

Mauao Base Track Remediation Project – Design Principles and Criteria

Issue	Principle	Criteria	Standard	Reference
Social	Track users and others enjoy the experience	Safe and accessible for all abilities	Generally to Classification: 3. Walking Track (Sub-Class 1; Walking Track Walking & Cycling) [SNZ HB8630 equiv.: “Walking Track”]	Track and Walkway Development and Maintenance Manual
			A maximum gradient of 1:12 is achieved, increasing to no more than 1:8 if necessary to protect significant environmental values.	
			Due to high usage, a minimum width of 2.5m is achieved, reducing to no less than 2m to protect significant environmental values.	
			Surface treatment well bound aggregate to ensure traction in all conditions, but natural ground track surface is not recommended on grades exceeding 1 in 8 (12%) because of the potential slipping risk in wet conditions.	
			Barriers avoided wherever possible.	
			Acceptable risk of injury from tree or branch failing.	Tree risk assessment for the Mauao Base Track
		Enjoyable and aesthetic	The form of the track is simple, and in harmony with the track as whole.	
			There are changing views of the ocean, beach, port, ships.	
			There are places to stop to enjoy the scenery.	
			The track promotes connectedness with nature: <ul style="list-style-type: none"> • See and feel the twisted pohutukawa trunks • Easily drop down to the beach from the track • Watch marine fauna 	
Tauranga Moana Iwi Culture and Traditions	Rangatiratanga (Mauao Trustees) and Mana (Nga Poutiriao O Mauao)	The mana whenua relationship of the 3 Tauranga Moana Iwi (as well as Waitaha) with Mauao are recognised and provided for throughout this project	Mauao is an iconic representation of the culture and traditions of Tauranga Moana Iwi with their ancestral lands, water, sites, waahi tapu, and other taonga associated that must be maintained and enhanced.	Section 5, Mauao historic reserve vested in trustees of Mauao Trust; Mauao Historic Reserve Vesting Act 2008. Section 7, (b) (ii) TCC continues to be appointed as the administering body of the reserve under section 28 of the Reserves Act 1977.
		Rangatiratanga of the Mauao Board and the	The Mauao trustees are directly engaged in decisions on all key issues.	Project design team protocol.

Mauao Base Track Remediation Project – Design Principles and Criteria

Issue	Principle	Criteria	Standard	Reference
		mana of Ngā Poutiriao O Mauao is maintained		
	Kaitiakitanga and mauri	Kaitiakitanga is enabled to be exercised / practised by Iwi and hapū that supports the maintains the mauri (well-being, presence and essence of humility) of Mauao in all of the facets of the mountains embodiment as an ancestral figure and entity	The loss of native vegetation, in particular the pōhutukawa trees and shoreline groves are minimised.	Draft Mauao Historic Reserve Management Plan, 2017. NZ Historic Places Trust (NZHPT) Registration of Mauao as a Waahi Tapu 25 June 2009; Record No: 9423 National File No: 29015-117.
All waipuna (springs) affected are maintained and enhanced.				
Impacts on landforms, cultural sites of significance and other natural features (i.e. southern coastal stone field) are minimised.				
Continue to provide public pedestrian access around the base of Mauao.				
			The unobstructed access to and from the Te Kawa beach and the pōhutukawa grove is maintained.	
Environment	Environmental values are appropriately managed in accordance with legislation	Occupation of Coastal Marine Area is minimised	The CMA is only occupied when no practicable alternative is available.	
			All structures in the CMA are designed to be visually and aesthetically compatible with the adjoining coast.	
		Natural Character is preserved	Significant adverse effects on natural character are avoided through: <ul style="list-style-type: none"> • Minimising the scale of structures • Minimising the loss of beach/foreshore environment. • Minimising the loss of native vegetation cover 	
			Natural character is restored by rehabilitating redundant tracks and removing obsolete structures and undesirable vegetation.	
		Natural features and landscape values are protected	Significant adverse effects on natural features and landscape values are avoided through: <ul style="list-style-type: none"> • Structures following natural contours and shapes of landform. • Materials being selected to harmonise with colours and textures in the immediate environment. • Re-establishment of native vegetation cover. 	

Mauao Base Track Remediation Project – Design Principles and Criteria

Issue	Principle	Criteria	Standard	Reference
		Ecological values are protected	The site is managed to exclude fauna from breeding in construction area.	
			The site is managed to minimise sediment entering the marine environment	
			Opportunities to integrate habitat features (e.g. planting, and nest/burrow areas) into the design are optimised.	
		Historic heritage is protected	Archaeological features are avoided wherever practical.	
Where an archaeology feature cannot be avoided, onsite research, recording of archaeological information and materials and the use of the information for raising public awareness and understanding is undertaken.				
Construction	The construction site and construction access routes are safely managed	Track users are protected	Construction site managed to minimise risks to recreational use (track users, fishermen, boats).	
Geotechnical	Track designed in cognisance of ground conditions	An appropriate level of track stability is achieved	Revetment foundation conditions (design return period 1% AEP).	Seismic design of revetment and any retaining structures – NZS1170.5 for structures and NZTA Bridge Manual (3 rd edition, amendment 2) for geotechnical design Liquefaction assessment methodology – MBIE/NZGS earthquake geotechnical engineering practice Module 3 Stability of revetment (Factors of safety to be confirmed with coastal engineers)
			Stability of costal slope above revetment.	Slope stability of coastal cliff – use engineering geological approach and AGS Landslide risk management guidelines 2007

Mauao Base Track Remediation Project – Design Principles and Criteria

Issue	Principle	Criteria	Standard	Reference
			Stability of slope and foundation conditions where track sidles up coastal slope.	Retaining wall design methodology – MBIE/NZGS earthquake geotechnical engineering practice Module 6
Coastal Engineering Rock Revetment	The design of the coastal components is made to applicable standards	The design is cost effective, robust, within design life requirements, maintenance expectations, and availability of materials	<p>Standard of protection: 1 in 100 year return period (1% AEP event)</p> <p>Design life: 50 years</p> <p>Slope face: 1v:1.5h (max)</p> <p>Crest elevation: 2.1m above MHWS / 3.0m above MSL</p> <p>Crest width: <i>See path standards</i></p> <p>Overtopping: 200 l/s/m discharge</p> <p>Damage coefficient: $S_D = 4$ (mid range)</p> <p>Peak storm duration: 4 hours</p> <p>Revetment permeability: $P = 0.4$</p> <p>Rock density: 2,600 kg/m³ (min)</p> <p><i>These criteria are able to be relaxed with client acceptance of the risks / implications.</i></p>	<p>Rock manual http://www.kennisbank-waterbouw.nl/DesignCodes/rockmanual/</p> <p>Coastal Engineering Manual (CEM) http://www.publications.usace.army.mil/USACE-Publications/Engineer-Manuals/u43544q/636F617374616C20656E67696E656572696E67206D616E75616C/</p> <p>AS 4997-2005 Design of Maritime Structures https://www.saiglobal.com/PDFTemp/Previews/OSH/as/as4000/4900/4997-2005.pdf</p>

Mauao Base Track Remediation Project – Design Principles and Criteria

Issue	Principle	Criteria	Standard	Reference
Geometrics	Safe, accessible and comfortable walking track meeting TCC standards	Cost effective, constructible alignment meeting TCC standards for walking tracks	Base track design considers regular horizontal curves along the base track and avoids straight sections to provide natural aesthetics. Maximum horizontal curve at 15 m and minimum at 10 m are implemented in the design, variance in curve radius to be used to protect natural habitat where possible.	Track and Walkway Development and Maintenance Manual Version 1.0 Sept 2008
	The proposed widths and grades provide sufficient accessibility and comfort for pedestrians travelling both directions	In accordance with relevant coastal engineering requirements	Cut slope is generally 1 in 1 and fill slope 1 in 1.5, but with allowance for steeper cut slopes where geotechnically feasible.	