APPENDIX H

Archaeological Assessment

Archaeological assessment of effects

Proposed Quarry: Whakanui Stud
Cambridge & Hooker Roads

Report prepared for: Shaws Quarries Limited

RedOx
Cultural Heritage Services

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Contents

Summary **1**

Introduction **2**

Statutory requirements **3**
- Waipā District Plan 3
- Waikato District Plan – Operative in Part 4
- Heritage New Zealand Pouhere Taonga Act (HNZPTA) 2014 6
- The Resource Management Act (RMA) 1991 7

Background **7**
- Landform and soils 7
- Geology of the Middle Waikato Basin 8
- Archaeology within the subject area 10

Archaeology in the immediate vicinity **11**
- Recorded archaeological sites within and adjacent the site 11

Historical Background **14**

Historic plans and aerials **14**
- Historic plans 14
- Historic aerials 15

LiDAR data **17**

Fieldwork – site visit **17**
- Method 17
- Results – Auger survey 18
- Results – Test pits 20

Assessment of Archaeological Values **21**
- Heritage New Zealand criteria 22
- Waikato Regional Policy Statement Criteria 23

Assessments of effects on archaeological values **24**

Conclusions and recommendations **24**

References **26**

Appendix 1: Test pit results **27**

Figures

Figure 1. Location for the proposed quarry (Site) within the wider Cambridge landscape (Source: LINZ). .. 2

Figure 2. Area of the proposed quarry Site (yellow polygon) and the proposed entrance off Hooker Road (blue ellipse). The red area is the total land area purchased by Shaws (Source: LINZ). 3

Figure 3. Excerpt from Waikato soil map showing approximate soil distribution within the general area of the Site. Soils overlays are considered approximate since they estimate soil types based on identifying factors and not always soil testing (Source: LRIS). 8

Figure 4. Block diagram showing the principal landform units of the Hamilton Basin (Lowe 2010:4). 9

Figure 5. Block diagram showing the soils found in the Hamilton Basin and their relationship to the landform units (Lowe 2010:5). 9

Figure 6. Recorded archaeological sites within and adjacent the Site (Source: NZAA ArchSite). 12

Figure 7. Excerpt from SO96-2 (1879) showing the land given to the leaving militiamen (Source: Quickmap). 15

Figure 8. Excerpt from aerial photography from 1939 (SN266_834 57 & 59) (Source: Retrolens). 16

Figure 9. Excerpt from aerial photograph from 1971 (SN3470_4513-20). Modern development including the horse stables and the quarry are visible in the image (Source: Retrolens). 16

Figure 10. LiDAR derived hillshade model from DEM data taken in 2023–2024 that shows the site for the proposed quarry and some of the surrounding landscape. The green ellipse shows an example of the visible borrow pits (Source: LINZ). 17

Figure 11. Location of borrow pits, auger samples and test pit locations. Green circles are previously identified potential borrow pits (Source: LINZ). 18

Figure 12. Taken from the south looking north across the western half of the Site. Some of the larger borrow pits are clearly visible in the image. The historic sand quarry is visible. 19

Figure 13. Taken from the south looking north across the Site. Some of the larger borrow pits are clearly visible in the image. The historic sand quarry is visible in the upper image. Upper=western half, Lower=eastern half. 19

Figure 14. Taken from the north showing the eastern side of the Site. 19

Figure 15. Taken from the north showing the western half of the site. The stables are visible in the foreground. 20

Figure 16. Test pit 4 showing the layering of soils. Red lines are approximate layer boundaries. 20

Summary

Shaws Quarries Limited commissioned RedOx Cultural Heritage Services (RCHS) to undertake an Archaeological Assessment of Effects (AAE) for a proposed new quarry adjacent the Waikato River and Cambridge and Hooker Roads (called the Site). The Site has been subject to both background desktop research, including historic documents, aerial imagery, historic maps, archaeological reports and archaeological site data held in the New Zealand Archaeological Association database, ArchSite, and a site visit of the entire site over two days in June 2025. Desktop research and a site visit identified multiple archaeological sites within the Site. These form part of a larger and interconnected archaeological landscape along the Waikato River and its margins. Further archaeological evidence was identified during the site visit whereby several additional unrecorded areas of archaeology were detected during the pedestrian and auger survey which have been recorded as archaeological sites. Several test pits confirmed that archaeological preservation is good across the Site. The entire Site (quarry/yellow polygon) was surveyed. However, the total number of parcels purchased by Shaws Quarries Limited is an area larger than the area identified for the proposed quarry footprint. This remaining, extra land (red polygon) has not been assessed, nor has any site visit been conducted. It has been stated that the quarry shall lie within the area assessed, the yellow polygon in maps provided. If the proposed quarry area is modified, then any extra land areas must be assessed by a qualified archaeologist using the same criteria as for this assessment.

Recorded archaeological sites (borrow pits and modified soils) identified within the Site are common along the Waikato River, its margins, and the environment of the Middle Waikato Basin. These sites represent a contiguous pre-European Māori occupation and horticultural landscape, interconnected with one another and the pā along the river margins. On the terrace below, and on either side of the site are further archaeological sites including S15/794 pā. Such sites are most probably functionally interconnected to the surrounding gardens. The pā boundaries, however, based on landform and data in Simmons (2021) report lie outside the Site; according to the applicant the proposed quarry will not affect it. There have been no archaeological investigations within the proposed site, however, some investigations have been undertaken along the Waikato River for the Te Awa cycleway, Te Awa Lifecare Village and the Arikirua subdivision. Within the lower terraced area adjacent to and below the site there were multiple remains from recorded and unrecorded archaeological sites including Māori horticulture and features relating to the pā. Since there are multiple recorded archaeological sites within the Site and the potential for unrecorded archaeology an Authority is required from Heritage New Zealand Pouhere Taonga prior to any works beginning that may affect archaeology within the Site.

Mana Whenua should be consulted at an early stage regarding this assessment, the conclusions reached and the cultural effects of the proposed quarrying activities.

Introduction

Shaws Quarries Limited propose to establish a proposed sand quarry (Site) within Whakanui stud and associated land parcels (Part Lot 3 DP 26177, Lot 4 DP 571795, Lot 3 DP 572677, Lot 3 DP 571795, Lot 1 DPS 71331, Lot 1 DPS 15181, Lot 1 DPS 11673 & Lot 1 DP 572677) (Figures 1–2). The Site comprises an area smaller than the total land area purchased by Shaws Quarries Limited; an area of approximately 55 Ha and an extra area for an entranceway from Hooker Road.

The Site encompasses multiple recorded archaeological sites, which be affected at some stage by the proposed quarry (dependant on staging). Archaeological sites relate to Māori horticulture and occupation. A site visit was conducted of the entire Site which included a visual pedestrian and auger survey (5–6 June 2025). Select test pits were undertaken to establish the quality of Māori horticultural soil and to establish potential for further archaeological remains within and around the borrow pits/sites. The site visit relocated all the recorded archaeological sites as well as identifying areas of previously unrecorded archaeology within the Site including areas of made soil and additional borrow pits; now recorded in ArchSite as new recorded sites. Intactness of archaeological sites and deposits was determined as good. This indicates good preservation conditions and high potential for further subsurface archaeological features relating to crop production, storage and occupation. Archaeological sites whether they be recorded or unrecorded are protected under the HNZPTA Act 2014.

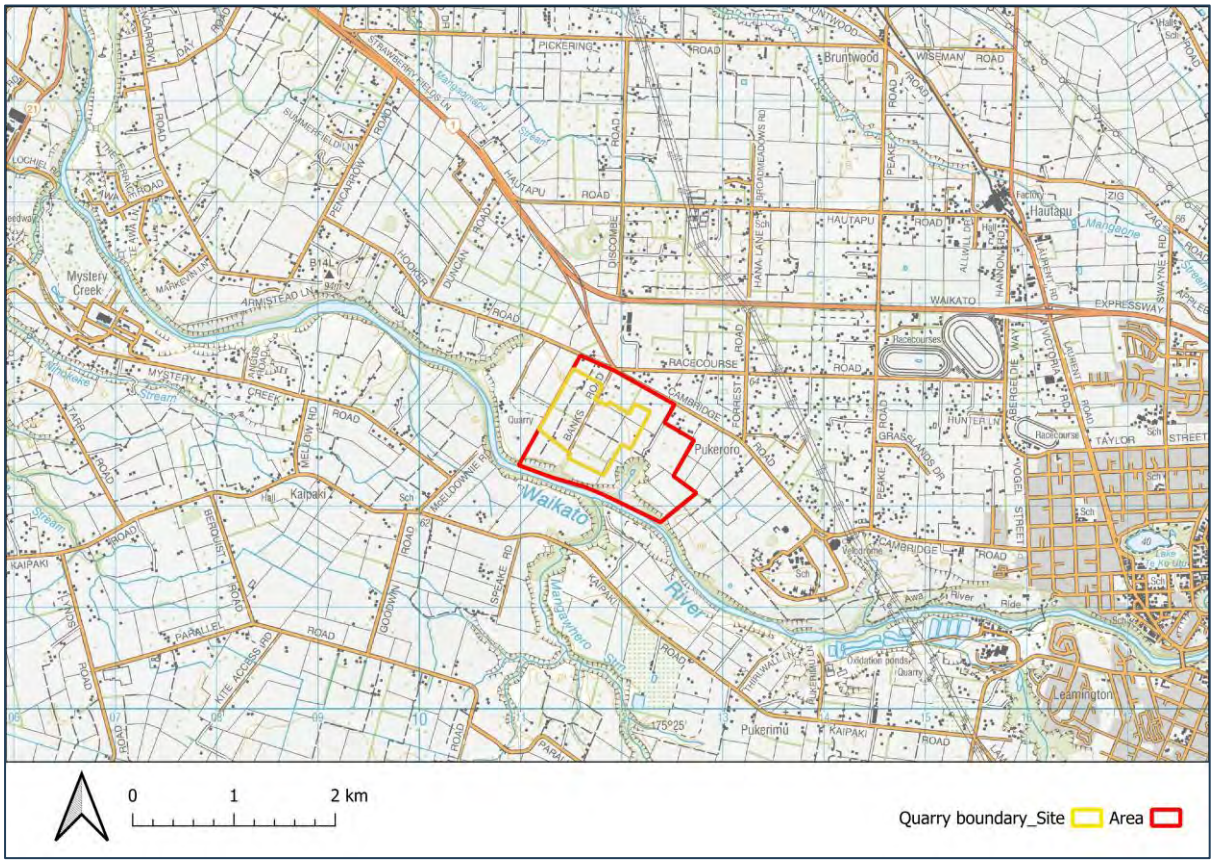


Figure 1. Location for the proposed quarry (Site) within the wider Cambridge landscape (Source: LINZ).



Figure 2. Area of the proposed quarry Site (yellow polygon) and the proposed entrance off Hooker Road (blue ellipse). The red area is the total land area purchased by Shaws Quarries Limited (Source: LINZ).

Statutory requirements

The management of archaeological historical and cultural sites and landscapes are controlled by the Resource Management Act (RMA) 1991 and its associated District Plans and Regional Policy Statements. Archaeological sites are also explicitly protected through the archaeological provisions of the Heritage New Zealand/Pouhere Taonga Act 2014 (NZHPTA). This Act prevents archaeological sites from being modified or destroyed without an Authority from Heritage New Zealand (HNZ).

Waipā District Plan

The Waipā District Plan (WDP) describes the objectives and policies, and rules for land use activities and subdivision. The WDP prescribes what, where and how activities can happen as well as protecting buildings, natural features and sites of significance. It is required to achieve the purpose of the RMA.

Outlined below are the relevant provisions of the Waipā DP:

Part F – District Wide Natural and Cultural Heritage

Section 22 - Heritage and Archaeology

Retaining archaeological heritage

22.2.4 The District's archaeological heritage has not been extensively recorded. Earthworks and the location of buildings in the District present an ongoing challenge to the protection and

retention of archaeological heritage. This may result in sites being discovered accidentally, and/or damaged as part of a development.

Objective - Protecting archaeological heritage

22.3.4 To protect the integrity of archaeological heritage items from inappropriate subdivision, use and development.

Policy - Protection of archaeological areas

22.3.4.1 Development shall not be located within the setback from a mapped archaeological area (Appendix N3), if adverse effects on the archaeological area cannot be avoided, remedied or mitigated.

Policy - Archaeological sites

22.3.4.2 To ensure that development does not adversely affect the archaeological resource of the District.

Waikato District Plan – Operative in Part

Part 2: District-wide matters

Historical and cultural values

HH - Historic heritage

Objective

HH-O1 - Historic heritage.

A district that acknowledges its past by: recognising, identifying, protecting, conserving and promoting historic heritage.

Policies

HH-P1 - Identification.

(1) Identify and schedule historic heritage throughout the District that represent the heritage values important to the district's identity. Those values are limited to:

(a) Archaeological;

(b) Architectural;

(c) Cultural;

(d) Historic;

(e) Scientific; and

(f) Technological.

HH-P2 - Historic heritage items.

(1) The contribution of historic heritage to the District and its communities is maintained through the protection and conservation of its buildings, sites, structures, places and areas through restoring, conserving and reusing.

(2) Protect historic heritage items and their heritage values from inappropriate subdivision, use and development of land where the heritage values relate to:

(a) Archaeological;

(b) Architectural;

(c) Cultural;

(d) Historic;

(e) Scientific;

(f) Technological; and

(g) Intrinsic or amenity values.

(3) Relationships between heritage buildings, sites, structures, places and their extent of setting are retained.

(4) Protect the relationship of identified redoubts and battlefields with their surrounds or settings from inappropriate subdivision, use and development.

(5) Protect historic heritage items from demolition, relocation or removal.

(6) Ensure alterations and additions to historic heritage items are:

(a) Consistent with the scale, detailing, style, materials and character of the historic heritage item;

(b)Retain the historic heritage item's heritage values;

(c) Do not compromise the historic heritage item, or have a design that competes with its historic heritage values; and

(d) Do not compromise the extent of setting of the historic heritage item.

(7) Ensure maintenance and repairs protects the heritage values of the historic heritage items.

(8) Ensure signs on historic heritage items are only for the purposes of identification and interpretation, and:

(a)Do not detract from the heritage values; and

(b)Maintain the historic heritage item as the primary visual element.

(9) Ensure the long-term viability, vitality, retention, and ongoing functional use of the historic heritage items, through matters including:

(a)Maintenance and repair;

(b) Earthquake strengthening;

(c) Compliance with fire safety requirements;

(d) Adaptive re-use.

HH-P4 - Subdivision and development.

(1) Ensure subdivision and development does not compromise the heritage values of historic heritage items or the extent of setting, by:

(a) Managing activities that occur within the extent of setting for each historic heritage item; and

(b) Having regard to the degree to which the extent of setting necessary to retain and protect the historic heritage item's heritage values is contained within one lot.

Rules

Advice note:

The effects of activity on archaeological sites, both recorded (identified by the New Zealand Archaeological Association) and unrecorded, are regulated under the Heritage New Zealand Pouhere Taonga Act 2014. Contact with Heritage New Zealand Pouhere Taonga is required to determine the need to undertake an archaeological assessment to determine the need for an archaeological authority under that Act.

Heritage New Zealand Pouhere Taonga Act (HNZPTA) 2014

The HNZPTA provides blanket protection to all archaeological sites meeting the definition in the Act, whether they are recorded or not. Protection and management of sites is managed by the archaeological authority process, administered by HNZPT. It is illegal to destroy, or modify archaeological sites without an authority to do so from HNZPT.

The HNZPTA 2014 (s6) defines an archaeological site as:

(a) Any place in New Zealand including any building or structure (or part of a building or structure) that:

(i) was associated with human activity that occurred before 1900 or is the site of the wreck of any vessel where that wreck occurred before 1900; and

(ii) provides, or may provide through investigation by archaeological methods, evidence relating to the history of New Zealand; and

(b) Includes a site for which a declaration is made under Section 43(1) of the Act[1].

Any person who intends carrying out work that may modify or destroy an archaeological site, or to investigate an archaeological site using invasive archaeological techniques, must first obtain an authority from HNZPT. The process applies to sites on land of all tenure including private, public and designated land. The HNZPTA contains penalties for unauthorised site damage.

[1] Such declarations usually pertain to important post-1900 remains with archaeological values.

The Resource Management Act (RMA) 1991

The *Resource Management Act 1991* (RMA) requires City, District and Regional Councils to manage the use, development, and protection of natural and physical resources in a way that provides for the wellbeing of today's communities while sustaining the potential of natural and physical resources for future generations. The protection of historic heritage from inappropriate subdivision, use, and development is identified as a matter of national importance (section 6f).

Historic heritage is defined as those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures, derived from archaeological, architectural, cultural, historic, scientific, or technological qualities.

Historic heritage includes:

- historic sites, structures, places, and areas;
- archaeological sites;
- sites of significance to Māori, including wahi tapu;
- surroundings associated with the natural and physical resources (RMA section 2).

These categories are not mutually exclusive, and some archaeological sites may include above ground structures or may also be places that are of significance to Māori.

Where resource consent is required for any activity the assessment of effects is required to address cultural and historic heritage matters (RMA Schedule 4).

Background

Landform and soils

The local landscape is dominated by the Waikato River, which runs to the south of the Site. Landform of the Site is composed of the upper river terrace with small paleochannels and levees across its surface. Soils within the Site are identified as Horotiu and Bruntwood series soils on the upper terrace. The lower terrace outside of the Site (to the south) towards the river comprises Waikato series soils. Both soil series are free draining and considered suitable/favourable for Māori horticulture (Figure 3). The auger survey identified that most of the Site is covered with Horotiu silt loam or Horotiu sandy silt loam. Both soils were identified on the upper terrace in combination with made (Tamahere) loam (Māori horticultural soils / made soil) which indicates widespread Māori Horticulture. Early soil survey maps also identify Tamahere loam across the Site; although the area identified in the auger survey exceeded this area. A large proportion of the area, identified in Figure 3, is Tamahere gravelly sand. Auger sampling determined this positively as Māori horticultural soils. This soil type was also found at several further locations/extensions inland across areas not previously recorded as having Tamahere loam.

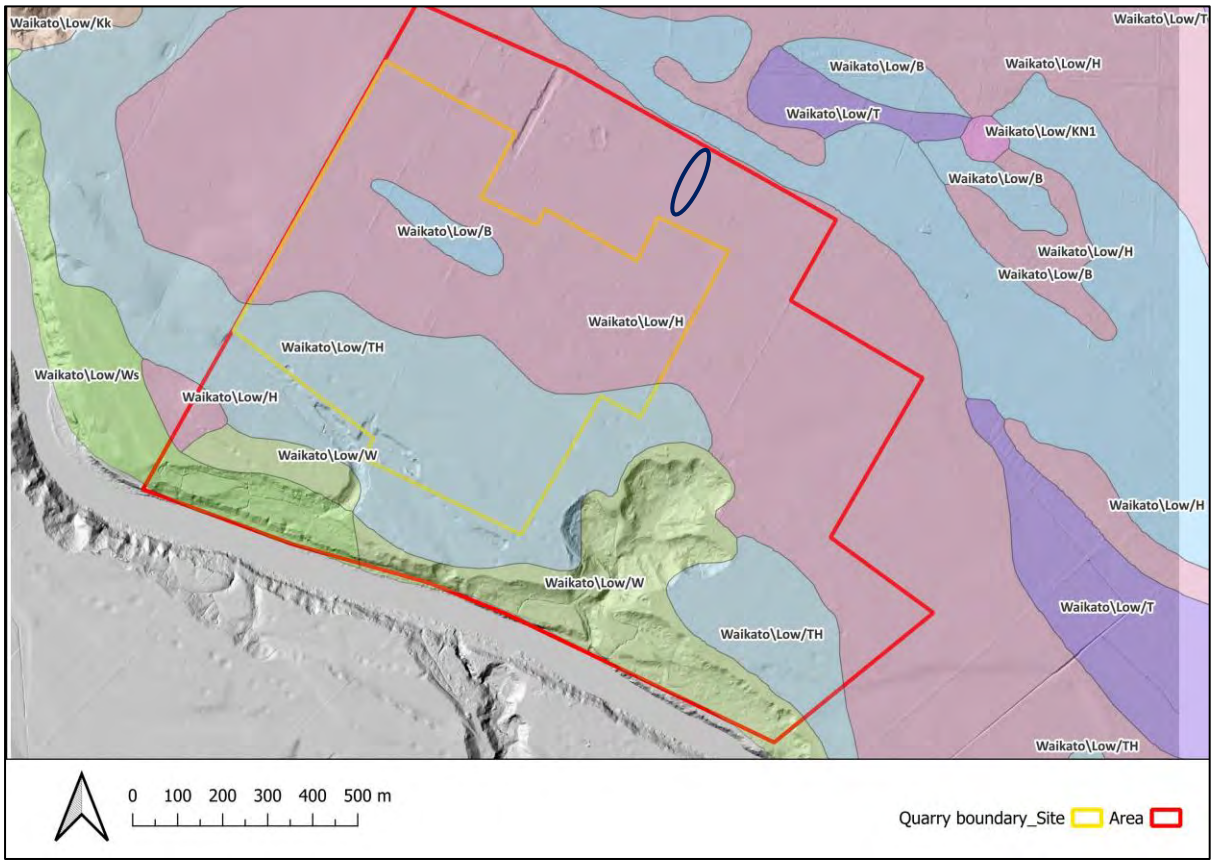


Figure 3. Excerpt from Waikato soil map showing approximate soil distribution within the general area of the Site. Soils overlays are considered approximate since they estimate soil types based on identifying factors and not always soil testing (Source: LRIS).

Geology of the Middle Waikato Basin

Both the Waikato River, Oranui eruption and Taupo pumice alluvium (Hatepe Eruption) have caused significant changes to the landscape of the middle Waikato basin, shaping the modern environment (Figures 4–5). During the last one hundred millennia a meandering braided Waikato River has both eroded and deposited sediment across the landscape. This has transformed the landscape into a rolling somewhat flattened environment made up of gently rolling hills composed of raised levees and depressed swales. After the Oranui eruption the Waikato was forced to change course being redirected away from the Firth of Thames into the Waikato basin, and finally through to its current outlet at Port Waikato. The Waikato's high energy braided river system distributed sediment across the Hamilton Basin in various thicknesses and consistencies. This landscape, represented as a braided fan, has now been classified as the Hinuera surface (Lowe 2010: 5; McLeod 1984:2). After the rivers final course had settled into its current alignment an eruption at Hatepe (c. 1800 BP) directed a lahar flow down the river (Taupo pumice alluvium-TPA). This created, through erosion and deposition, a series of new river terraces along the banks of the river, which are still visible today (Lowe 2010: 3–8). Aside from natural modification humans have also significantly modified this landscape, through the construction of defensive sites, living spaces and horticultural areas.

The subject area is mostly located on soils of the Horotiu (H) and Bruntwood (B) soil series (upper flat areas). The adjacent lower terraces adjacent the river are composed of Waikato (W) series. Horotiu/Bruntwood soils are soils formed on the Hinuera surface (sandy/silty loams over a sand gravel water bedded layer) whilst the Waikato series soils are formed from the recent TPA. Both soils are free draining and suitable for Māori horticulture. Within the

subject area there were no soils deemed unsuitable for Māori horticulture (for example Te Kowhai silt loam (Tk)).

To develop horticultural soils suitable for tuber cultivation, Māori added quarried water bedded sand and gravel (deposited by the braided system) to the topsoil layer forming what is now categorised as Tamahere series soils (TH & THw, Made soil, Māori horticultural soil). This soil is classified as a sandy-gravelly loam which underlies a thickened charcoal rich topsoil. Below this layer is a distinct horizon (Ab) which is the remnant of buried topsoil mixed with the Tamahere soil layer and charcoal remnants from forest clearance. Soils of this type are usually associated with Horotiu and Waikato series soils, although they have, to a lesser degree, also been identified on less free draining substrates, for example, Bruntwood and Te Kowhai silt loams (Grange et al. 1939: 39–40; Lowe 2010: 7; McLeod 1984; Bruce 1979).

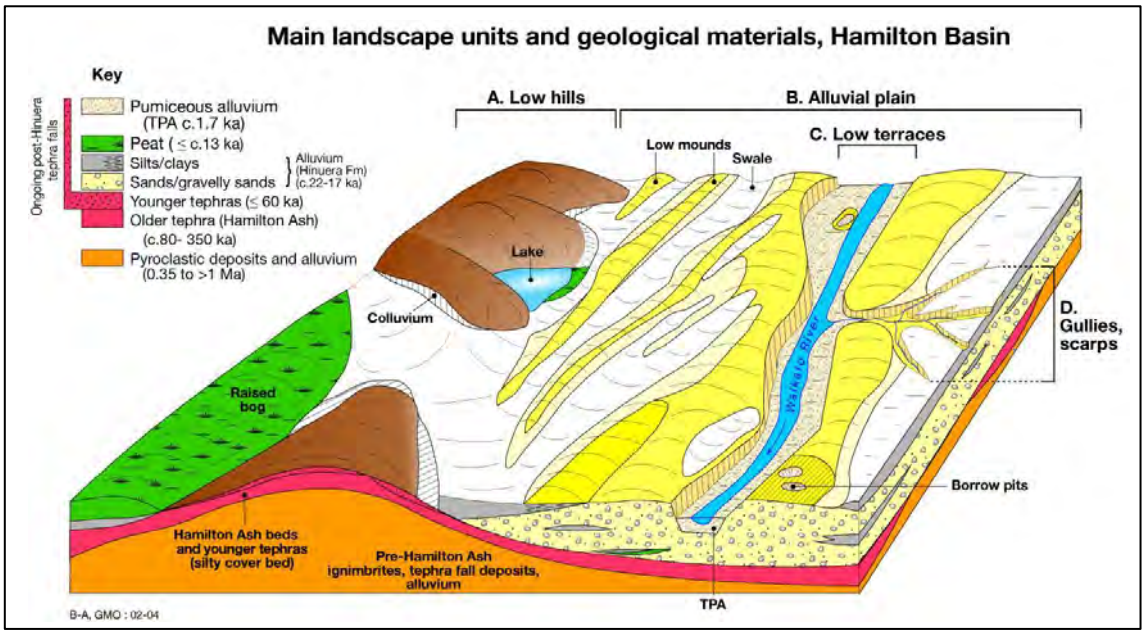


Figure 4. Block diagram showing the principal landform units of the Hamilton Basin (Lowe 2010:4).

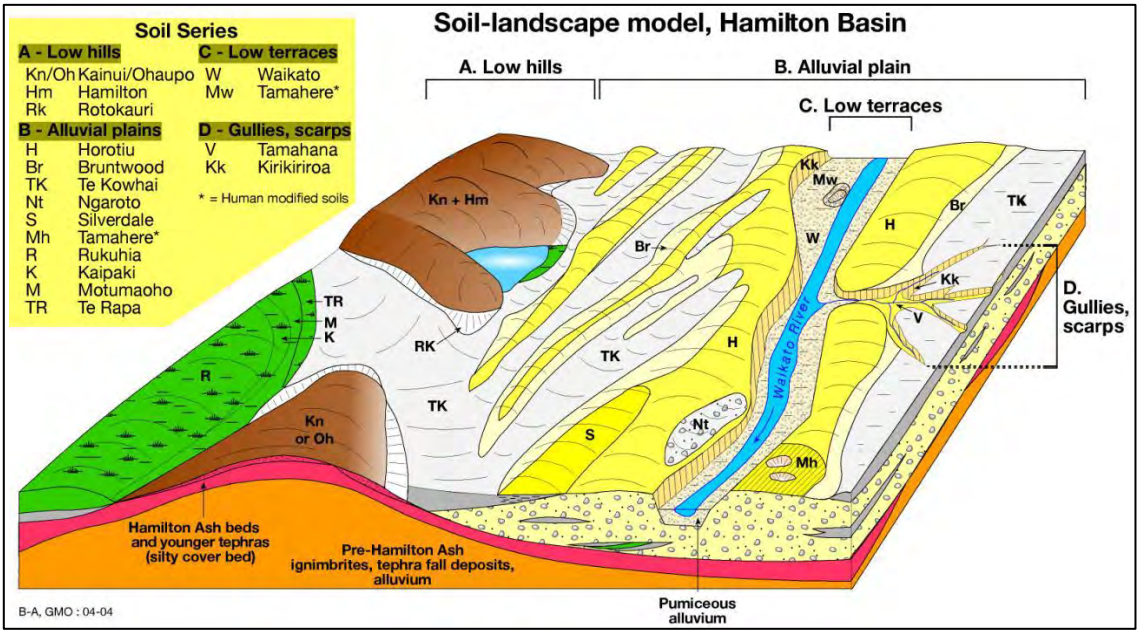


Figure 5. Block diagram showing the soils found in the Hamilton Basin and their relationship to the landform units (Lowe 2010:5).

Archaeology within the subject area

Archaeology within the Site and the surrounding landscape is typical for the Waikato horticultural complex (Gainsford & Gumbley 2021). Feature types listed below are typical for horticultural sites and provide an insight to what type of features may be encountered when dealing with such sites throughout the Middle Waikato Basin/Hamilton Basin. Since recorded archaeological sites containing Tamahere soils have been identified within the Site it is likely that one or more of the features will be present to some degree within or adjacent to each of the identified areas of made/Tamahere soil (TH).

Borrow pits

Borrow pits are significant, easily recognisable features of Māori horticulture. They can vary in size and shape, consisting of single use features, to multi-episodic shafts interlinked over time. Their depth is also variable which is a response to depth of quarriable material, stability and underlying substrates/soils. Borrow pits are 'quarries' used by Māori for the underlying C-horizon alluvium of water bedded sand and gravel which was added to the upper soil layers to create a growing medium. Their morphology usually consists of one or more borrow shafts to remove the sand/gravel alluvium. During quarrying excavated shafts were backfilled; likely a function to uphold stability. These shafts are recognisable on the surface once the topsoil is removed as sub-circular accumulations of backfilled unwanted tephras.

Tuber cultivation - Bowl-shaped hollows (BSH)

Commonly called puke the term 'bowl shaped hollow' was coined by W. Gumbley during his study of Māori horticultural sites. These features are small, sand and gravel filled hollows with loam mounds used for growing tubers. Archaeological remains of these features present as a series of round circles, usually in a regular formation. The sand and gravel fill originates from the quarried C-Horizon material. A single BSH likely represents the production of a single plant with a raised mound (now flattened archaeological remains). These have been identified in the vicinity of the Site around Cambridge, for example, the proposed Arikirua subdivision (Gainsford in prep).

Sand/gravel layers

These layers are identified as remnant mediums used for the production/growing of tubers. They are either composed of a spread-out sand and gravel layer or the remains of BSH mounds that have been flattened with time and reused (Gainsford in prep). These layers can vary in thickness but are usually 10–30 centimetres thick. In exceptional cases they may be thicker depending on landform and sediment wash. They are a completely anthropogenic soil type created by humans for the purpose of horticulture, through the addition of sand and gravel from the C-Horizon to the topsoil. Depending on land use (for example ploughing/cultivation) this soil can be divided into three constituent elements: 1) an enriched turf layer with some sand and gravel, 2) a thicker dark grey coarse sand and gravel layer and 3) a pale yellow brown coarse sand and gravel layer. All these three overly a layer which is described by Grange & Bruce as a buried topsoil layer classified as B(w) (Grange et al 1939; Bruce 1978 & 1979) and the B-horizon below.

Kāinga / domestic activities areas

In addition to the horticultural features domestic/occupation activities areas are found to be closely associated with this site type. This is unsurprising given that the gardens would have been labour intensive, requiring multiple people to be in proximity over varying lengths of time. Features that have been found usually associated with the horticultural sites are fireplaces, ditches, drains, umu, postholes and storage pits (of varying form) (Gainsford in prep).

Charcoal Patches

Represent the burnt remains of the former mature forest that occupied the landscape prior to its clearance by fire. Quite often these features present as large amorphous charcoal dense stains under the topsoil layer in the Horotiu surface (B-Horizon). In some cases, the remains of root systems are identified as a series of dendritic formations through the soil layer. Dating of this layer provides a period for pre-horticulture clearance of the forest.

Archaeology in the immediate vicinity

Identified within the New Zealand Archaeological Associations (NZAA) site recording database (ArchSite) prior to this assessment were six recorded archaeological sites: S15/303 (Artefact), S15/553, S15/554, S15/556, S15/614 & S15/615 (Māori Horticulture). Just outside the Site are the recorded locations for several additional sites, which are part of the same system and likely extend into the Site: S15/555, S15/557 & S15/558 (Māori Horticulture). As a result of this assessment several additional sites were recorded in NZAA site recording scheme ArchSite: S15/795, S15/796, S15/797, S15/798, S15/799 & S15/800 (Māori Horticulture). On the terrace below the Site is a recorded pā S15/794 (outside the Site and will be avoided).

All Māori Horticultural sites listed above are recorded as pre-European Māori borrow pits with associated made soil. The earlier sites were initially recorded via aerial photography and LiDAR derived imagery by Gumbley and Hutchinson in 2012–3 (Gumbley & Hutchinson 2013). Horticultural sites, which are a common site type, follow the Waikato River forming a backbone of archaeological sites from Arapuni to Taupiri. These sites are widespread especially around Cambridge whereby they are found several kilometres from the river. Even if sites are separated by site numbers, they are functionally interconnected archaeological sites within the same contiguous landscape that are related to other occupational sites and pā that dominated the landscape, for example S15/794, on the lower river terrace to the south.

Recorded archaeological sites within and adjacent the site

Sites shown in the below image form part of the same contiguous horticultural landscape of archaeological sites that follow the Waikato River. As such they are interrelated with one another despite being labelled as separate units. As such sites can overlap into one another and have similar qualities and features that are not visible on the ground surface. Their areas are also very approximate and can be larger than the areas identified in ArchSite.

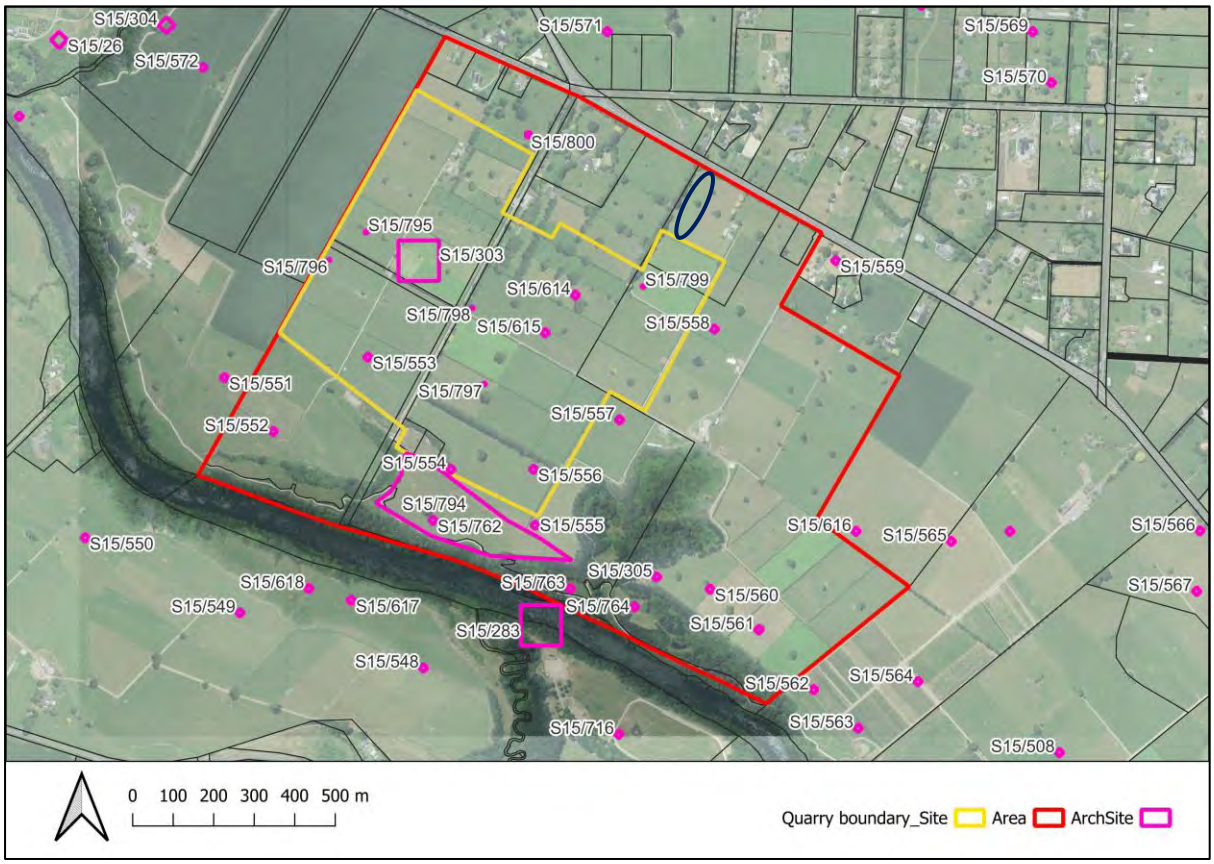


Figure 6. Recorded archaeological sites within and adjacent the Site (Source: NZAA ArchSite).

S15/303

Artefact find spot of an adze located in the middle of the paddock by owner. No further evidence of archaeology.

S15/553

Series of five borrow pits located in a paddock on the upper terrace and recorded from aerial imagery identified in 2013 by Gumbley, 160x50m. Recently Gainsford identified a sixth borrow pit west of the five recorded on the terrace and associated made soil. There may even be borrow pits along the edge of the scarp that are unrecorded.

S15/554

Originally recorded as a series of five borrow pits located along the scarp down to the lower terrace, 130x20m. However, aerial imagery and a recent field visit by Gainsford identified that there is likely six to seven borrow pits with associated made soil.

S15/555

Originally recorded as three borrow pits at the southern end of the upper terrace, 120x50m. Simmons identified the site in 2018 stating that the borrow pits were still clearly visible. Gainsford identified the site and concluded that S15/555 and S15/556 are likely the same site. Both have associated made soil.

S15/556

Originally recorded as two borrow pits through aerial imagery, 50x20m. Gainsford, after Gumbley has identified that the site is larger than stated and that it comprises six borrow pits with associated made soil.

S15/557

Recorded originally as three borrow pits from aerial imagery, 100x20m. Gainford following identification by Gumbley noted that the total number of borrow pits is six. There is substantial made soil surrounding the borrow pits that connects to adjacent archaeological sites.

S15/558

Recorded through aerial imagery review as four borrow pits, 190x40m. The site was not visited by Gainsford since the area proposed quarry area provided, differed from the final quarry boundary. However, auger samples taken adjacent S15/558 within the quarry boundary were negative for made soils.

S15/614

Recorded as a single borrow pit from aerial imagery. Gainsford identified the site and determined that there is made soil surrounding it. This site is likely part of S14/615.

S15/615

Recorded originally as a single borrow pit. However, a site visit by Gainsford verified work conducted by Gumbley that the total number of borrow pits for the site is in fact nine. Borrow pits have a dense made soil around them which connects to adjacent archaeological sites.

S15/794

Recorded as a pā. Simmons observed four in-filled ditches and postholes in a test trench at the edge of the Waikato River. It is noted that site S15/762, gardening soils, is within the speculated boundary of the pā; Dr Warren Gumbley considers it likely that an area of gardening was later enclosed by defensive ditches to protect the resource. The polygon boundary is based on landscape features such as small gullies that may have been utilised for site edges, but it is stressed that the site boundary is inferred. This site lies outside the proposed quarry boundary.

S15/795

Recorded by Gainsford as two borrow pits with associated made soil 115x50m.

S15/796

Recorded by Gainsford as a single borrow pit with associated made soil 160x50m.

S15/797

Recorded by Gainsford as a series of six borrow pits with associated made soils 250x100m.

S15/798

Recorded by Gainsford as a single borrow pit with associated made soil 75x20m.

S15/799

Recorded by Gainsford as a single borrow pit with associated made soil 40x25m.

S15/800

Recorded by Gainsford as a two borrow pits with associated made soil 70x40m.

Historical Background

Māori

After the initial occupation of coastal New Zealand, the Māori diaspora led inland towards the Middle Waikato Basin. To access the Waikato, navigable waterways and accessible land were used to locate suitable areas for horticulture and occupation; evidenced by the plethora of recorded archaeological sites along the Waikato River, its tributaries and gully systems. Recorded archaeological sites within this landscape are a combination of defensive structures; established at higher elevations to provide a watershed of the area, and horticultural sites. Pā are closely linked with surrounding settlements and gardens which utilise fertile soils adjacent to the river for the cultivation of kumara and other plant species. Within the Site and in the immediate vicinity are multiple Māori horticultural sites and a single recorded pā site.

European

During the early influx of European settlers Māori continued as they had since their arrival into the Waikato. Initially the Waikato was not considered favourable by Europeans for farming or cultivation as it was deemed difficult, too swampy and quite inaccessible. Little land changed hands during this period due to its 'unfavourable' nature. However, Māori with newly acquired agricultural skills, tools and modern farming techniques and crop species (introduced often by Missionaries) changed Europeans perceptions. Māori farming and exports became very successful (Phillips 2014). Most likely this success prompted, to a degree, the British invasion of the Waikato (1863) by the Crown. Land acquired was used for European settlers and allotted to militiamen. Following the land wars large tracts of Māori owned land were confiscated and allocated to militiamen. Later this land was often sold by the men since they too thought it too difficult to clear and cultivate. This is the case for the site and the surrounding area around Cambridge whereby land was confiscated to be allotted to militiamen men following service.

Historic plans and aerials

Historic plans

A review of historic survey plans in Quickmap resulted in a single survey plan (SO 96-2 from 1879) relevant to the Site. Despite the review of Quickmap the identified did not show anything of archaeological interest. However, the plan does show allotments given to militiamen following the termination of their service. Potential roads passing through the Site

as well as the Waikato River are shown; the north-south road is currently used as a farm race (Figure 7).

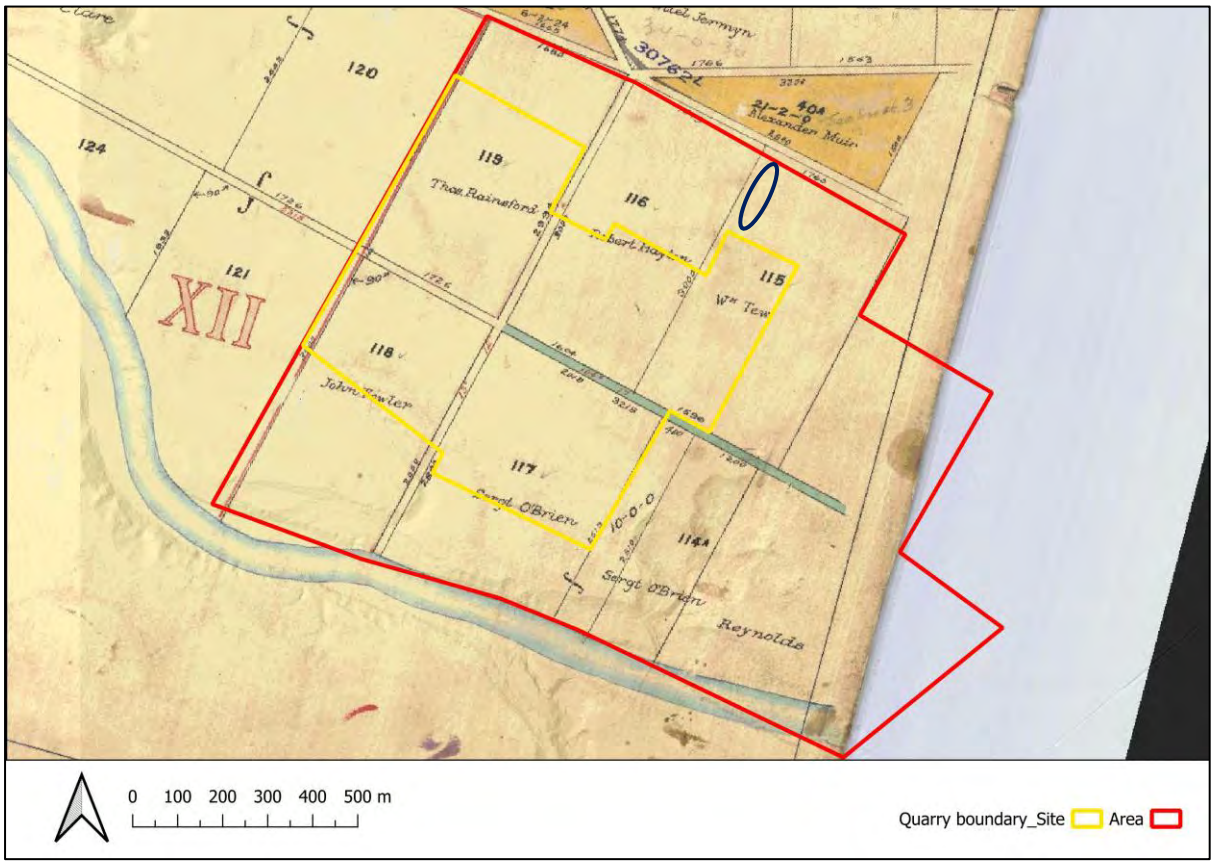


Figure 7. Excerpt from SO96-2 (1879) showing the land given to the leaving militiamen (Source: Quickmap).

Historic aerials

Aerial photographs were reviewed from Retrolens and span the period 1939 to 1995. They visualise historic land use for the Site, which has primarily been pastoral grazing and horse stud. However, more recently there have been several developments within the Site including residential houses and an area of historic (no longer used) sand quarrying at the southern end of the road at the edge of the upper terrace to the lower. There has also been tree planting, and ongoing maintenance of the working farm including construction of outhouses, race maintenance and fences etc (Figures 8–9). The landform is quite typical for this area; being composed of river terraces stepping up from the river with relict levees and swales.

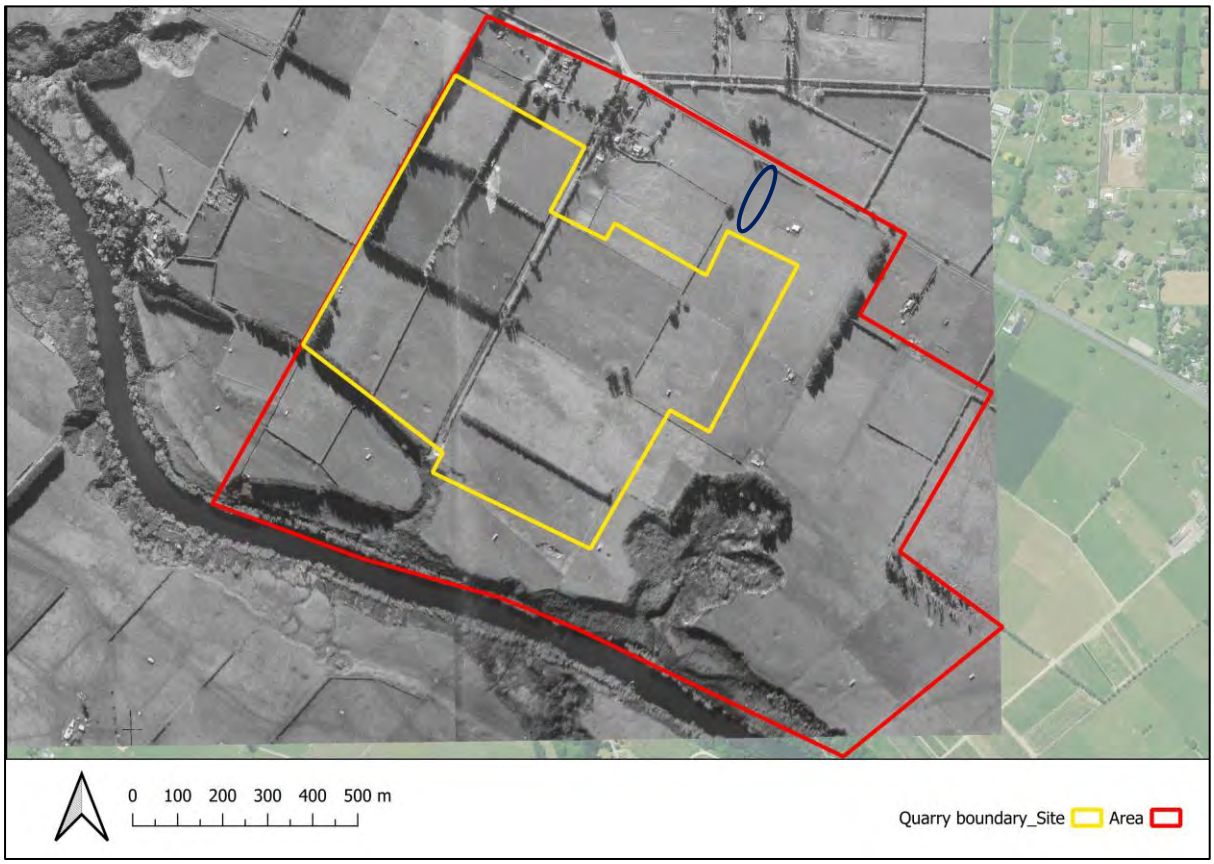


Figure 8. Excerpt from aerial photography from 1939 (SN266_834 57 & 59) (Source: Retrolens).

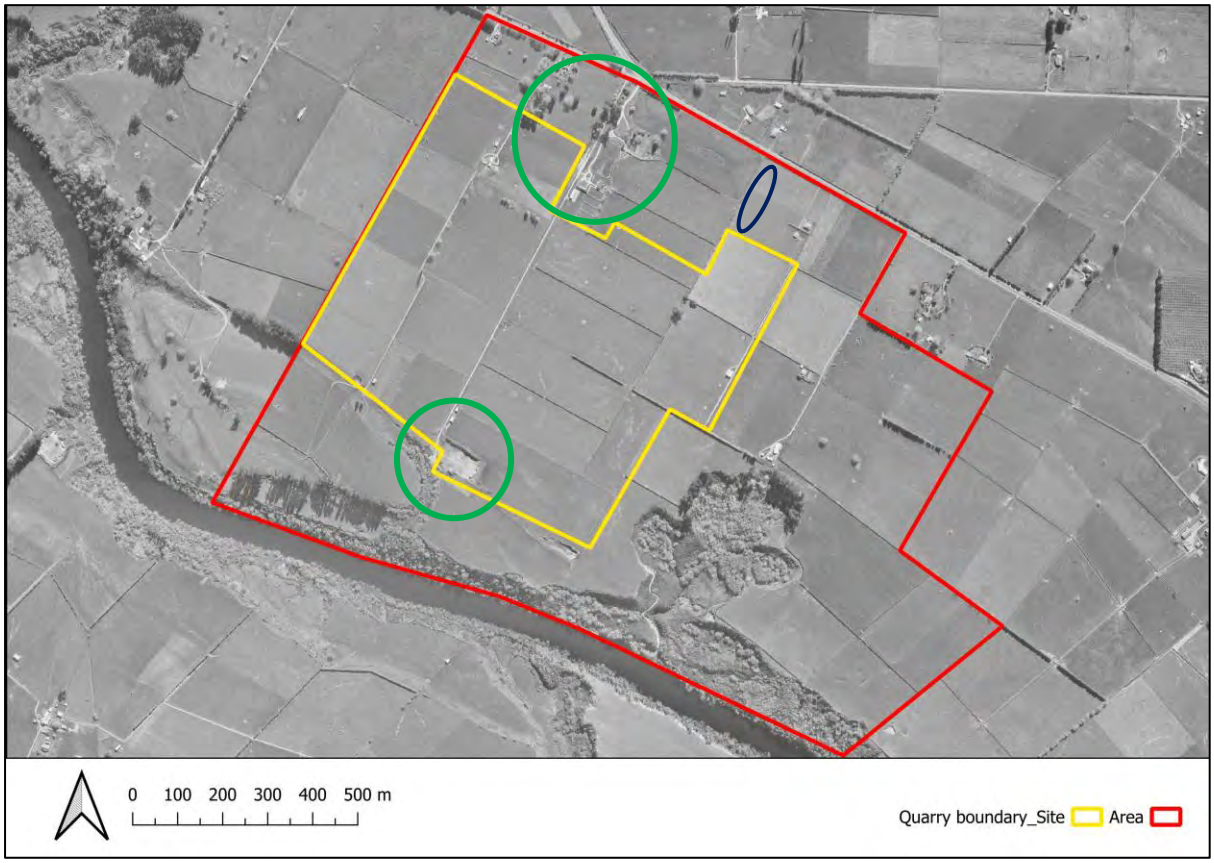


Figure 9. Excerpt from aerial photograph from 1971 (SN3470_4513-20). Modern development including the horse stables and the quarry are visible in the image (Source: Retrolens).

LiDAR data

Height data (2023–2024) shown below provides a view of the landscape and Site. LiDAR data uses laser points taken from aircraft to create a height elevation model for the landscape and can remove extraneous object such as houses and trees. In the data below it is still possible to identify most of the borrow pits in the landscape. This helps determine that the landscape has not been subject to intensive modification (Figure 10).

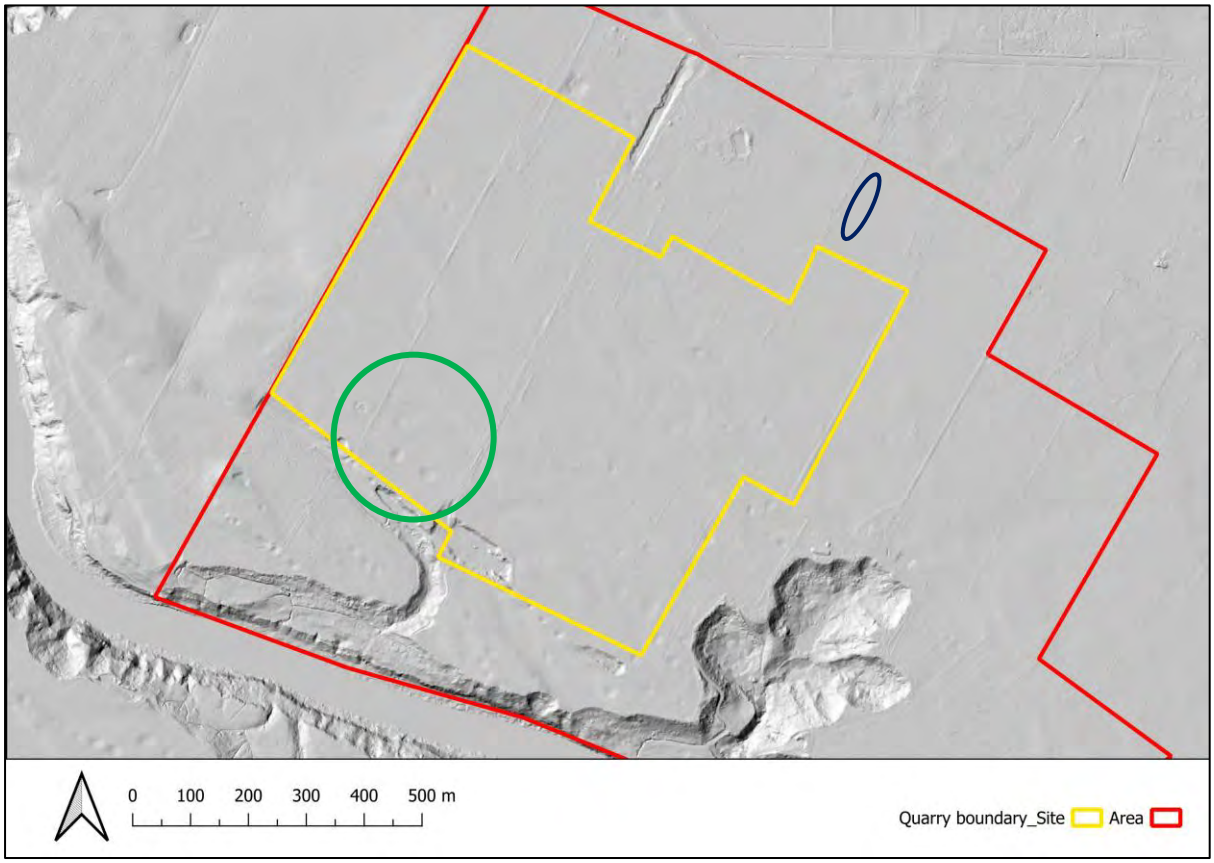


Figure 10. LiDAR derived hillshade model from DEM data taken in 2023–2024 that shows the site for the proposed quarry and some of the surrounding landscape. The green ellipse shows an example of the visible borrow pits (Source: LINZ).

Fieldwork – site visit

Method

A field visit to the Site (quarry area/yellow polgon) was undertaken in June 2025 to relocate recorded archaeology, assess its composition and approximate size as well as identify potential for unrecorded archaeological sites and their spread. It also assessed landform, soil type, variation and potential effects. To identify the spread of archaeology (through identification of Māori-made soils/Tamahere loam) a pedestrian and auger survey was undertaken across the site using a 25mm screw auger. Six test pits were also used to broadly identify the soil profile and to understand the potential level of preservation of made soil and archaeology across the Site.

Results – Auger survey

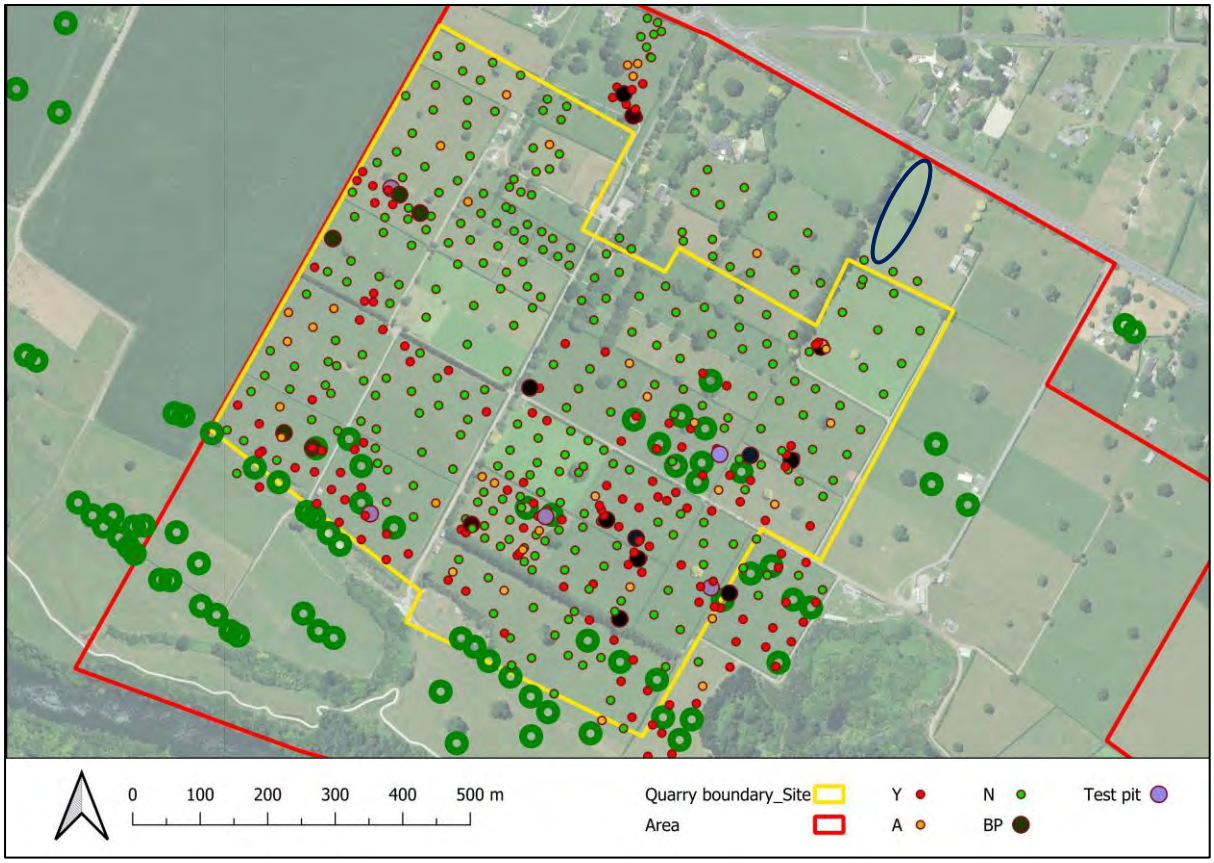


Figure 11. Location of borrow pits, auger samples and test pit locations. Green circles are previously identified potential borrow pits (Source: LINZ).

Pedestrian survey and sampling with a 25mm soil auger was undertaken across the entire Site but not the entranceway which has been relocated from its original proposed location (Figure 11). As shown in the image above results of the survey identified that a significant percentage of the Site tested positive for made soils. Red points indicate a positive result for Māori horticultural soils, yellow points indicate an ambiguous result, and the green a null result for made soil. Borrow pits are represented by the green circles (previously identified) and black larger points (newly identified). Test pits are shown as the purple points. The soil profile within areas of made soil was turf, made soil A&B, Ab layer, B-Horizon (Horotiu & Bruntwood silt loams) (Figure 11). The soil profile for areas without made soil was Turf/topsoil followed by either Horotiu or Bruntwood silt loams.

The below images, taken with a drone, visualise the Site's landscape. Some of the borrow pits are clearly visible, especially those closer to the scarp down to the lower terrace (Figures 12–15).



Figure 12. Taken from the south looking north across the western half of the Site. Some of the larger borrow pits are clearly visible in the image. The historic sand quarry is visible.



Figure 13. Taken from the south looking north across the Site. Some of the larger borrow pits are clearly visible in the image. The historic sand quarry is visible in the upper image. Upper=western half, Lower=eastern half.



Figure 14. Taken from the north showing the eastern side of the Site.



Figure 15. Taken from the north showing the western half of the site. The stables are visible in the foreground.

Results – Test pits

Made soil quality was further confirmed through the hand excavation of six (30x30cm) test pits within the Site. Test pits identified distinct, intact and separate bands of made soil horizons in each profile. Made soils were distinct and intact across most of the Site and were distinguishable from areas lacking such. There was little to no evidence of widespread modification of the soil layers from ploughing or other modern modification. The slopes along the edge of the scarp to the lower terrace did not return a positive result for made soils and it is likely that this material was taken further inland away from the scarp to the lower or upper terrace.



Figure 16. Test pit 4 showing the layering of soils. Red lines are approximate layer boundaries.

In Figure 16 soil stratigraphy shows the presence of made Māori horticultural soils. Its stratigraphy is, from top to bottom:

- Turf: dark brown and sandy, 0–5cm;
- Made soil A: dark grey, brown/black – extremely sandy and gravelly, 5–13cm;
- Made soil B: dark brown/dark yellow brown - extremely sandy and gravelly, 13–20cm;
- Mixed Ab (Bw) layer (brown to very dark brown), 18–30cm;
- Horotiu silt loam (dark yellow brown) 30+cm.

This visualises the distinct made soils across the site and the layering within the made soil horizons, as there is in intact horticultural archaeology. This establishes that the subject area has not been subject to any significant ploughing or other modification throughout European history. Made soils have been identified across a significant area of the Site with several new archaeological sites being recorded. It can therefore be stated that recorded archaeological site areas extend across most of the Site.

Visible/identifiable archaeological deposits are borrow pits and Māori-made soils (Tamahere loam). These occur across the site in various densities, quantities and areas, broadly identified during the auger sampling. The soil profile was distinct and some of the auger samples even contained charcoal flecks/pieces which indicate the potential presence of further archaeology in the form of occupation, activities areas and forest clearance. These can, for example, include features relating to crop storage (pits) or living areas (kāinga – whare, post holes, fireplaces, drains, working areas etc). Based on the results it is likely that sites within this horticultural landscape were used to produce kumara and had associated areas of domestic activities/occupation within or around them.

Assessment of Archaeological Values

Within the boundary for the site (proposed quarry) there is a total of twelve recorded sites: S15/303 (Artefact), S15/553, S15/554, S15/556 S15/614, S15/615, S15/795, S15/796, S15/797, S15/798, S15/799 & S15/800 (Māori Horticulture). Just outside the area is the recorded location for an additional three horticultural sites that are part of the same system and likely extend into the Site: S15/555, S15/557 & S15/558 (Māori Horticulture). All the sites in the immediate area relate to Māori horticulture aside from S15/794–pā and S15/303–artefact (likely a surface find originating from one of the surrounding sites). The site visit identified areas of made soils around the borrow pits and established that site preservation is likely to be good due to a lack of evidence of modern modification in the form of ploughing.

It should also be stated again that archaeological sites along the margins of the Waikato River are interconnected, whether they be on the lower or upper terraces. Sites have been, mostly, separated into distinct units based on cadastral boundaries rather than archaeological site areas or boundaries. Therefore, sites are interconnected rather than separate units and should be treated as a larger landscape. Recording of archaeological sites has been undertaken to simplify sites and to identify areas of surface features. Sites of this type are not uncommon and form an extensive back bone of archaeology along the Waikato River. Sites of this type are readily identifiable visually by the sometimes large borrow pit clusters; features were the basis creation of the associated Tamahere soils used to grow kumara.

Based on previous experience and investigations within the Waikato there is a high potential for subsurface archaeological remains to be present, within, under or adjacent to any of the recorded archaeological sites within the Site. Even if such features are likely to relate to the production of kumara and associated activities (for example: postholes, storage pits and growing feature etc) there is a high potential for features relating to domestic occupation such as kāinga (for example: postholes, fireplaces and whare etc). This is often the case when dealing with larger horticultural sites, and the association of horticulture with activities/occupation areas has been established at most sites investigated around Cambridge and the wider Waikato.

Heritage New Zealand criteria

Table 1. Assessment of recorded archaeological sites S15/553, S15/554, S15/555, S15/556, S15/557, S15/558 S15/614, S15/615, S15/795, S15/796, S15/797, S15/798, S15/799 & S15/800 (Māori Horticulture) against the HNZ criteria.

Value	Assessment of S15/553, S15/554, S15/555, S15/556, S15/557, S15/558 S15/614, S15/615, S15/795, S15/796, S15/797, S15/798, S15/799 & S15/800 (Māori Horticulture)
Condition	Sites are clearly visible on aerial imagery and LiDAR derived imagery. Most borrow pits are still visible on the ground surface. The associated made soils are in good condition, and this is likely the case across the entire Site (quarry area). It is likely that there will be additional associated features with the made soils and borrow pits including domestic activities and occupation. Condition of the site is likely to be good.
Rarity/uniqueness	These sites are not rare since they form part of an extensive complex of sites that follow the Waikato River between Arapuni and Mercer. However, pressure has been put on such sites due to their favourable location along the river for creation of subdivisions. Therefore, at least half of these sites have been destroyed since the advent of large-scale clearance and landscape modification (Gumbley & Hutchinson 2013). Based on this attrition and likely continuation of such activities these sites provide a valuable resource that cannot be recreated once destroyed.
Information potential	Can develop and enrich current knowledge and understanding of pre-European Māori horticultural landscapes and horticultural practices within the Waikato. Such practices may even be used to compare with other regions. Such information can provide information to the age of sites (when they were formed, used and abandoned) and evidence of satellite and domestic activities.
Amenity value	Borrow pits are visible across the Site. However, given that there is no public access and that they are not visible from the cycleway they have a low amenity value.
Cultural associations	This is a matter for Tangata Whenua.

Waikato Regional Policy Statement Criteria

Table 2. Assessment of recorded archaeological sites S15/553, S15/554, S15/555, S15/556, S15/557, S15/558 S15/614, S15/615, S15/795, S15/796, S15/797, S15/798, S15/799 & S15/800 (Māori Horticulture) against the Waikato Regional Policy Statement.

Archaeological Qualities	S15/553, S15/554, S15/555, S15/556, S15/557, S15/558 S15/614, S15/615, S15/795, S15/796, S15/797, S15/798, S15/799 & S15/800
Information	Can develop the current knowledge and understanding of pre-European Māori horticultural practices within the Waikato. Such practices may even be used to compare with other regions. Such information can provide information to the age of sites (when they were formed, used and abandoned) and evidence of satellite and domestic activities.
Research	Can build on the archaeological research about the adaption of Polynesian horticulture to New Zealand conditions. It can offer insight into the socio-economic structure of the site with comparison to other sites in the vicinity and region.
Recognition or protection	HNZPT archaeological provisions.
Architectural Qualities	
Style or type	N/A
Design	N/A
Construction	N/A
Designer or Builder	N/A
Cultural Qualities	
Sentiment	This is a matter for Tangata Whenua.
Identity	This is a matter for Tangata Whenua.
Amenity or Education	Currently there are no visible features across the site, as such it currently has a low amenity value.
Historic Qualities	
Associative Values	They are not specifically rare since they form part of an extensive complex of sites following the Waikato River between Arapuni and Mercer. However, attrition of this site type is a continual threat to the remaining ca. 30–35 percent of horticultural sites.
Potential Scientific Research	see Archaeological Qualities.
Technical Qualities	
Technical Achievement	Sites of this type show the adaption of Polynesian horticulture to a more temperate climate in New Zealand.

Assessments of effects on archaeological values

Due to the proposed activity, being sand quarrying, recorded archaeological sites S15/553, S15/554, S15/555, S15/556, S15/557, S15/558, S15/614, S15/615, S15/795, S15/796, S15/797, S15/798, S15/799 & S15/800 (Māori Horticulture) will be highly modified or destroyed. Modification/destruction will occur through the creation of infrastructure including roads, buildings, layup areas, weighing stations, the quarrying itself which will extract sand from below the B-horizon modifying/destroying all layers above including any archaeological sites, horizons, features or deposits. Therefore, the effect on archaeological values is considered high since a significant area of the archaeological landscape will be modified/destroyed. The proposed Site area is shown in figures throughout this report. Since these activities are restricted to within the yellow boundary, recorded archaeological site S15/794 – pā will not be affected by the proposed activity due to the location identified by Simmons (2021). Site S15/303 is a single artefact find and is likely related to one of the surrounding sites.

Conclusions and recommendations

Through consultation of historical documentation, site record forms and a site visit to determine the spread of archaeology it is determined recorded archaeological sites S15/553, S15/554, S15/555, S15/556, S15/557, S15/558, S15/614, S15/615, S15/795, S15/796, S15/797, S15/798, S15/799 & S15/800 (Māori Horticulture) occupy a significant proportion of the Site across the upper terrace, where the activities/works will occur. The Site is shown in assessment maps as the yellow quarry area.

Significant areas of a well-preserved Māori horticultural landscape were identified as multiple interconnected archaeological sites listed above. Based on prior experience and investigations there is a high potential that sites may be interconnected via the made soil layer, occupation and activities areas. As such, there will be, aside from the horticultural features, other associated features including domestic activities and occupation, likely in the form of kāinga. Such areas are usually found either directly under made soil layers or adjacent close by areas that are advantageous for such activities. The proposed quarry, based on its scale and components, will modify or destroy all the sites identified.

Recorded archaeological site S15/303 (Artefact) is a single find of an adze. No further evidence of archaeology was found within the Site at its location. Recorded archaeological site S145/794 – pā, lies adjacent the Waikato River on a lower river terrace south of the Sites southern boundary. According to Simmons (2021) S15/794 is located at the edge of recorded archaeological site S15/762 – horticulture. This area, adjacent the river, comprises a slightly raised levee. Simmons investigation was limited only to the cycleway, and the features identified were within that corridor. The site area recorded in ArchSite has not been based on any extensive testing. It is determined based on Simmons location (by the river) that S15/794 will not be affected by the proposed works. No machinery or earthworks will occur within this area; it will be avoided by the proposed quarrying.

Recommendations:

1. Since there are multiple recorded sites within the Site an application must be made to Heritage New Zealand Pouhere Taonga for an authority for recorded archaeological sites S15/553, S15/554, S15/555, S15/556, S15/557, S15/558, S15/614, S15/615, S15/795,

S15/796, S15/797, S15/798, S15/799 & S15/800 (Māori Horticulture) by modifying or destroying parts/all the sites (this is a legal obligation and is required for the proposed activities). This also includes any unrecorded archaeology within the Site.

2. That no machinery or works move/occur outside of the Site (yellow boundary line and the proposed access route shown in Figure 1). Therefore, the proposed activity is concisely bounded and as such S15/794 – pā will be avoided by the proposed quarrying.

2. Consultation must be undertaken with Mana Whenua at an early stage of the process. The results of this assessment must be discussed in detail so that Mana Whenua are aware of the scope of archaeology identified and the ramifications of the proposed activity on them.

3. That any destruction of archaeological sites, features or deposits, by the proposed activity (quarrying) are mitigated through archaeological investigation, recording and reporting. For all archaeological works mitigation must use an Archaeological Site Management Plan (ASMP) and Archaeological Research and Mitigation Strategy (ARMS). These enable archaeological investigation and works to proceed in a planned and methodical method using approved methods, research strategies, procedures and protocols. The purpose of these documents are:

- ASMP's are used to manage archaeology during the any works by providing methodology, protocols and procedures for how archaeology should be managed. The ARMS provides a research framework around the methodology for archaeological fieldwork and how the investigations will be undertaken, how sampling will occur and the investigations are reported.

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Appendix 1: Test pit results

Test pit	***Depth (cm)***	***Description of layer***
1	0-1	Sandy turf
	13-17	Made soil, dark grey brown & dark yellow brown, sand and gravel
	17-19	Mixed buried topsoil layer, brown to dark brown
	19+	Horotiu silt loam, dark yellow brown
2	0-2	Sandy turf
	2-20	Made soil A, dark grey brown, sand and gravel
	20-26	Made soil B, dark yellow brown, sand and gravel
	26-30	Mixed buried topsoil layer, brown to dark brown
	30+	Horotiu silt loam, dark yellow brown
3	0-2	Sandy turf
	2-20	Made soil, dark grey brown, sand and gravel
	20+	Horotiu silt loam, dark yellow brown
4	0-5	Sandy Turf
	5-13	Made soil A, dark grey brown, sand and gravel
	13-18	Mixed buried topsoil layer, brown to dark brown
	18-30	Mixed buried topsoil layer, brown to dark brown
	30+	Horotiu silt loam, dark yellow brown
5	0-2	Sandy turf
	2-20	Made soil, dark grey brown, sand and gravel
	20-35	Ab horizon, potential feature. Some charcoal
	35+	Horotiu silt loam, dark yellow brown
6	0-4	Sandy turf
	4-20	Made soil, dark grey brown, sand and gravel
	20-24	Mixed buried topsoil layer, brown to dark brown
	24+	Horotiu silt loam, dark yellow brown

Test pit 1 (left) and test pit 2 (right)




Test pit 3 (left) and test pit 4 (right)




Test pit 5 (left) and test pit 6 (right)