommon in New Zealand, and if the stamping battery was returned to the site (it is at Gees Flat Gold Mining Centre in Kawarau Gorge), it "would be the most complete historic Scheelite [*sic*] complex left in the world" (Schmidt, 2012). The Government Battery site (Site No. E41/207) is situated just outside the project area, closer to Glenorchy.

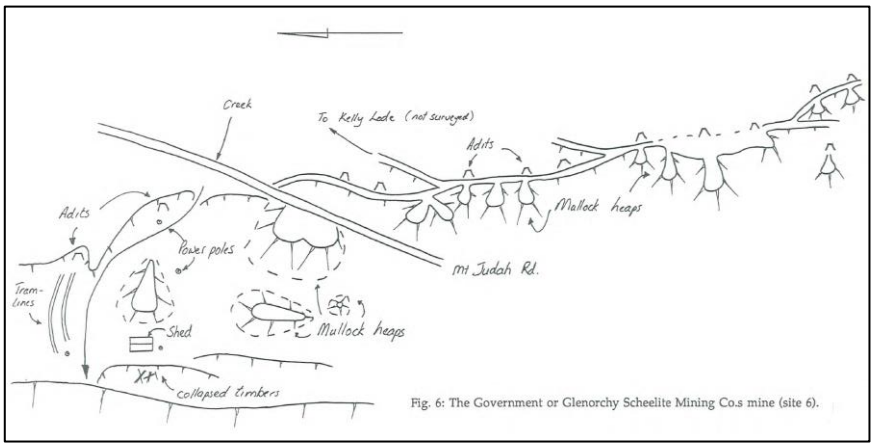

Figure 5-1. Plan of the Government or State Mine (Bristow, 1995, p. 9).

Table 5-1. Previously recorded archaeological sites in EP40547.

NZAA Site Number	Short Description	Site Type	Site Features	Bristow's Site Number	Description (after Bristow, 1995)
E41/208	Scheelite mine	Industrial	Mine	6	Government or State mine. The site of the main scheelite mine at Glenorchy, including mining in the 1880's, 1906, 1942, and 1971. Two lodes worked at the site; adits marked by large spoil (or mullock) heaps. The site also includes the main plant and building remains.
E41/209	Scheelite mine	Industrial	Mine	7	Features at the site include a single adit, spoil heap, and possible loading hopper. Possible relationship with exploration in the 1970's.
E41/210	Scheelite mine	Industrial	Mine	8	Broadleaf Mine or Taylors Mine? The site includes two mullock heaps and concrete fireplace. An adit was not located, possibly due to limited visibility (scrub).
E41/211	Scheelite mine	Industrial	Mine	9	Unidentified mine that includes a timbered adit, a short tram line to a small spoil heap. Possibly Cunningham mine?

NZAA Site Number	Short Description	Site Type	Site Features	Bristow's Site Number	Description (after Bristow, 1995)
E41/212	Scheelite mine	Industrial	Mine	10	Gollop No 1 or Massey/Cruickshank? The site is comprised of a sluiced area (c. 50m wide) with a timbered adit entrance and mullock heap. Rubber piping and a 44-gallon drum are present at the site.
E41/213	Hut	Historic - domestic	Hut floor/ site	12	Junction Huts (1930s). The site is on a terrace, which is much reduced in size after flood damage. Features include a small corner of stacked and mortared stone. Artefacts include a 44-gallon drum, wooden boxes, long-necked beer bottles, dressed timber, a rubber boot, pieces of tin, and a section of waste pipe.
E41/214	Battery	Mining - gold	Stamper battery	13	Groves (WW1). The site of surface workings; however, there was poor visibility due to scrub. The site includes the remains of a battery with a mortar box, crankshaft, two stampers, and the concrete foundations. Wire cables (from the aerial cableway) are also present.
E41/215	Scheelite mine	Industrial	Mine	14	Sunshine Mine (1930s). The site features include an area of possible sluicing, two adits, a lean-to building, and a water race.
E41/216	Building terrace	Pit/Terrace	Terrace	15	Boozer Workings? (1930s-1940s). The site includes a terrace (8-x-6m) with a small (4-x-4m) extension on the true left side of Bonnie Jean creek. The remains of a four-cylinder engine, fuel tank, and hut outline are present. A set of workings are located above Bonnie Jean creek.
E41/217	Scheelite mine	Industrial	Mine	16	Crossing workings and Bonnie Jean Mining Co. Battery? (1908, 1930s-1950s). The site includes numerous features, including a standing tin hut, a collapsed hut, rubbish pit, foundations (battery?), stone-faced reservoir, and workings (bulldozed or sluiced).
E41/218	Scheelite mine	Industrial	Mine	17	Bonnie Jean Mine (pre-WWI, 1930s-1970s). The site includes two large sluiced faces on the true right side of Bonnie Jean creek, a timbered adit, tram line, mullock heap, pipes, sluicing monitor, wooden hut, and other machinery and equipment.
E41/219	Scheelite mine	Industrial	Mine	18	Alaska Workings (*c.*1900-1920, 1960s). The site is situated mid-way down the main northern ridge of Mt Alaska and includes an area of open workings, a stone fireplace, stone walling, stone face terrace, earth-walled reservoir, and artefacts.
E41/220	Scheelite mine	Industrial	Mine	19	Heather Jock Mine (WWI?, 1930s-1970s). The site includes an area of open workings on the lower end of the main northern ridge of Mt Alaska. The site also includes an iron hut and a four-cylinder engine. Bristow did not identify adits, but suggests that there are underground workings based on historical records and the presence of timbers and tram rails.
E41/221	Scheelite mine	Industrial	Mine	20	Thompson Mine?(1940's). The site includes a long terrace with a shallow pit faced with quartz blocks, an adit, and two engines.
E41/222	Reservoir	Industrial	Reservoir	21	A 20m-long earth-walled reservoir on a natural terrace.
E41/223	Scheelite mine	Industrial	Mine	22	Gollop No. 2 (1940s-1970s). The site includes workings along a small gully south of Long Gully, as well as an earth dam, adits, ore cart, tram tracks, pipeline, mullock heaps, and hut.
E41/224	Scheelite mine	Industrial	Mine	23	Long Gully Mine (WWI?, 1930s-1940s). The site is situated on the upper slopes of Mt McIntosh. Features at the site include a hut, remains of a meat safe, a cast iron stove, pipe, bulldozed track, building sites (one may be a treatment plant), and a sluiced area.

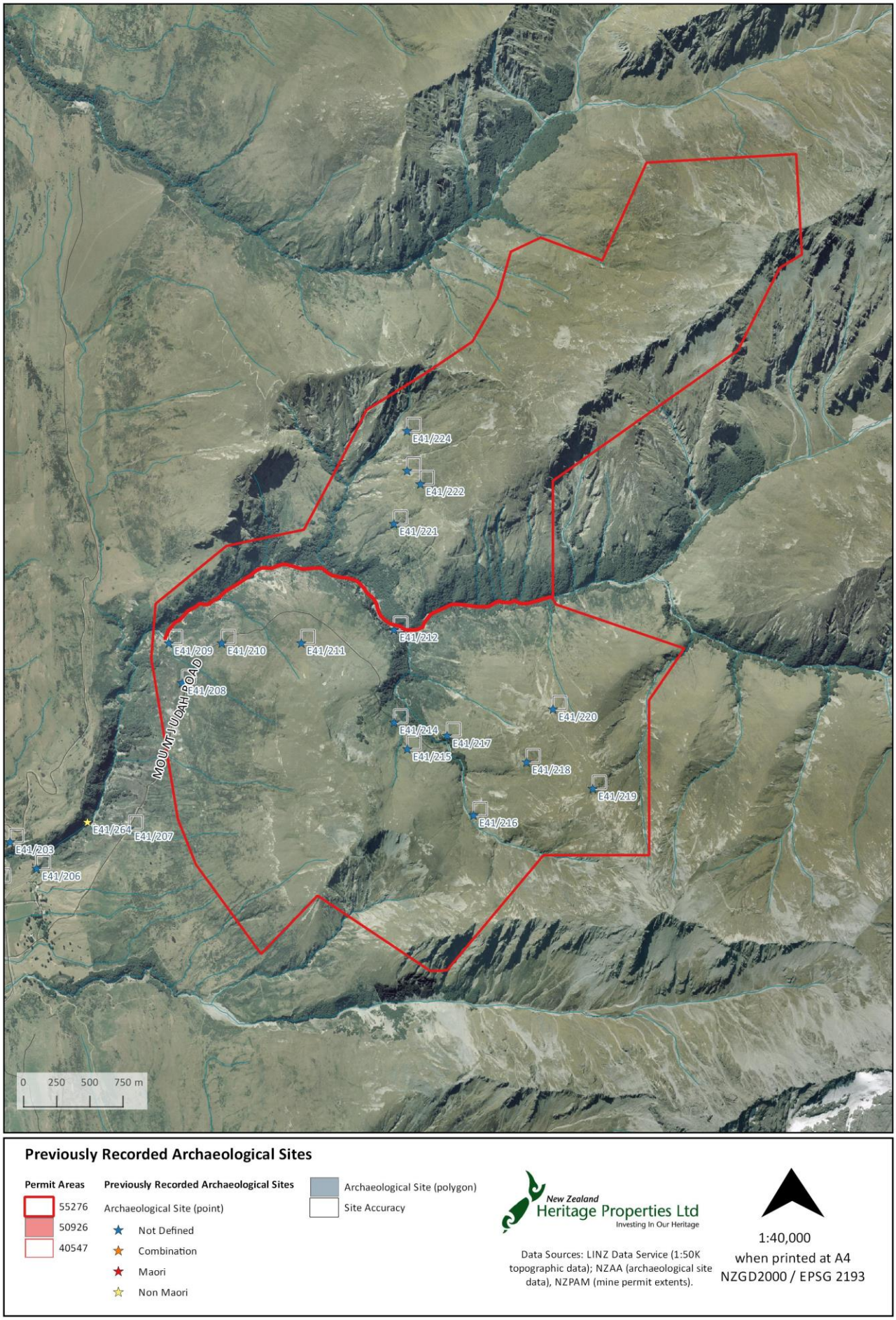

Figure 5-2. Previously recorded archaeological sites in EP40547.

While only one previously recorded site is known to have been worked prior to 1900, historical research also demonstrates other pre-1900 sites exist in the area. The dray road was constructed in 1885 and a water race extended from the Buckler Burn to the area where the ore was crushed and dressed (Otago Witness, 1886). Additionally, it is reported that small-scale mining continued after the closure of the Wakatipu Scheelite Mining Company (Lake Wakatip Mail, 1900); however, it is not clear from where this ore was mined.

5.2 Heritage Sites within EP50547

Unlike archaeological sites, heritage sites are not well defined. Archaeological sites are those that witnessed human occupation or use prior to the year 1900. Heritage sites can be any site that provides for the understanding or history of New Zealand. As noted above, some of the sites listed as archaeological technically don't meet the definition of an archaeological site but can still be considered as valuable heritage sites. There are, however, a number of "heritage" sites that are not also recorded as archaeological sites.

5.3 Site Types

Based on previous surveys (see Cropper & Cawte, 2015; Jones, 2014), the whole project area can be considered a mining complex as opposed to individual archaeological and heritage mining sites. Previous surveys' identified a vast amount of mining activity covering an extended period of time, which correlates with the historic records for the mining that took place. The mining activity recorded during the survey has been categorized into three types of mining site features (Category 1-3) that are considered to reflect a variety of mining activities.

- **Category 1:** Features in this category are considered primary evidence of mining. This includes, mine entrances, adits, stopes, and sluiced areas.
- **Category 2:** Features in this category are considered secondary evidence of mining. This includes waste rock, tailings, and artefacts.
- **Category 3:** Features in this category are considered tertiary evidence of mining. This includes, water races (head and tail), reservoirs/dams, terraces, support services, mining roads, and fluming/chutes, and processing areas. Other non-mining features were also coded as Category 3.

Each of these categories then has sequence or stratigraphy in terms of the life of mining which spans the late nineteenth century through the majority of the twentieth century. There appears to be considerable overlap in terms of mining areas with early mining activity being disturbed or destroyed by later mining activity

Cropper and Cawte (2015) show that methodologically, the main method for mineral extraction has been underground mining with Category 1 adits and drives representing the most abundant evidence type. Similarly, the survey has shown that a wide range of primary, secondary and tertiary features and material are present within the permit area painting a picture of a large mining complex developed over 130 years of scheelite mining in Glenorchy (*ibid*).

The survey presented in Cropper and Cawte (2015) has produced 94 sites/areas of interest, including many of the previously identified archaeological sites (Table 5-2, Figure 5-4, and Figure 5-5). The main difference between Mt Judah sites and those on Mt McIntosh are that those of Mt McIntosh are more sporadic and are readily identified as twentieth century owing to the types of artefacts that remain scattered across the landscape (Figure 5-3). There are also more open cast mining remnants on Mt McIntosh than that of Mt Judah. This is most likely a result of twentieth century technology making access to this area easier. Additionally, the use of a bulldozer meant tracks and roads were easily formed and thus greater ease of access granted. Mt Judah sites are more dense, with more overlap and show a greater range of ages and site types. Examples of sites encountered during the surveys and terrain are provided below (Stage 1: Figure 5-6 through Figure 5-17; Stage 2: Figure 5-18 through Figure 5-23).

Table 5-2. Frequency of site types encountered in Stage 1 and Stage 2 areas.

Stage	Site Type	Frequency
1 – Mt Judah	1	16
	2	10
	3	21
	1 and 2	3
	1 and 3	1
	1, 2, and 3	6
	Total	**57**
2 - Mt McIntosh	1	0
	2	4
	3	28
	1 and 2	1
	2 and 3	2
	1 and 3	0
	1, 2, and 3	1
	Total	**37**

Figure 5-3. Examples of twentieth century materials identified at sites on Mt McIntosh.

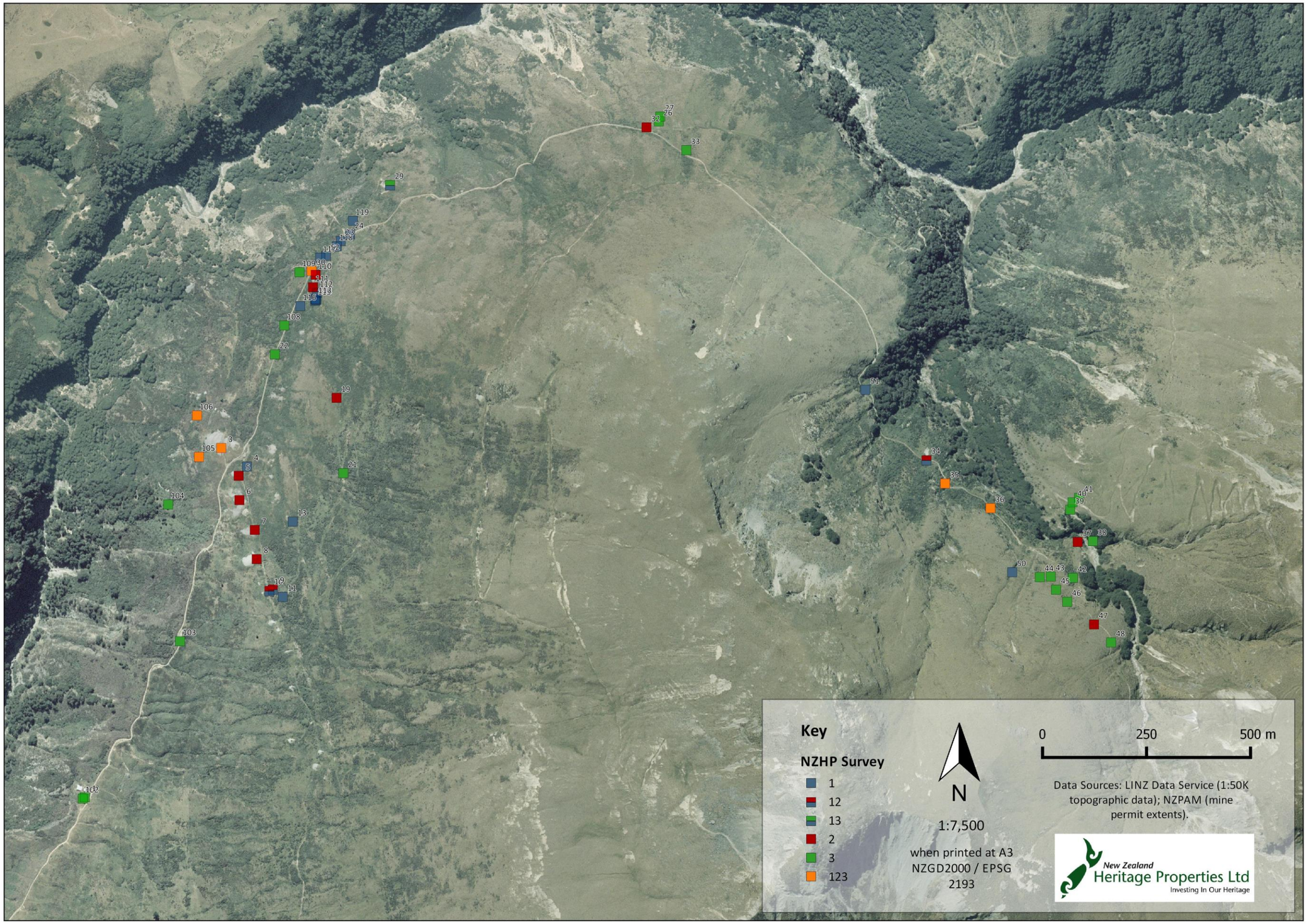

Figure 5-4. Distribution of sites by type on Mt Judah (Stage 1).

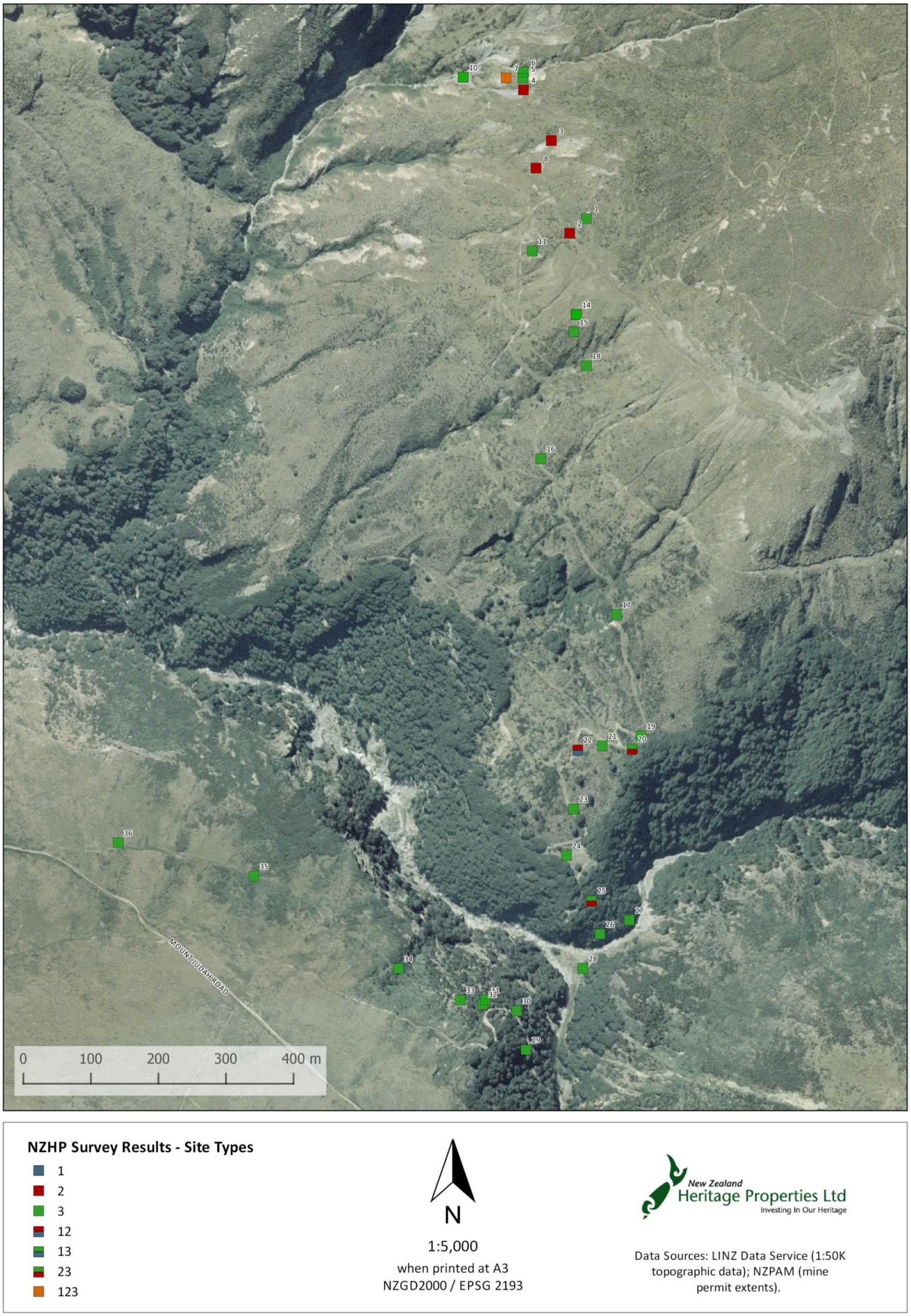

Figure 5-5. Distribution of sites by type on Mt McIntosh (Stage 2).

Figure 5-6. Mt Judah Track.

Figure 5-7. Glenorchy Scheelite Battery Site.

Figure 5-8. The start of the State Mine complex.

Figure 5-9. Terrain on the western side of the hill.

Figure 5-10. Mt Judah Track.

Figure 5-11. Looking up towards Mt Alaska.

Figure 5-12. Looking towards Mt McIntosh.

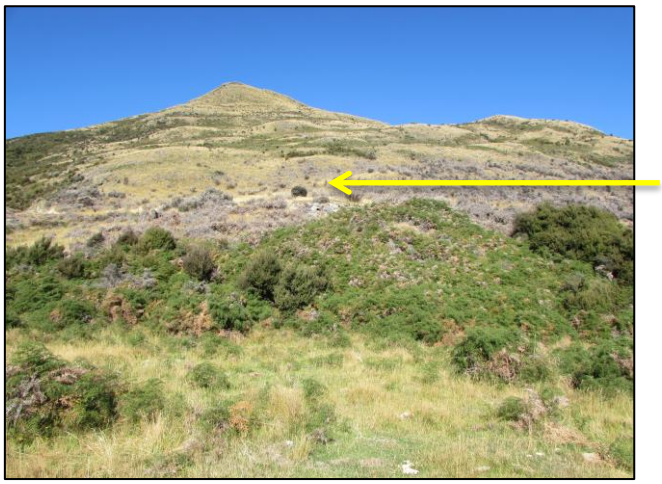

Figure 5-13. Terrain around the north side of Mt Judah. Yellow arrow points to fluming up the mountainside.

Figure 5-14. Mt Judah Road along the north face of Mt Judah.

Figure 5-15. End of Mt Judah Road at the Bonnie Jean Creek.

Figure 5-16. Jean Hut with Wallers Spur in the background.

Figure 5-17. Complex of features visible across the valley from Mt Judah.

Figure 5-18. McIntyre Hut.

Figure 5-19. Mine Waste Rock at Gollop No. 1 (2?)

Figure 5-20. Timbered adit at Gollop No. 1 (2?)

Figure 5-21. Aerial cableway.

Figure 5-22. Steel frame (Site No. 24, Stage 2).

Figure 5-23. Fluming on track (Site No. 26, Stage 2).

5.4 Sites of Significance to Maori

While the research undertaken by Cropper and Cawte (2015) shows no Maori sites within the permit area, consultation with Te Ao Marama was undertaken in order to understand Maori values and interest in the area. Consultation confirmed that there were no known sites of significance to Maori within the project area; however, a process was agreed for accidental discovery. This process is further outlined below.

5.5 Heritage and Archaeological Values

In evaluating the heritage sites across the permit area, for their; condition, rarity/uniqueness, contextual value, information potential, amenity value, aesthetics/character, Cropper and Cawte (2015) have identified a range of heritage values with decreasing numbers of sites with high significance compared to the more frequent, sites of low significance. The highly significant sites tend to be complexes that is to say, groups of sites that combine to form a mining complex in which most or all parts of the mining process can be identified in a relatively restricted area. These values are tallied into an overall significance for each surveyed site and area shown in Figure 5-24 and Figure 5-25 below.

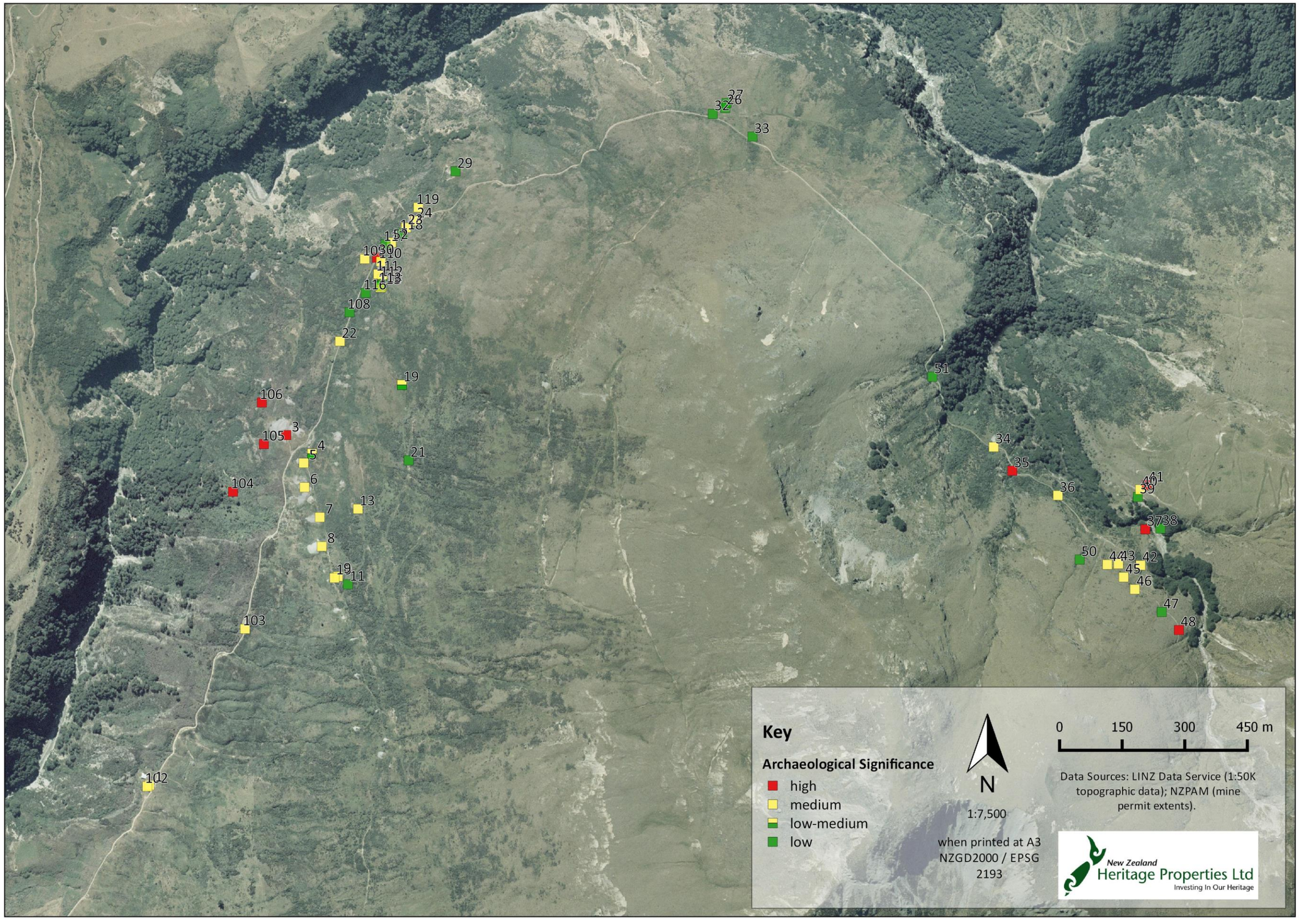

Figure 5-24. Archaeological significance of sites identified during the Stage 1 survey of Mt Judah.

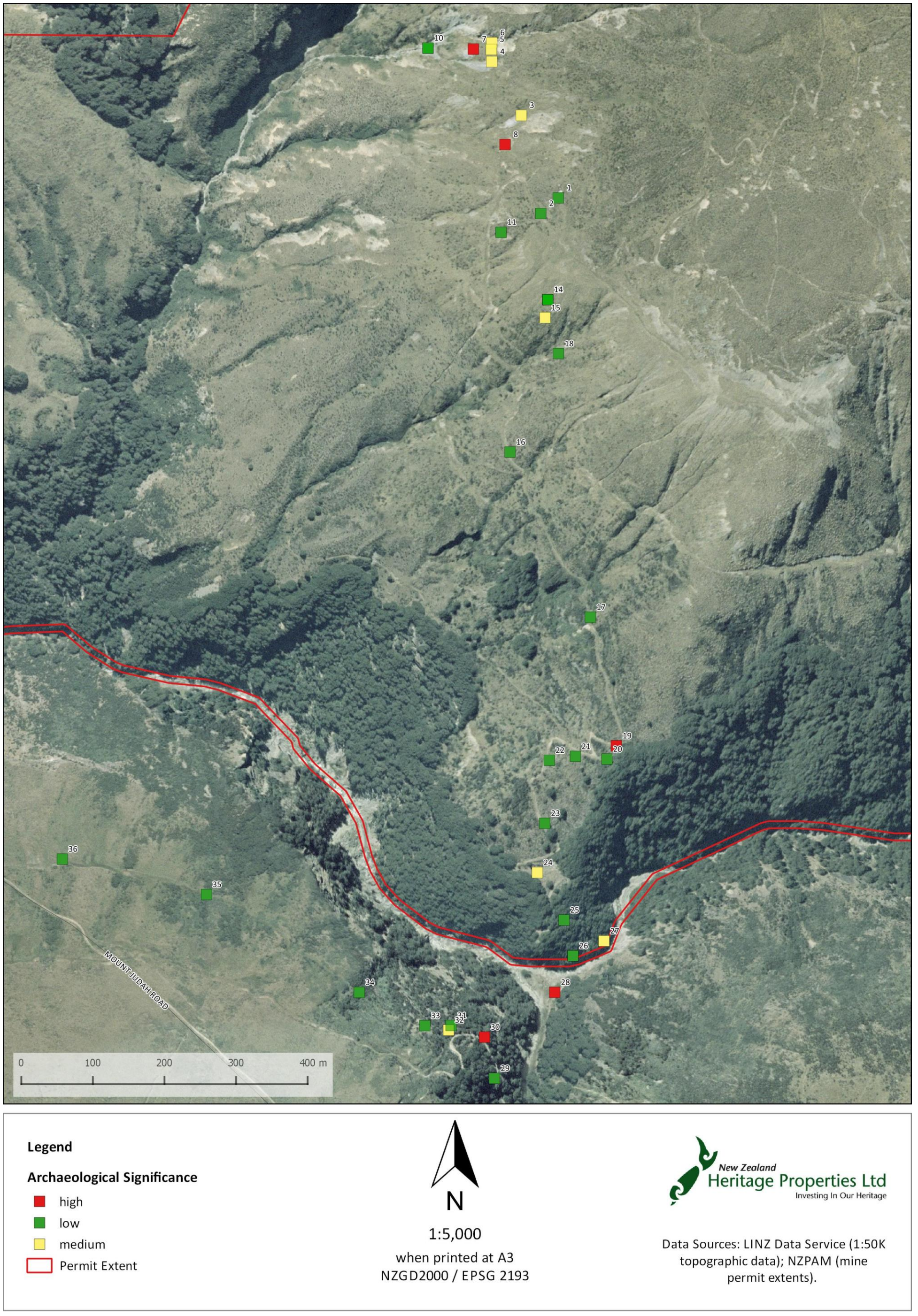

Figure 5-25. Archaeological significance of sites identified during the Stage 2 survey of Mt McIntosh.

6 Assessment of Effects

The proposed exploration activities (minimum impact activities and drilling) have the potential to affect a range of heritage and archaeological sites across the EP40547 permit area (Table 6-1). In considering the proposed drill locations with the known location of sites (Figure 6-1) we can see some overlap. Under the proposed activities, effects can occur in four ways; site establishment works, creating a working area, moving the drilling rig from site to site, and the physical drill holes themselves. Given the nature of core drilling, geophysical surveying and sampling using handheld methods, the effects would be considered minor. The location of the proposed exploration sites are somewhat flexible and can occur up to metres from their proposed locations. Therefore, there is the ability to locate exploration sites to avoid any effect upon the previously identified heritage sites. In this case, there is considered to be no effect.

Table 6-1. Summary of the assessment of effects and mitigative measures for drilling at EP40547.

Effect	Ranking of effect	Avoid/remedy/mitigate	AEE action
Establishment of drill site equipment	Minor	Avoid	Archaeologist to brief contractors prior to establishment works on what constitutes a site, how to identify them and thus, how to avoid sites during establishment works.
Location of working area for core drill site	Minor	Avoid	Archaeologist to visit site and brief contractors prior to works as to what constitutes a site and thus, how to avoid it.
Movement of drill rig could impact upon archaeological and heritage sites	Minor	Avoid	The rig will be largely airlifted across the landscape, however, where it is to be tracked an archaeologist to advise contractors of features to avoid.
Drill hole	Minor	Avoid	Archaeologist to brief contractors prior to works meaning sites can be easily avoided

As noted, there are potential minor effects to heritage and archaeological sites, however, in selecting the specific drill sites on the ground, all effects can be reduced to the level of no affect.

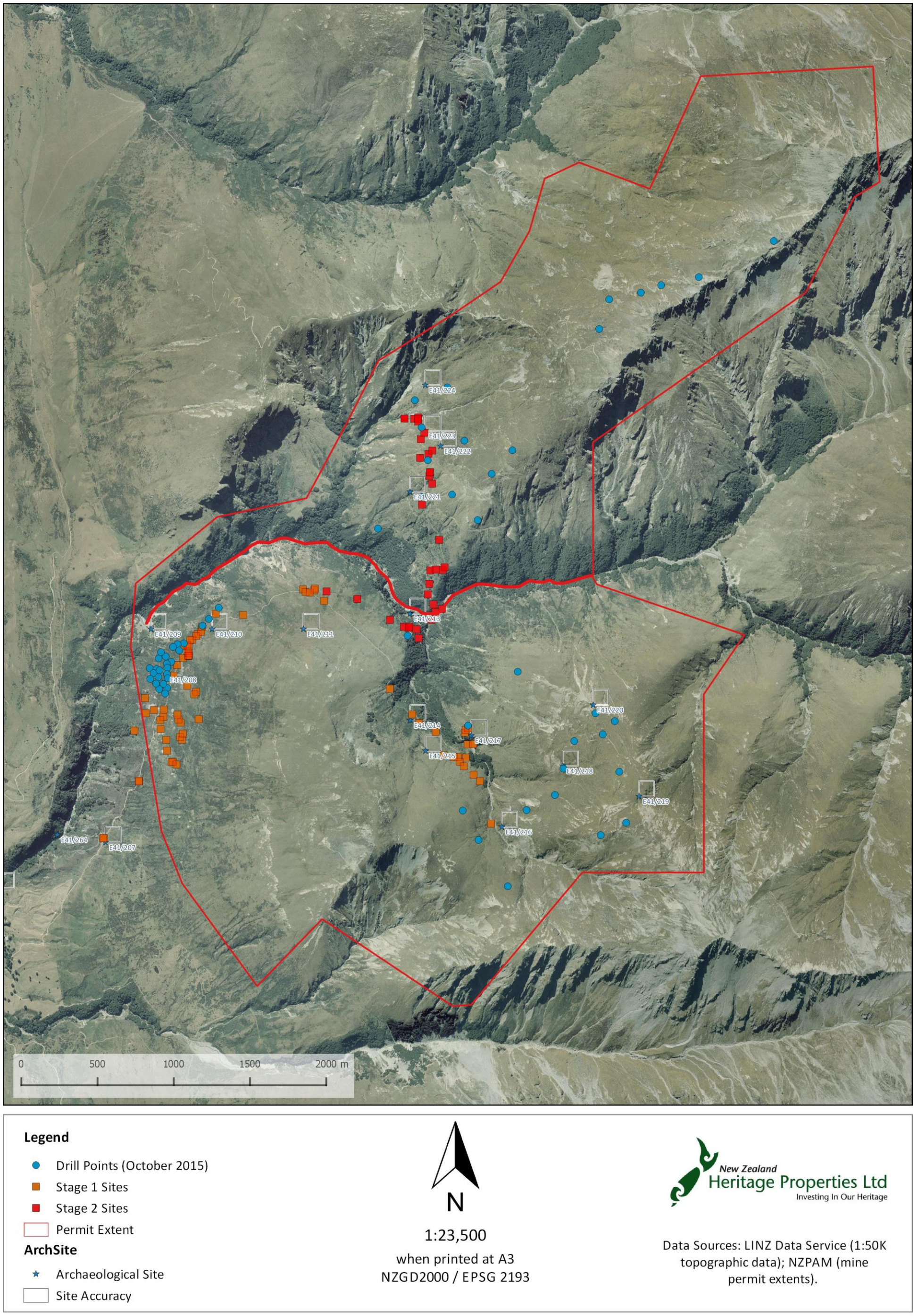

Figure 6-1. Relationship of sites recorded during the Stage 1 and 2 surveys with previously recorded archaeological sites and proposed drill locations.

7 Conclusions and Recommendations

The proposed exploration activities within the Mt Judah, Mt McIntosh and surrounding area of the Glenorchy Scheelite mines have the potential to affect known heritage and archaeological sites. The area is littered with mining remnants. Mining began, in earnest, in the 1880's continuing into the twentieth century subject to the wax and wane of market forces dictating demand and mine viability. In the context of these enduring mining operations the proposed minimum impact and drilling activities within the mining cycle, is considered an appropriate development subject to the following measures;

- Initial establishment of equipment for minimum impact operations and drill sites will be inspected by qualified heritage practitioner.
- An operator's briefing will be provided to ensure personnel are aware of what constitutes archaeology and heritage, and thus, are provided with means of avoiding said sites.

While no known Maori sites are recorded within the area, there is the potential to inadvertently encounter Maori sites during the proposed works. The possibility of damaging these or any other site can be avoided by providing a contractor briefing, and instituting an accidental discover protocol.

This process has been conveyed to local iwi and iwi are in agreement that this is an appropriate precaution. 'Accidental discovery protocol' is a term used in archaeology when items and material are encountered unexpectedly and usually in absence of an on-site archaeologist. The accidental discovery protocol identifies the process of dealing with unexpected finds and features. In cases where there is no heritage professional on site, NZHP must be contacted immediately. If these artefacts are European in origin, the approved archaeologist must be contacted before works can proceed in that area.

To assist with this process those working on site may send photographs of the artefacts to NZHP. At this stage we will inform the site supervisor or relevant personnel of how to proceed, specifically whether works in that area need to be delayed until an archaeologist can investigate or not.

If any Maori material is encountered, all work must stop within 20 metres of the find and NZHP be contacted. At this time, the approved archaeologist will consult with Heritage New Zealand, the Ministry for Culture and Heritage, and Te Runanga Te Ao Maramama. Dependent upon the nature of the recovered Maori cultural material site works can continue outside of the 20 metre radius.

The proposed minimum impact activities and drilling exploration activities within the Glenorchy scheelite mining area is an appropriate development within the existing heritage landscape as all effects can be avoided by selecting specific target locations in consultation with a heritage professional.

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