



Heritage Management Specifications for Mauao Historic Reserve, Tauranga

20 May 2016

Prepared for: Tauranga City Council
P O Box
TAURANGA

Prepared by: InSitu Heritage Ltd.
P O Box 710
WHAKATANE 3158

Contents

1. Purpose	3
2. Work Planning	5
3. Current Management Issues.....	6
3.1 Maintenance of the Summit repairs.....	6
3.2 Land slips and slope stability	7
3.3 Protection or stabilisation of archaeological features	8
3.4 Water control, walking and vehicle track maintenance	10
3.5 Farm operations	10
3.6 Rabbit control	11
3.7 Conservation of the Stone Jetty	12
3.8 Conservation of the Iron Jetty landing platform.....	13
3.9 Condition monitoring.....	13
4. Specifications for work actions.....	14
4.1 Large tree removal.....	14
4.2 Land-slip assessment and response.....	15
4.3 Track maintenance.....	16
4.4 Livestock management	16
4.5 Fencing	17
4.6 Monitoring.....	18
5. Summary of work actions.....	20
References	21
Appendix 1: Example Monitoring Form.....	22

1. Purpose

Mauao Historic Reserve is an extensive cultural heritage landscape that covers approximately 40 hectares. It is located on the eastern side of the entrance to Tauranga Harbour (Figure 1). The Reserve contains components of three pa, plus associated pits, terraces, platforms, house floors and middens. The shell mounds in the reserve are the only known surviving examples of this type of archaeological feature within the Bay of Plenty. Mauao is gazetted as a Historic Reserve and is managed by Tauranga City Council (TCC). Mauao is protected under the provisions set out in the Mauao Vesting Act 2008. The Trustees of the Mauao Trust administer the Reserve on behalf of Ngai Te Rangi, Ngati Ranginui and Ngati Pukenga. The Reserve must be managed in a manner consistent with the requirements of the Reserves Act 1977.

One of the key principles of historic heritage management is that the values of heritage places are clearly understood before decisions are taken that may result in change. Once the heritage values are identified and understood, the aspects of the places that possess heritage value can be conserved and protected accordingly. The visible archaeological features of the Reserve were accurately mapped in 2003 and an archaeological report was prepared by Ken Phillips at that time. In 2004 a Conservation Plan was prepared for the Reserve by Wildland Consultants Ltd, which incorporated specialist archaeological advice to guide management and conservation of the archaeological sites within the Reserve. Phillips updated the archaeological report in 2014, and there have also been other archaeological reports prepared between 2003 and 2014 relating to particular work carried out under archaeological authority conditions within the Reserve.

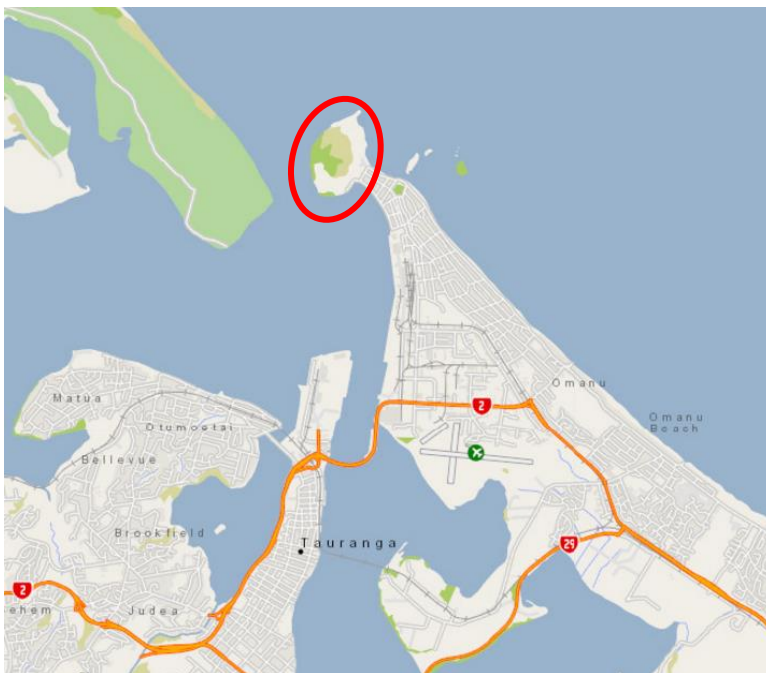


Figure 1: Location of Mauao Historic Reserve, Tauranga.



Figure 2: Plan showing recorded archaeological features on Mauao (Phillips 2003).

TCC intends to apply for an archaeological authority from Heritage New Zealand Pouhere Taonga (HNZPT) to carry out maintenance and vegetation clearance work in the Reserve. HNZPT has requested the preparation of a site management specification to detail how this work will be carried out. These heritage management specifications have been prepared for this purpose, to guide the proposed work and assist in the conservation of the archaeological sites.

This report begins with an overview of the work planning process to be followed to ensure that archaeological issues are handled accordingly. Section 3 identifies the current management issues in the Reserve, and provides work actions to address those issues. In some instances, where management of the issue requires a more complex process than a one-off work action, detailed specifications are provided in Section 4. The report concludes with a summary of work actions and a time frame for these.

2. Work Planning

When planning any work in the Reserve that includes any element of ground disturbance, the following process should be followed:

- Check the archaeological features map (Figure 2, and also available on Council GIS) to determine if visible features are present in the area of proposed work.
- Where there are known or suspected places with heritage values, establish the location and significance of any places using appropriately qualified people where necessary. Archaeological field surveys or inspections should be undertaken by qualified, appropriately experienced archaeologists.
- Ensure that an annual meeting is held with an archaeologist, or Heritage New Zealand staff, to review the proposed work plan for the year, and to obtain appropriate archaeological advice.
- All/any archaeological sites within areas where work is planned must be recorded and accurately shown on maps, and their extent delineated on the ground if appropriate/practical. This work should be carried out with archaeological advice.
- Contact Mauao Trust representatives to identify specific concerns and protection/restoration requirements for any known or suspected heritage places.
- If heritage places will be affected, attempt to redesign or modify the work program to avoid disturbance, this should be done with archaeological advice.
- If disturbance is unavoidable, check the work is covered by a current Heritage New Zealand Archaeological authority. Ensure compliance with any authority that may be in place.
- Ensure contractors have been briefed about heritage places and archaeological authority requirements.
- Provision should be made during planning for archaeological monitoring of work if required.

3. Current Management Issues

A range of management work has been carried out since the preparation of the Conservation Plan in 2004, including repair of eroded surfaces on the summit, adjustments to the water control management on the 4WD track, redesign of the fencing plan, retirement of vulnerable areas from grazing, cessation of the use of shell for track surfacing, adjustment of the grazing regime to reduce stock numbers and planting of areas retired from grazing.

The main issues currently affecting the condition of the archaeological sites relate to the activities of visitors, management of large trees, erosion, failure of slopes predominantly on the southern side of the Reserve, and pest control. Erosion and slumping at Mauao is a complex issue, relating to slope stability, vegetation cover, water control and the land management regime, each of which is discussed in detail below although these factors are often interrelated. In addition, two historic jetties on the shoreline at the southern end of the Reserve require conservation work.

Conservation of heritage places also requires ongoing monitoring of their condition, and appropriate actions to be taken in response to any identified threats. Regular, systematic condition monitoring has not previously been completed in the Reserve and the specification for a monitoring programme is provided in section 4.6. Regular monitoring should be implemented from 2016 onward.

3.1 Maintenance of the Summit repairs

The summit pa of Mauao was one of the most strategically important locations in the Tauranga district with commanding views along much of the Bay of Plenty coast and inland to the volcanic plateau. The summit is relatively flat and comprises of two low ridges branching north and northwest from a central high point. The two ridges are separated by a sheltered basin. The summit ridges are terraced while the basin contains a series of long low back scarps creating large open terrace and platform areas. The summit is naturally defended on three sides by rocky bluffs and steep talus slopes while a 10-20 metre scarp on the southern approach was probably strengthened by palisades.

Prior to 2009 damage to archaeological features on the summit was being caused by the high number of visitors walking over the summit area. The grass sward on tracks could not be maintained due to the density of the foot traffic. As a result archaeological material was being exposed and subjected to erosion. In many cases the erosion surface had advanced through the archaeological deposit to the underlying natural soil substrate.

Coupled with this erosion was the damage that walkers were causing by using direct routes to destination points which traversed archaeological features. For example, many walkers were taking a direct line through terraces rather than following the track which skirted the edge of these features. The 'desire lines' were often up steeper, and hence more erosion prone, slopes. The severely eroded areas on the terraces and tracks were slippery and as the

centre cut deepened the edges collapsed inwards. The steepness of the track and the slipperiness increased the erosive effect of foot traffic. As the erosion area became more unstable walkers moved to a new area which resulted in gradual expansion of the problem.

Repair work commenced in May 2009 (Archaeological Authority No. 2009/224) to cap and armor the archaeological deposits exposed on the summit, and to form a loop track through the site based on widening and formalising the existing walking track. The majority of capping work was completed in 2009. In 2010 a breach in the bank on the summit was repaired with fill and a set of steps was installed over the fill material. In 2011 work on the walking track surface and planting to close old desire line tracks on the cliff edges was completed.

The capping and armoring of the areas of the summit subject to heavy foot traffic and the formalisation of walking routes through the site will protect the archaeological features in the long term. However, in order to ensure that the capping continues to protect archaeological features, surface wear needs to be regularly monitored and new fill material added periodically. In addition, monitoring of track routes on the summit should be carried out regularly to ensure that new areas of 'desire lines', which have the potential to impact on buried archaeological features, are not developing.

Work actions:

- Condition monitoring of capping and the formation of informal desire lines (see section 4.6 monitoring specification).
- Remedial action, as required, through the addition of new fill and prevention of desire line formation.

3.2 Land slips and slope stability

Land stability is a significant issue on Mauao, and there has been severe localised loss of archaeological features as a result of slip events since the early 2000s. Some action was taken to stabilise a large slip in the vicinity of the water reservoir by diversion of overflow from the reservoir, fencing of the area to exclude stock and planting in indigenous species. However, three other large slips that have occurred since that time have not been similarly treated and are continuing to erode.

In addition the base track cut, coupled with over-grazing, resulted in the destabilisation of middens on the lower slopes, and these have been subject to on-going loss through erosion. This was partially addressed by retiring the areas from grazing in 2005, however the high rabbit numbers in the Reserve since that time means that vegetation growth on the slopes is not as dense as would be expected after ten years of no grazing. As a result midden continues to erode out onto the base track in several areas (Figure 3).

There are several very large trees within the reserve that require removal. A specification for this work is set out in section 4.1. In addition, there are numerous other smaller trees in the

southern portion of the Reserve growing on archaeological features. The majority of these are exotic species, and these should also be removed before they become any larger and pose significant removal issues.



Figure 3: Eroding slopes with exposed midden.

Work actions:

- Large tree removal (Specification in Section 4.1)
- Remove smaller trees by felling at ground level, followed by herbicide application to stumps if necessary.
- Land-slip assessment and response (Section 4.2).

Depending on the outcomes of rabbit control, consideration should also be given to methods to stabilise eroding middens, including the inter-planting of appropriate species on slopes. This is discussed in more detail below in Section 3.3.

3.3 Protection or stabilisation of archaeological features

It is appropriate to establish vegetation other than grazed pasture on archaeological features in parts of the Reserve where continued livestock grazing is not desirable for archaeological site protection or other reserve management purposes. In these areas, continued grazing is having a detrimental effect on slope stability and is contributing to the loss of archaeological sites. While establishment of a vegetation cover other than grazed pasture may lead to some loss of archaeological information, on the whole that loss will be less than that caused by ongoing erosion. In particular this currently applies to areas where there have been recent large land slips above the 4WD track within the grazed portion of the Reserve. These require

retirement from grazing and planting in indigenous vegetation to prevent or minimise the possibility of further slippage.

Work action:

- Retire large land slips above the 4WD track from grazing. See Sections 4.2 and 4.5 for specifications.

In 2005 areas retired from livestock grazing included the escarpment adjacent to the base track on the eastern, western, and southern sides of Mauao; the seaward side of the base track; and the spring-fed gully below the reservoir on the southern side of Mauao. Scattered pohutukawa (*Metrosideros excelsa*) were planted in some of these areas, where visible archaeological features were absent, to assist in establishing vegetation cover that was aimed at reducing weed invasion over time. Unfortunately, due to high rabbit numbers, these areas have effectively continued to be 'grazed' and there has not been any significant improvement in slope stability. Rabbits need to be removed and then it may be appropriate to interplant pohuehue (*Muehlenbeckia complexa*) on these sites, to stabilise and protect the archaeological features. Ongoing periodic weed control will also be required in areas retired from livestock grazing.

In addition to the areas retired from grazing in 2005, there are areas above the base track on the north-eastern side of Mauao where slope stability and visitor management would be aided by retirement from grazing. There are fewer archaeological features in this area, but any planned work will require an archaeological authority and advice.

Work action:

- Pest control followed by possible inter-planting, if required, in areas retired from grazing in 2005.
- Weed control in areas retired from grazing in 2005.
- Ensure archaeological authority is in place prior to any fencing or planting work above the base track on the north-eastern side of Mauao.

The establishment or at least encouragement, by protection from grazing by rabbits, of pohuehue on the large shell mounds within the grazed portion of the Reserve should also be investigated. In a few areas this is well established, and is protecting the archaeological features (Figure 4). In others, the ground cover had been denuded by rabbit browsing and the middens are eroding. Temporary fencing, or covering with netting, of these areas may be required in order to protect newly established seedlings from grazing by sheep; however care should be taken to ensure that sheep do not cause further erosion damage by tracking along any fence margins, as has occurred in the past. Archaeological advice is required for this work. This work should not be attempted until rabbit numbers within the Reserve have been significantly reduced.

Work action

- Establishment of pohuehue on shell mounds, this may involve excluding livestock by temporary fencing or protective netting, if required.



Figure 4: Vegetation established on midden above eroding mound.

3.4 Water control, walking and vehicle track maintenance

Regular maintenance of water run-off systems and track formations will minimise the risk of accidental damage to heritage places resulting from land slips. The primary function of regular maintenance is to ensure early identification and remedying of problems. Machinery used for the maintenance of access tracks, water control work, and land slip clearance, however, also has the potential to damage heritage places.

- The specification for track maintenance is provided in Section 4.3.

3.5 Farm operations

Grazing of sheep, to maintain a protective grass cover on archaeological features, has the potential to seriously damage the features through trampling and tracking. Nevertheless, grazing is the most appropriate regime to maintain a vegetation cover that offers the best protection to archaeological features while also providing for public viewing and appreciation of the surface features. The risk to archaeological features posed by grazing must be carefully balanced against the potential damage caused by a change in the vegetation cover.

Management of grazing and associated fencing is a key requirement to stabilise archaeological features and reduce the rate of deterioration of features. A degree of ground

damage due to stock trampling and tracking is always going to occur as a consequence of using grazing animals to maintain a pasture sward. This risk should be managed to restrict damage to areas where archaeological features are not affected.

- The specification for livestock grazing and fencing is set out in Sections 4.4 and 4.5.

3.6 Rabbit control

Feral rabbits are currently present in the Reserve in very high numbers. The rabbits are having significant detrimental impact on archaeological features both due to their burrowing activity (Figure 5), and browsing of vegetation which is exposing the ground surface and exacerbating erosion issues. This limits the opportunity to use vegetation as a method to protect and conserve archaeological features. Rabbits need to be reduced to either very low numbers, and maintained at those levels, or eradicated from the Reserve entirely.



Previous rabbit control methods have not been effective in reducing numbers long term. A comprehensive programme of rabbit control is required, and specialist advice should be obtained.

Care is required in undertaking control methods within the Reserve to ensure that ground disturbance is avoided. Some common control practices, such as collapsing burrow entrances during fumigation, are not appropriate within the Reserve due to the potential to cause further disturbance of archaeological features. 'Sandbags' should be used to block burrow entrances. Material to fill the bags must not be collected from within the Reserve as this too may result in damage to archaeological features.

Figure 5: Example of damage caused by rabbit burrowing.

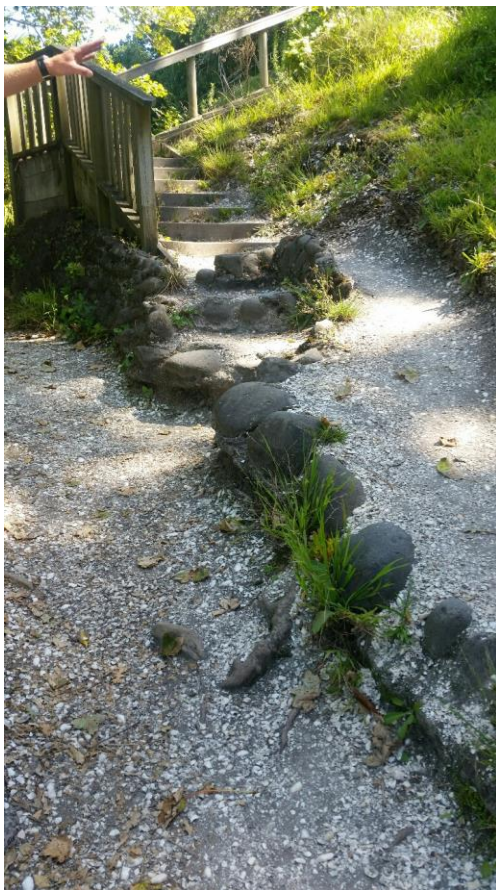
Work action:

- Implement rabbit control programme, with archaeological input to ensure no adverse effects on archaeological features.

3.7 Conservation of the Stone Jetty

The stone jetty (U14/361) was built by Mr G. Gardiner, Mr A.W. Burrows and a team of volunteers between December 1888 and March 1889, and was used until the 1930s¹. The jetty was constructed for public use enabling Victorian picnickers to disembark without getting their voluminous skirts wet.

The jetty has been subject to periodic repairs and loose stones have been re-cemented. The sand cement mix used in some parts of its construction contains archaeological artifacts, including stone flakes, indicating the jetty was constructed from locally sourced materials. When it was constructed the jetty had wooden breastwork to protect the hulls of moored vessels. No evidence of the breastwork remains.



There are stone retaining walls and steps in the vicinity of the wharf but it is unclear whether they were constructed at the same time as the wharf or are later additions. Repairs are needed due to erosion and loss of stone work in these adjacent areas (Figure 6).

Work actions:

- A formal assessment by a suitably qualified conservator should be completed to determine what elements relate to the construction and use of the jetty up to the 1930s.
- A repair programme for the area of stone walls adjacent to the stone jetty needs to be separately developed, taking into account the underlying archaeological features as well.

Figure 6: Eroding stone work in the vicinity of the stone jetty, note underlying midden deposit.

¹ Cunningham, B. & K. Musgrave. 1989. *A History of Mount Maunganui*. Printcorp Services Ltd, Tauranga.

3.8 Conservation of the Iron Jetty landing platform

The Iron Jetty (U14/362) was the first jetty to be built on the southwestern shore of Mauao near the coastal outlet of the Waipatukakahu spring². The Iron Jetty is thought to have been constructed in 1886 and was used by steam ships up until the mid-1920s. It comprised a stone-faced landing stage and a platform extending out into the deep channel waters supported by iron posts. The stone-faced landing survives in excellent condition, while several lengths of iron can still be seen in the surf below.

Periodic trimming and/or removal of saplings adjacent to the stone-faced landing platform is required in order to conserve this historic feature by preventing damage from root action. This work should be undertaken with advice from a suitably experienced archaeologist, and sapling growth should be monitored annually and removed as required.

Work action:

- Monitoring and vegetation management of Iron Jetty platform.

3.9 Condition monitoring

Comprehensive recording, condition assessment and ongoing monitoring of heritage places is required as part of effective reserve management in order to:

- Assess the effectiveness of the management regime;
- Detect changes that may lead to detrimental impacts;
- Determine if site management or visitor behaviour is having a detrimental impact
- Initiate appropriate actions where adverse effects are detected.

Section 4.6 provides further detail about monitoring. Depending on the outcomes of monitoring, appropriate specialist advice should be sought and action taken to address any issues.

² Ibid.

4. Specifications for work actions

4.1 Large tree removal

The southern portion of the Reserve contains several very large exotic trees, including radiata pines, which are nearing the end of their life and becoming unstable. In some cases these trees overhang walking tracks and pose a significant hazard to visitors due to their instability. In all cases these trees are either growing on archaeological features, or access to them is via archaeological features.

The removal of such trees requires specialist equipment and machinery assistance. Leaving the trees in place is not a viable option due to the public safety risk and if they topple the root plate uplift, as well as the damage caused by the main stem and branches impacting the ground surface, is likely to cause significant loss of archaeological features.

The following principles must be applied during tree removal to minimise the impact on archaeological features:

- All contractors engaged to work on tree removal within the Reserve must be made aware of the significance of the archaeological features, the requirement to minimise ground disturbance, and the constraints on the activity.
- A designated route for machinery access to the felling site must be defined with archaeological advice. This route should be used for all machinery access and no deviation from the specified route should occur.
- The route should be designed to minimise impact on intact archaeological features by utilising areas that have already been subject to disturbance, or where it is possible to introduce additional fill material to cap and protect archaeological features.
- Tree removal should only be carried out when weather conditions are dry and the ground surface is as robust as possible, applying additional material such as metal to protect the track surface may be required.
- All tree removal activity where there is potential for ground disturbance must be subject to an archaeological authority from Heritage New Zealand and include appropriate archaeological monitoring.
- Felled stems and branches must be lifted clear of the ground surface for removal either for transport off the site or for mulching. No dragging of felled material across the ground surface should be permitted.

4.2 Land-slip assessment and response

Loss or damage to archaeological features caused by land slips is a significant threat at Mauao. Since 2004 there have been three slips that have resulted in loss of features that were recorded in 2003 (figure 5). These areas are currently awaiting management action to stabilise the erosion faces and minimise the possibility of further loss of heritage fabric.

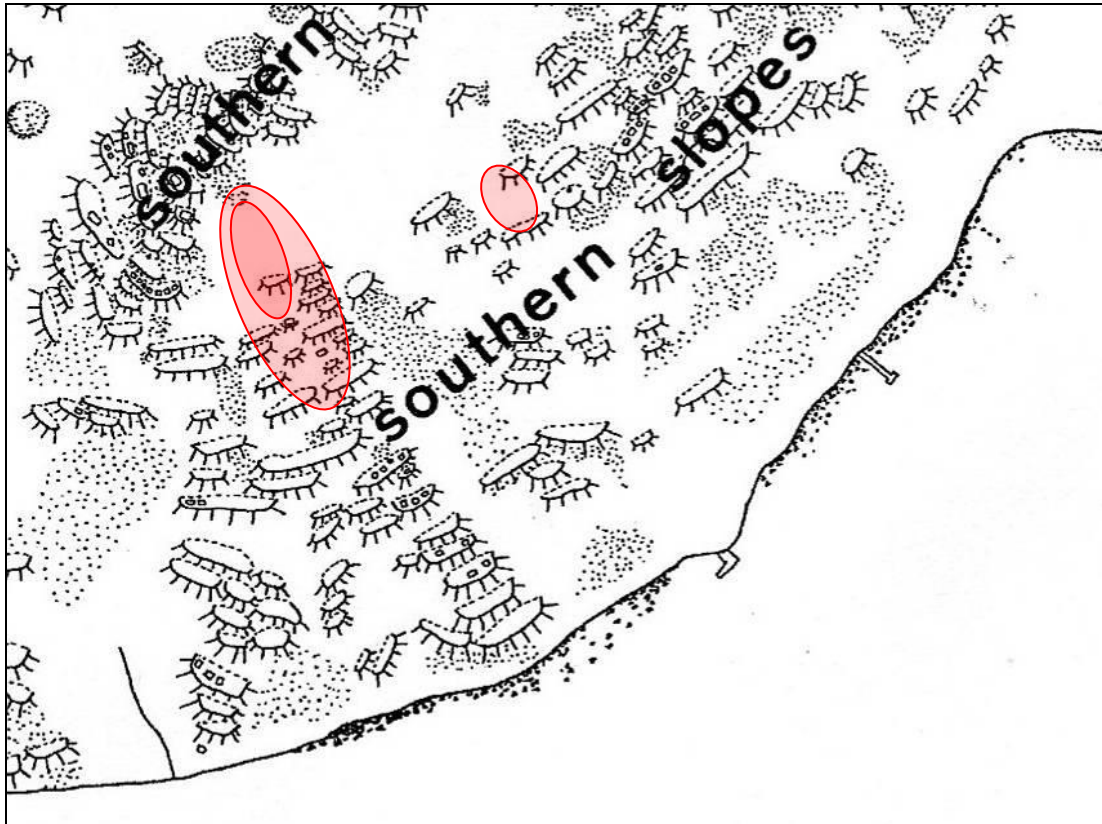


Figure 5: Recorded archaeological features on the southern slopes of Mauao, areas damaged by significant erosion scars indicated in red (from Phillips 2014, Figure 3).

The following specification should be used in response to all land slip events that occur within areas of the Reserve that contain visible archaeological features:

- Immediately following land slip events check the archaeological features map (Figure 2) to determine if visible features are present in the affected areas and complete a field visit to confirm.
- Advise Heritage New Zealand and the Mauao Trust of the event; and as soon as practical arrange an archaeological inspection by a qualified, appropriately experienced archaeologist. Additional specialist advice on slope stability may also be required.
- In consultation with Heritage New Zealand, the Mauao Trust and the archaeologist develop a remediation plan for the slip area. This may involve fencing and planting of the affected area.

- Check that any proposed work is covered by a current Heritage New Zealand archaeological authority. Ensure compliance with any authority that may be in place.
- Ensure any contractors involved in remediation work have been briefed about archaeological authority requirements.
- Provision should be made during planning for archaeological monitoring of work if required.

4.3 Track maintenance

The following specification should be used for all track maintenance.

- Permitted routine works for the maintenance of walking and vehicle track surfaces should be restricted to levelling of existing tracks and adding new material. The clearance of slips from tracks should also be permitted routine work.
- If any ground disturbance is likely to occur in any area that is not already clearly part of the established track and water control network – for example, the establishment of additional culverts – and will take place in an area containing archaeological sites or heritage features the proposed work should be discussed with Heritage New Zealand in order determine if an archaeological authority is required.
- Culverts and water tables should be regularly checked and cleared. In areas containing archaeological sites, machinery should be restricted to established tracks and work should be monitored by Reserve staff. Material removed from culverts should not be spread on known archaeological sites.
- Water needs to be diverted off tracks at regular intervals to reduce volume and velocity which in turn reduces the potential of erosion. The velocity of the water when it exits the culverts should be monitored to ensure that run-off does not cause localised channelling and erosion of archaeological features. Reducing the velocity of the run-off ensures that water is dissipated over the ground surface, thus preventing channelling. This can be achieved by placing rocks or geotextile near the culvert exits. The results of such intervention would need to be monitored closely, to ensure that scouring does not occur around any new velocity 'barrier'.

4.4 Livestock management

The objective of the livestock grazing regime within the Reserve should be to maintain continuous ground cover with a robust pasture sward. This is a key requirement in order to stabilise archaeological features and reduce the rate of deterioration. This is particularly

important for the large shell mounds within the Reserve, which are vulnerable to loss as a result of land slippage.

The following principles should apply:

- A degree of ground damage due to stock trampling and tracking is going to occur as a consequence of using grazing animals to maintain a pasture sward. This risk should be managed to restrict potential damage to areas where archaeological features will not be affected.
- Ground damage can be minimised by using species and classes of livestock that are appropriate to the site features and conditions. Sheep are the best fit for Mauao and should continue to be used.
- Animals should be provided with access to shade and shelter in areas where archaeological features are not affected. The stock should be rotationally grazed, and moved regularly, so that the pasture sward is maintained by even grazing appropriate to the seasonal conditions. Stock numbers should be monitored and adjusted to suit seasonal variations in grass growth.
- Gateways and water troughs should not be placed in areas where archaeological features are present. Artificial ground hardening, using shingle or cement, could be considered in areas where congregation of stock occurs – for example, gateways and around water troughs.
- At present the rabbit population on Mauao is so high it is reducing the number of sheep able to be grazed. The rabbits are causing serious overgrazing issues which are exacerbating erosion, and they are damaging and destroying archaeological features by burrowing. Rabbits must be controlled through on-going action (see section 3.6).
- Uniform length of pasture sward is not required or necessarily desirable for archaeological site protection i.e. a longer sward on scarps will assist slope stability.

4.5 Fencing

Fences should be designed and placed to have minimal effects on archaeological features. This can be achieved by ensuring that fence alignments avoid visible features or areas likely to contain buried archaeological deposits wherever possible. However, on Mauao the slope and the widespread archaeological features mean that some impact on archaeological features is unavoidable. The following specifications should be followed to minimise adverse effects:

- Some existing fence alignments cross archaeological features. In some cases this is the only available, practical fencing alignment. However, fences should be progressively assessed as they are due for renewal, and where possible adjustments should be made to alignments in consultation with an appropriately experienced archaeologist.
- Any new fence alignments should be established in consultation with an archaeologist familiar with the management of archaeological sites within a pastoral context.
- Ground disturbance associated with the establishment of fences should be minimised by the use of driven posts where-ever possible. Alternative fencing methods, such as the use of standards and netting should be considered where appropriate to reduce ground disturbance.
- Persons undertaking fencing work should be informed of the probability of encountering archaeological deposits and should be briefed by the supervising archaeologist prior to commencing any work. It is recommended that a fencing contractor with some familiarity and experience of working in and around archaeological features is used.
- Where archaeological sites will be affected, all ground disturbance associated with the fencing programme should be subject to direct archaeological supervision, monitoring and recording.
 - The archaeologist will advise if the holes resulting from the removal of existing fence posts should be marked in the ground with a layer of fine gravel placed in the base of the holes prior to backfilling. This will ensure that these fence post holes are not confused with earlier archaeological features, if the area is archaeologically investigated in the future.

4.6 Monitoring

An accurate and sufficiently detailed level of baseline survey and recording (baseline inspection) is essential in order to determine change over time. The level of detail required will depend on the specific circumstances of the heritage place, including its complexity and the nature of any threats. Objective measures of condition should be used in order to provide a baseline for future monitoring. It is important that any detrimental effects arising from natural processes or visitor use are identified and addressed.

Monitoring should be carried out at regular intervals by Reserve staff. Initially quarterly monitoring is recommended for Mauao due to the Reserve being erosion prone, and the

high visitor numbers. The frequency of monitoring should be reassessed with archaeological advice after two years.

A walk-through survey can be used to monitor natural processes as well as visitor and management impacts. Aspects that should be regularly monitored include (as appropriate) weed growth, graffiti/vandalism damage, damage caused by informal tracking, vehicles or bikes, deterioration or damage to structures and safety issues related to features or structures.

In addition to these regular quarterly surveys, informal monitoring should be undertaken during any site visit, after specific management actions, or after extreme weather events. The condition of interpretation signs and visitor facilities can also be incorporated into the monitoring programme.

A standard monitoring form should be used, which may be able to be developed for use on a hand held device, alternatively paper forms may be used and copies kept on file (Appendix 1). Photographs taken from specified points can also be a useful monitoring tool.

The monitoring results should be collated and discussed with an archaeologist at an annual meeting to determine if adjustment to the monitoring programme, intervention or remedial action is required.

5. Summary of work actions

No.	Action	Page	Timeframe
1	Condition monitoring of capping and informal desire lines	7	On-going
2	Remedial action as required: addition of approved / suitable fill, or aggregate to address desire lines.	7	On-going as required in response to monitoring
3	Large tree removal	8	2016-18
4	Remove smaller trees by felling at ground level, followed by herbicide application to stumps if necessary.	8	2016-17
5	Land-slip assessment and response	8	2016 and on-going as required
6	Retire large land slips above the 4WD track from grazing	8	2016/17
7	Pest control in areas retired from grazing in 2005.	9	On-going as required following planting
8	Weed control in areas retired from grazing in 2005.	9	Ongoing
9	Establishment of pohuehue on shell mounds	9	2017
10	Ensure archaeological authority is in place prior to any fencing or planting work above the base track on the north-eastern side of Mauao	9	2016
11	Maintain walking and vehicle tracks	10	On-going
12	Implement rabbit control programme	11	2016 and on-going
13	Stone Jetty and associated stone walls heritage assessment	12	2017
14	Repair of stone walls associated with jetty	12	2017/18
15	Monitoring and vegetation management of Iron Jetty platform	13	2016 and on-going
16	Monitoring	13	2016 and on-going

References

Cunningham, B. & K. Musgrave. 1989. *A History of Mount Maunganui*. Printcorp Services Ltd, Tauranga.

Phillips, K.J.S. 2003. Preliminary Archaeological Survey and Identification of threats to archaeological resources, Mauao Historic Reserve. Unpublished report to Tauranga District Council

Phillips, K. J.S. 2014. Archaeological Inspection and Conditions Assessment Mauao Historic Reserve. Unpublished report prepared for Tauranga City Council

Wildland Consultants Ltd. 2004. Conservation Plan For Mauao Historic Reserve. Unpublished report prepared for Tauranga District Council

Appendix 1: Example Monitoring Form

Mauao Historic Reserve			
Reserve Management and Visitor Monitoring Form			
<i>(Form adapted from Archaeological Site Maintenance Form, developed by s 7(2)(a) – Privacy s 7(2)(a) – Privacy East Coast Hawkes Bay Conservancy, Department of Conservation).</i>			
Inspection Done By		Date	
Maintenance Done By		Date	
Attach a Plan of the Site and annotate if required.			

AREA / ITEM	CHECK		
1. Consultation			
	- hapu/iwi be involved in work that needs to be done		
	- hapu/iwi concerns		
Comments:			
2. Surrounds			
Security	- broken fences/gates		
	- gate latches functional		
	- vandalism		
Groundcover	- trees		
	- weeds		
	- fire danger		
Lines of sight (if obscured)	-		
	-		
Comments:			

3. Condition of archaeological features			
The sites should be inspected methodically i.e. use consistent route through the reserve.			
	- pits		
	- midden		
	- terrace		
	- around visitor facilities, interpretation and fences		
	- erosion beside tracks		
	- mowing/grass trimming heights		
	- pest damage		
	- vegetation/ root damage		
	- protection from weather/lack of vegetation		
Grassed area	- trimming heights		
	- track edges		
Forest	- windthrow damage		
	-erosion/ slip		
Comments:			
4. Visitor Facilities			
	- road condition		
	- parking conditions		
	- water		
	- rubbish		
	- picnic tables		
	- ground cover		
	- weeds		
	- structures (eg. steps) i.e. safety and maintenance		
	- Use - visitor impacts		
	- Use - visitor numbers		
Comments:			
5. Interpretation			
Sians	- new signs needed?		
	- good order		
	- info needs to be updated		

	- sign surrounds ok or require work		
	- location appropriate		
Comments			
6. Tracks			
	- location appropriate/re-routing		
	- gradient appropriate		
	- material appropriate		
	- erosion		
	- being used/ making new ones/ informal tracking		
	- directional signs: condition		
	- directional signs: location		
Comments:			
7. Maintenance			
	- vegetation management		
	- specific treatment required		
Comments			
8. Pests/ threats			
	- insects		
	- rabbits		
	- mountain bikers		
	- horses		
Comments:			

Photo point One

Description

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Date						
Time						
Weather						

Photo point Two

Description

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Date						
Time						
Weather						

Photo point Three

Description

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Date						
Time						
Weather						

--	--	--	--	--	--	--

Photo point Four

Description

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Date						
Time						
Weather						

Photo point Five

Description

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Date						
Time						
Weather						

Photo point Six

Description

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Date						
Time						
Weather						