

Tongariro Alpine Crossing

Carrying Capacity review

PREPARED FOR DEPARTMENT OF CONSERVATION

Executive Summary

Our view is that enforcing a carrying capacity limit is not required in the short-term.

1. Activity levels are still lower than earlier peaks, and there are now more management interventions in place to help mitigate impacts. Assessments provided to us indicate that Tongariro Alpine Crossing (TAC) activity numbers have not reached levels that require a carrying capacity limit to be applied.
2. Some impacts still require active management and investment, including additional interventions if possible. If these cannot be successfully managed, and activity levels increase, then a carrying capacity limit should be considered.
3. We recommend approaching carrying capacity in two ways:
 - > **From a base management perspective** – using annual activity figures as the guide. The impacts most relevant to a base management approach are asset & infrastructure maintenance & investment, and biodiversity risks (invasive species, protection of existing habitats etc).
 - > **From a peak management perspective** – using daily activity peaks and weekly rolling averages as the guide. The impacts most relevant to a peak management approach are manaakitanga (including safety, respect for the maunga, and perceptions of crowding) and waste management (blackwater & litter).
4. Shifting away from the traditional language of 'daily average' figures better recognises the manaakitanga challenges at peak times, the longer-term impacts that result from annual activity levels, and the variability that occurs during the main TAC season.
5. Recent management interventions have built a strong foundation for further improvements that would help mitigate impacts from high activity levels. We recognise that there are funding challenges for DOC, but also note that the TAC is an asset for the wider community (and is highly valued by the community). A mix of central, local and community funding is likely to be needed to cover additional interventions.
6. Our recommendations is that carrying capacity limits should be considered:
7. **Base management** – when annual activity levels reach above 155,000 and no additional investment in interventions is available then a limit should be considered. If additional interventions are put in place, and biodiversity evidence does not indicate any further risk, then a limit of 200,000 is feasible in our view.
8. **Peak management** – when more than 5 daily peaks above 2,000 occur in a season, and when a rolling 5 day average of 1,500 is reached. If these occur then a limit at similar peak times in the following season should be applied.
9. Ideally peak management would be done on a predictive basis using forecasts and data from the booking system. We appreciate that this may be difficult to achieve with current systems.



Figure 1: Tongariro Alpine Crossing

Introduction

Appointment and terms of reference

10. The Department of Conservation (DOC) and the Tongariro Alpine Crossing (TAC) Sustainability Project requested analysis of the carrying capacity of the TAC. The review also aligned with reporting requirements from the Provincial Growth Fund which contributed to the initiation of the TAC Sustainability Project.
11. Third Bearing Limited was commissioned by DOC to undertake this work in April 2024.

Purpose

12. The purpose of the analysis was to review and provide analysis that summarised the Social, Environmental, Cultural and Economic impacts against the potential caps and identify the carrying capacity of the TAC based on this data.

Work programme and reporting

13. The project proposal was submitted and the contract signed in April 2024 with a final report due May 2024.
14. The timeline was adjusted in May 2024 to allow for final report delivery in June 2024 due to availability of key information. A preliminary report was delivered to the TAC Sustainability Project Team on 6 June and the final report was delivered in late June 2024..
15. Our methodology involved:
 - > Evaluating and summarising the cultural assessment (draft), social impact assessment (draft), environmental impact assessment (draft), and economic impact (final) assessments that were supplied.
 - > Review of historical reports (both supplied and sourced ourselves).
 - > Discussion with DOC staff on asset maintenance of the TAC.
 - > Analysing relevant data collected, including:
 - Counter and bookings data.
 - Weather data.
 - Blackwater removal information.
 - > Review the findings of the provided assessments according to The Treasury's Living Standards Framework, including against He Ara Waiora.

- > Presentation to the DOC project team on the interim findings to provide opportunity for feedback.
 - > A written report delivered advising the team and providing any recommendations on the carrying capacity of TAC based on the information and data provided.
16. Our work was carried out by Tyson Schmidt, Mark Devery, Sonia Griffin and Jemma Cheer of Third Bearing Limited.

Abbreviations, tables and currency units

17. The following abbreviations are used through the text:
 - > DOC – Department of Conservation.
 - > TAC – Tongariro Alpine Crossing.

Acknowledgements

18. We would like to thank Cher Knights, Fiona Hall, Kareem Ismail of DOC for their assistance and input throughout this work. The co-operation and assistance of wider DOC staff, their contractors and the TAC Sustainability Project team is also gratefully acknowledged.

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20. No responsibility is accepted if full disclosure has not been made. We do not accept responsibility for any consequential error or defect in our conclusions resulting from any error, omission or inaccuracy in the data or information supplied directly or indirectly.
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Background

22. The Tongariro Alpine Crossing (TAC) is New Zealand's most iconic day walk. Situated within the dual world heritage Tongariro National Park in New Zealand, and one of only three World Heritage Sites in New Zealand, it is steeped in both geological and cultural history. The landscape of the TAC is dominated by rugged volcanic beauty of Mount Tongariro and by neighbouring peaks, Ngauruhoe and Ruapehu, the culturally significant blue lakes and native dense forest.
 23. The TAC's popularity and visual appeal was recently acknowledged with the TAC achieving a top four position in an (informal) study¹ that ranked walking trails across the world according to the amount of Instagram posts that have been uploaded per km of the trail.
 24. The walk will typically take between six and eight hours and is 20.2 km long between Mangatepopo and Ketetahi. It is considered that walkers need to have a moderate level of fitness as the track climbs nearly 800m in altitude to 1900m above sea level. While most of the track is graded and considered to be well-maintained there is elements of the track that require more caution, such as the descent from Red Crater. The primary walking season spans from October to April, as weather conditions can change rapidly in the mountainous environment, with temperatures dropping significantly. During winter, the trail can be covered in snow and ice, making the traverse more challenging.
 25. The mountains at the heart of the park hold cultural and spiritual significance importance for Ngāti Tuwharetoa, symbolising their spiritual connection to the environment. Ngāti Hikairo ki Tongariro sit within Ngāti Tuwharetoa as the hau kāinga for the Tongariro region and serve as the kaitiaki of the Tongariro Maunga. Their role as kaitiaki is to ensure the spiritual and physical wellbeing of the maunga and its people, both local and visitors.
- ## Visitor & stakeholder views
26. The TAC has always maintained a high level of visitor satisfaction from surveys dating back to 2007 through to 2024. Where visitor satisfaction was negative it related to peak activity days where perceptions of overcrowding and access to clean toilet facilities influenced responses. Perceptions of when overcrowding occurs can vary also:
 - > 2007 report² found while 74% of walkers were satisfied with the walk, regardless of the number of walkers per day, but the level of satisfaction diminished after both 350 and 550 walkers per day.
 - > A 2017 Inception Survey suggested congestion and negative perceptions of crowding can be managed at an activity rate of 1000-1100 per day.
 27. Overcrowding wasn't the only issue affecting visitor satisfaction, a 2021 TAC Evaluation found that drones were having the most significant negative impact (number of people and behaviour of people was second).
 28. A stakeholder engagement survey in 2022 was conducted through several online and face-to-face workshops. Issues identified:
 - > Visitor crowding. Of those surveyed 87.5% were supportive of a trial to manage visitor numbers (this included using a booking system which was trailed in 2023/24 season).
 - > Importance of TAC on culture and environment with 72% of respondents who felt that culture was very or extremely important.
 - > Use of alternative management solutions.
 29. In 2017 there were noted concerns from Ngāti Hikairo ki Tongariro around the desecration of the maunga with blackwater not being sufficiently managed, culturally sensitive areas not respected, issues with rubbish and litter on the maunga and safety of visitors. A report drafted that same year³ recommended several management interventions to improve visitor experience, minimise environmental impact and improve cultural and community values, these included:
 - > To trial a daily limit for TAC visitors to 1250 visitors between 6.30am and 11.30am.
 - > To restrict access to TAC carparks and encourage visitors to use 'park and ride' transportation.
 30. Carpark restrictions were implemented for the 2018/2019 walking season and a private car park providing parking for up to 250 cars was opened in 2020.

1 [Tongariro Alpine Crossing is Instagram's 4th most popular tramping track in 2024 - study | Newshub](#) - site accessed 13/06/24

2 Establishing integrative use limits on the Tongariro Crossing - Paul Blaschke (2007)

3 Establishing daily limits for Tongariro Alpine Crossing (TAC) visitors in Tongariro National Park and a proposed schedule for public transport drop off limits. Bamford, 2017.

Figure 2: Tongariro Alpine crossing



- 31. Blackwater remained an issue and additional toilets installed in 2016 helped alleviate some of the pressure but there remained an issue around the Emerald Lakes with visitors relieving themselves in the natural environment. Temporary toilets are now located in the Emerald Lakes and South Crater areas over the summer walking period however it is noted they are located in culturally sensitive sites and were only reluctantly agreed to by mana whenua.
- 32. New occupancy sensors and quick dry solutions currently being considered will help to improve the monitoring of the facilities and visitor experience.

Management framework approach

- 33. In 2021 DOC collaborated with Ngāti Hikairo ki Tongariro to create an iwi-based values management framework for the TAC. This framework integrated the principles of manaakitanga and kaitiakitanga into visitor management strategies for the TAC, with a focus on the cultural significance of the TAC. This framework highlighted that unrestricted visitor access and lack of management measures pose risks to these principles and the broader wāhi tapu status of the TAC.
- 34. Because the TAC is of prime cultural, environmental, social, and economic importance to mana whenua, local communities, and the region, the Living Standards Framework is also used due to its ability to prompt system thinking across different domains, and recognition of long-term issues and its implications on policy. The Living Standards Framework is also underpinned by He Ara Waiora, a waiora framework built on te ao Māori knowledge and perspectives of wellbeing. He Ara Waiora can be used to prompt deeper understanding and thinking to improve policy advice and operational processes.
- 35. The TAC management framework aims to achieve certain goals:
 - > Incorporate Tangata Whenua’s cultural and spiritual values, both tangible and intangible in the practice guidelines and management actions.
 - > Identify desired end state.
 - > Be an anchor / foundation for DOC that provides a sound rationale and guiding principles to base the TAC visitor management decisions and beyond in the management of protected natural areas.

- 36. The framework is based on six overarching principles⁴ explained below in Table 1. Visitor management objectives for the TAC are shown in Table 2 below. These fit with the principles outlined in Table 1, and frame the desired state for the TAC.⁵ To ensure this theoretical management framework is practical and implemented on the ground, five key problem areas were identified to inform TAC management objectives and carrying capacity. The five key problem areas have been used to develop assumptions that are used to test if restricting visitor will resolve these problems – these are shown in Table 3.

Table 1: The principles of TAC management framework & its explanation

Principle	Explanation
Respect diversity	Recognise, respect, acknowledge, and include the cultural and spiritual significance of Papatūānuku.
Build diverse networks	Creating and cultivating networks of support among Tangata Whenua and others, enabling revitalisation, resilience and strengthening of the management and governance of protected and conserved areas.
Ensure safety & inclusivity	Create an informed and safe environment for Tangata Whenua and all stakeholders. Culturally appropriate and inclusive processes enable the best possible management.
Account for change	The concept of a thriving Papatūānuku may change with time and place. Thus, protected natural areas are seen as embedded within broader cultural, historical, and socio-economic networks.
Recognise rights & responsibilities	Adopt a holistic approach that recognises the multiple responsibilities and rights of Tangata Whenua as kaitiaki and that encourages dialogue and reciprocity amongst all parties.
Recognise nature-culture linkages	Recognition of Papatūānuku through education, practice, arts, humanities, and literature.

⁴ Detailed explanation of the overarching principles and framework phases could be accessed through TAC Management Framework.

⁵ Representatives from Ngāti Hikairo ki tongariro developed an iwi-based values for TAC.

Table 2: Categories and desired status influencing TAC management objectives

Values	Categories	Desired Status
Manaakitanga	Natural & Cultural Values	<ul style="list-style-type: none"> > TAC is a safe place to visit. > Visitors are hosted according to Ngāti Hikairo values. > To convey the significant sacred and intrinsic values of the maunga in a meaningful way.
Kaitiakitanga	Visitor physical safety	Every visitor can keep themselves safe and visitor infrastructure is kept safe.
	Congestion	Structured management of visitors' flow.
	Transportation	Quality safe integrated transport network serving the TAC and nearby experiences.
	Visitor impacts	Human-induced environmental impacts are minimal.
	Visitor appreciation & Accessibility	Visitors have a fair opportunity to experience the values of TAC.
Sustainability	Carbon neutral experience within PCL by 2040.	

Table 3: Key problem statements & operational assumptions

Key Problem Statements	Operational assumptions to be tested
Timely access to toilet facilities is required to eliminate the desecration of the maunga from unmanaged human waste and inherent impacts to nature.	<ul style="list-style-type: none"> > Reducing wait times at facilities that have fixed capacity can be achieved by controlling visitor flow and daily demand. > Managed visitor volume could reduce demand for temporary summer toilets installed at high altitude sacred sites (Emerald Lake).
The environmental risks and costs of removing human waste (black water) increases with volume and frequency of its removal.	<ul style="list-style-type: none"> > The risks of transporting black water in a sensitive site can be reduced by lowering visitor demand and the subsequent volume of waste. > The Department service delivery is better when demand is more stable. > Carbon reduction can be better managed if demand is stable.
Congestion at scared sites is unacceptable from a Manaakitanga and Kaitiakitanga perspective.	<ul style="list-style-type: none"> > Controlling daily visitor volume will reduce congestion at sacred sites. > Managing visitor departure times can reduce congestion at scared sites and cultural impacts.
Off-track walking creates environmental impacts and risk desecrating the mana of the maunga.	<ul style="list-style-type: none"> > Controlling daily visitor volumes, flow and behaviour can reduce congestion which minimises off track walking.
Visitor safety is compromised when concessionaires ignore 'Adverse Weather Warnings'.	<ul style="list-style-type: none"> > Concessionaires complying with weather warning recommendations and improving lines of communication to visitors will reduce visitor safety risks.

Summary of assessments provided

Economic impact assessment

37. An economic impact assessment of various carrying capacity limits was prepared for DOC by Market Economics Consulting Limited.⁶ This was completed in late 2023 and was based on five different 'day visitor limits' provided by DOC. Market Economics Limited reviewed DOC's initial modelling from 2022, undertook sensitivity analysis, and estimated the economic impacts associated with the different visitor limits.⁷
38. Two key factors influence spread of potential outcomes under each of the visitor limit scenarios:
- > Percentage of visitors who would rebook if they were above the visitor limit. Each scenario considered 20%, 30% and 40% rebooking loss (i.e. 80%, 70% or 60% of visitors would rebook).
 - > Number of clear weather days each month. Higher levels of bad weather mean less visitors, with a corresponding loop to rebookings.
39. The economic impact assessment was based on 2018/19 activity levels – 146,260 visitors generating combined revenue of \$7.85m. Recovery from low COVID19 activity levels was assumed to take until 2026/27. Total Value Added for the 'no visitor limits' scenario (i.e. return to earlier activity levels) was assessed as \$8.236m (including \$3.081m to Ruapehu District itself), and a total of 71 employees (30 in Ruapehu District).

Table 4: Total value added and employment impacts of various activity limits

		Rebooking loss	
		20%	40%
600 limit	Total Value Added	-\$3.975m	-\$4.960m
	Total Employment	-34	-43
800 limit	Total Value Added	-\$2.810m	-\$4.082m
	Total Employment	-24	-35

⁶ Market Economics Limited, *Tongariro Alpine Crossing. Economic Assessment of Proposed Visitor Restrictions*, 16 November 2023.

⁷ Market Economics Limited assessed economic impacts using a bespoke impact model, and reported in terms of value added and employment. The value added impacts covered potential lost revenue (concessions, activity fees and levies) and lost visitor spending. Sensitivity analysis focused on visitor activity and revenue changes under various limits based on DOC modelling.

		Rebooking loss	
		20%	40%
1,000 limit	Total Value Added	-\$1.645m	-\$3.205m
	Total Employment	-14	-28
1,200 limit	Total Value Added	-\$0.480m	-\$2.328m
	Total Employment	-4	-20
1,500 limit	Total Value Added	\$0	-\$1.012m
	Total Employment	0	-9

40. Both Market Economics Limited and DOC have stressed that the economic impact assessment does not consider the wider economic and other costs and benefits, such as health and wellbeing effects, connecting with nature, social and cultural values, and environmental protection. In that sense it is always just one part of the overall carrying capacity picture. It also did not cover any pricing responses to any limit changes.
41. Important to note that the economic impact assessment is based on the daily limits (of visitor numbers) being translated into annual visitors. A lower average daily visitor limit translates into a correspondingly lower annual number of visitors (based on the length of the main walking season, and an estimate of clear weather days). It is not a model that considers daily peaks and 'clips' these according to any daily limit, which would result in significantly less visitor 'loss'. In this sense the assessment is a conservative one. It also further highlights to us the importance of knowing how the concept of 'average daily visitors' is applied when thinking about capacity limits.
42. The economic impact assessment also assumes that similar levels of spending per visitor continues into the future. If a higher value experience was provided (including more guided options), then more revenue could be obtained from a lower number of visitors to the TAC. This would mean less impact from any activity limits that may be imposed.

"Balancing visitor limits and economic impacts is crucial for managing the hiking track in a sustainable manner while maximizing economic benefits for the region, particularly for small local economies."⁸

⁸ Quote taken from page 5 of the economic impact assessment.

Cultural report – iwi view

43. We received a draft cultural report dated 25 March 2024 which was primarily the result of a wānanga held in February 2024.⁹ The wānanga was attended by Te Ngāehe Wanikau, Bubs Smith, and Te Maari Gardinere-Ngata of Ngāti Hikairo ki Tongariro, along with Dave Bamford (Project Lead and Tourism Advisor) supported by Kathy Ombler, and Tania Short (Manager Experience Design, Visitor and Heritage) and Deborah Chae (Senior Brand and Marketing Advisor) from DOC.
44. Key points from the cultural report were that:
- > No carrying capacity was defined. Ngāti Hikairo ki Tongariro emphasise the qualitative aspects of managing impacts from manuhiri on the maunga, rather than quantifying any capacity or limit (though see room for both to work alongside each other).
 - > Economic impacts are not the prime drivers. Ngāti Hikairo ki Tongariro see it as important to begin with te ao Māori and get the values right, and then the economic value will fit. Manaakitanga and kaitiakitanga are fundamental bases for managing the TAC experience.
 - > The starting point is anyone walking on the maunga is trampling mana. Therefore, if people are going to be on the maunga, then it is about managing this through manaakitanga.¹⁰ The experience must be about quality (for people and the environment), because if quality is low then this reflects on those who have responsibility for manaakitanga.

“Ngāti Hikairo ki Tongariro believe the qualitative work that has been started, along with the implementation of these additional measures, and the improved understanding and respect these measures will engender for our tupuna, Tongariro, hold more importance than concern about specific numbers walking on the maunga on any given day.”¹¹

9 Ngāti Hikairo ki Tongariro, *Tongariro Alpine Crossing Visitor Caps – an iwi view. Perspectives from Ngāti Hikairo ki Tongariro and Te Ao Māori* (Draft), 25 March 2024.

10 It is important to note that manaakitanga encompasses the wider concepts of caring and protecting for visitors, not just greeting and making people feel welcome. It therefore includes ensuring people are well prepared, understand where they are walking and what their impact is, and that they are safe on the maunga (physically and otherwise).

11 Quote take from page 8 of the cultural report.

45. A strong theme from the cultural report was the number of new initiatives that Ngāti Hikairo ki Tongariro note as helping achieve a quality experience (and therefore appropriate manaakitanga and kaitiakitanga). This included:
- > Cultural awareness programme currently under development by DOC and Ngāti Hikairo ki Tongariro.
 - > Pou whenua almost completed for installation at the Mangatepopo entrance to the TAC, enabling a powerful statement to manuhiri that they are walking on sacred land.
 - > Annual, full-day wānanga for all drivers and guides as a concession requirement when operating on and around the maunga.
46. Further initiatives to enhance the quality of the experience were also noted:
- > Staggering start times as a way to help perceptions of crowdedness.
 - > Encouraging more guided walks, led by guides who have attended wānanga to understand the kaupapa of Ngāti Hikairo ki Tongariro and the maunga.
 - > Increased presence of Ngāti Hikairo ki Tongariro representatives at the track entrance, offering mihi whakatau, waiata, and korero to welcome and safeguard manuhiri. This would be especially important in summer peak times.

Social impact assessment

47. A draft social impact assessment report was completed by DOC in May 2024,¹² along with a summary presentation of its findings. The report highlighted:
- > The local community values and considers TAC as fundamental to their identity due to its cultural significance and its essential economic benefits to local businesses.
 - > There is an expected variation of opinions regarding the potential visitor capping numbers between different stakeholders based on their interest, and concerns about the effectiveness of some project interventions.
 - > Despite communities and businesses feeling a considerable degree of uncertainties about potential impacts of any carrying capacity limits, there is recognition that measures need to be taken to lift the visitor experience and protect natural and cultural values.

12 Department of Conservation, *Social Impact Assessment Report for Tongariro Alpine Crossing Visitor Sustainability Project* (Draft), May 2024.

- > Results are consistent with earlier engagement about the issues and potential innervations facing TAC and the visitor perceptions about the TAC experience.
- 48. Earlier engagement had noted that visitor satisfaction rates with TAC are generally high, but that visitor perceptions of crowding creates negative experience during peak activity days. These perceptions of crowding were seen as manageable at annual daily activity levels of 1,000 to 1,100, and/or through staggering groups starting at the Mangatepopo carpark at 125 visitors every 30 minutes.
- 49. A 2024 survey of TAC stakeholders showed that 94% of respondents strongly agreed or agreed that the TAC is fundamental to community identity in the area, and that the TAC is highly valued or valued by the local community. Earlier engagement also highlighted that respondents felt:
 - > culture was very or extremely important (72% of respondents)
 - > environment was very or extremely important (97.5%).
- 50. The focus on culture and environment was further emphasized by the 2024 survey of TAC stakeholders where 50% agreed that these aspects need to be further emphasised as part of improving the visitor experience.
- 51. Engagement with visitors and stakeholders in 2022 showed that there was increased support of interventions (such as the booking system) for better management of visitor impacts on the TAC. One suggestion included varying any capacity limit, allowing for it to be higher during busy times and lower for the rest of the walking season.
- 52. Manaaki rangers (rangers staffed by Ngāti Hikairo ki Tongariro) highlighted in the 2024 stakeholder survey that they are seeing improvements in visitor safety/preparedness (including an increased degree of compliance with bad weather alerts), but it still remains a key issue. They Manaaki ranges also noted appreciation of the cultural components from international visitors.

"...around 50% of the respondents think that the experience could be improved significantly and/or does not generate the sufficient level of understanding of the cultural heritage and environment in such an important dual world heritage site."¹³

¹³ Quote taken from p.18 of the draft Social Impact Assessment Report.

Environmental impact assessment

- 53. A draft environmental impact assessment report was completed by DOC in May 2024,¹⁴ along with a summary presentation of its findings. It was not able to give a definitive carrying capacity limit based on the evidence available, but did note that blackwater management issues tend to support a daily average capacity of 1,000 to 1,100.
- 54. A recent Assessment of Environmental Effects for the Tongariro Alpine Crossing Realignment set out the likely species present at the Ketetahi end of the TAC (and therefore likely present at other locations).¹⁵ Environmental-DNA testing results were also received by DOC in May 2024 which provided comprehensive view of species at six key locations. Some nationally vulnerable and at risk native flora were identified by these reports – Woodrose, Thismia, and White Mistletoe. Native bird species are present in some parts of the TAC, but only the Western Brown Kiwi is noted as at risk. There is likely to be some at risk lizard species present (including potentially Barking Gecko), but additional monitoring would be needed to confirm if this is correct¹⁶.
- 55. In terms of the biodiversity aspects of the TAC, the general assessment was that the impact on ecosystem types and threatened species from current activity levels is low to moderate and localised around the track.
- 56. However, DOC biodiversity experts who contributed to the Environmental Impact Assessment noted that the main ecosystem impacts from TAC visitors comes from:
 - > waste – including human waste and rubbish
 - > potential spread of exotic species, weed and algae.

Spread of invasive species

- 57. The Environmental Impact Assessment highlighted the spread of Juncus weed in the culturally valued Emerald Lakes. This weed covered practically the whole edge of the lake, and took several years of consistent effort and resources to remove it. While it cannot be proved definitively that the Juncus weed was introduced by walkers (e.g.

¹⁴ Department of Conservation, *Social Impact Assessment Report for Tongariro Alpine Crossing Visitor Sustainability Project* (Draft), May 2024.

¹⁵ Department of Conservation, *Assessment of Environmental Effects for the Tongariro Alpine Crossing Realignment, Ketetahi End Tongariro National Park*, April 2024.

¹⁶ Additional monitoring is also needed to establish trend information for the e-DNA testing.

through boots), it remains a good example of the potential risks from sustained high numbers of walkers. The spread of invasive weed or other species is also noted as one of the most significant potential impacts on the ecosystem of the area.¹⁷ Continuous surveillance to allow for quick and rapid response to any invasive species has been identified by DOC as a recommended inclusion in the environmental monitoring programme for the TAC.

Impacts of human waste and rubbish

58. Installation of toilets on the TAC have been the main way to manage the human waste impacts of forecasted growth in activity levels. New toilets were most recently installed in 2016 and then again 2018 – and the Environmental Impact Assessment noted that these have been successful in mitigating the risk of human waste from increased activity levels. This indicates that the current toilets on the TAC are capable of handling a carrying capacity of around 1,000 and 1,100 daily average. Our modelling of the toilet capacity suggests that a higher carrying capacity could be handled with targeted management.
59. It is important to note that the installation of toilets on the TAC is contentious, especially at the higher levels of the track where the more sacred sites are. The recent installation of 6 temporary summer toilets installed at high altitude close to sacred sites, was a decision Ngāti Hikairo ki Tongariro allowed to prevent impacts but were very reluctant to support.¹⁸ Neither DOC nor Ngāti Hikairo ki Tongariro want to increase the number of toilets on the TAC any further, and the preference is to reduce the number.
60. There is a difficult balance to be struck when managing human waste on the maunga. If the number of toilets is reduced, then there is the risk of visitors toileting outside of the facilities due to long waiting queues. It also isn't just a case of emptying the toilets more frequently – helicopters are required to access most of the toilets and that comes with higher carbon emissions, higher costs, and increased risk of spillage.
61. We understand DOC and Ngāti Hikairo ki Tongariro continue to identify how management of human waste can be improved. The Environmental Impact Assessments notes that setting and managing TAC management objectives based on visitor wait times at facilities, total containment of human waste, and annual targets for

total volume transported off the maunga will all help determine the carrying capacity of the toilet facilities.

“Since the additional toilets were installed in 2016 & 2018 it appears they are managing visitor impacts on anecdotal observations. More work is required to confirm this and better understand the true carrying capacity of the facilities.”¹⁹

Asset maintenance of the TAC

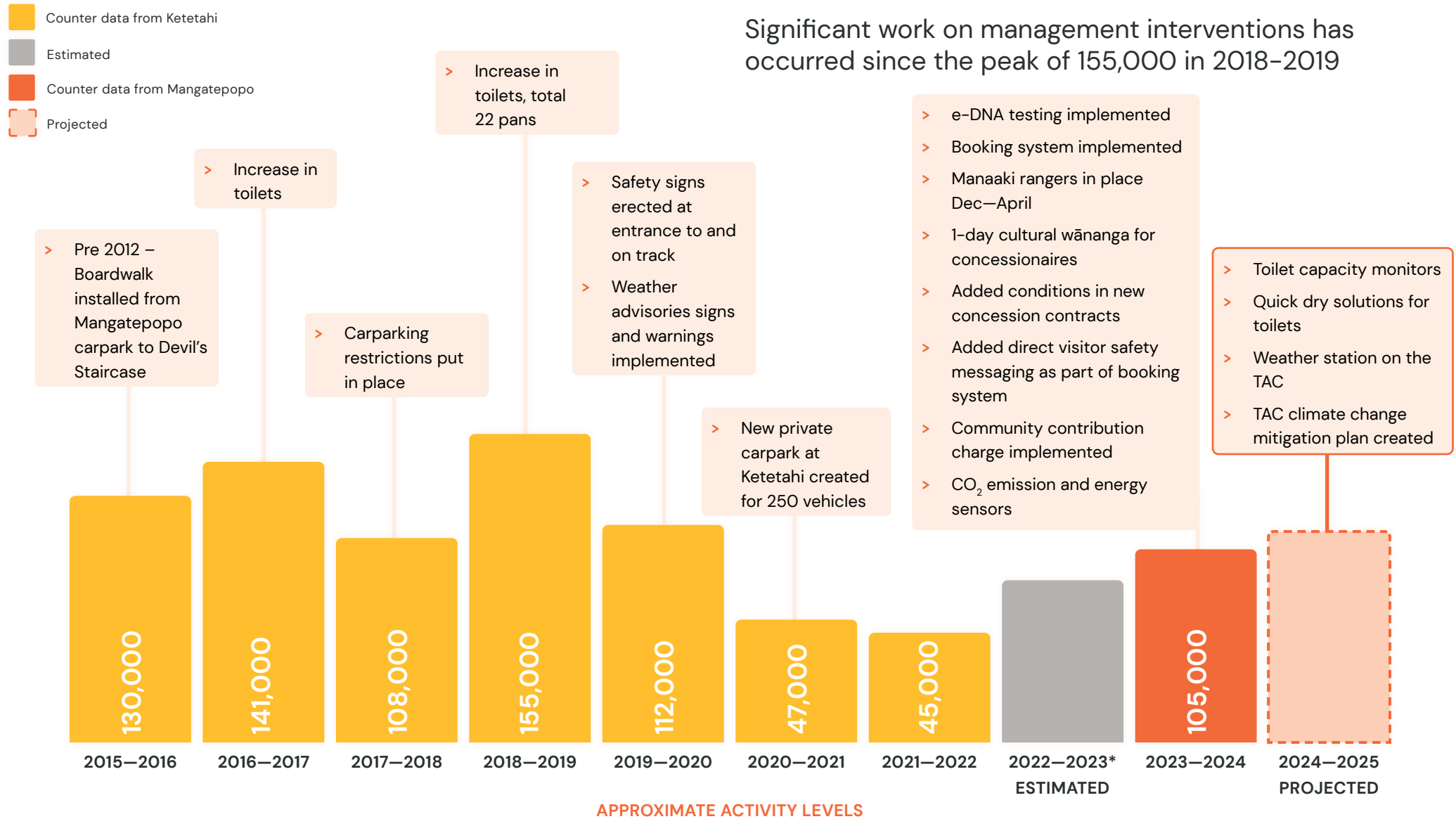
62. We discussed the approach to asset management of the TAC with DOC staff. Our understanding from these discussions is that while the TAC was not originally designed for the activity levels experienced over the last decade, most of the track damage arises from weather events and natural erosion. Activity levels can still accelerate track damage, and erosion can result in safety issues for users. Climate change is also likely to impact on the TAC by accelerating the number and severity of weather events that can cause damage to the track.
63. DOC staff told us that the TAC is likely to be past its optimal 'level of service' in terms of asset maintenance funding. Operational maintenance spend provides for day-to-day track upkeep, but there is limited capital available to improve the TAC 'level of service'. At the time we spoke to DOC staff they were working on securing internal funds as well as funds from other parts of Government to cover the capital requirements.
64. The nature of maintaining an asset like the TAC is that underspends can take a number of years to reveal themselves (i.e. before the effects of deferred maintenance become obvious to the user). Any deferred maintenance is likely to reveal itself in terms of safety issues for users and/or evidence of lower quality of experience. While we were not able to find any evidence to match the asset maintenance impacts to carrying capacity levels, we accept that higher activity levels would have an impact on track standards over time.

¹⁷ Department of Conservation, *Tongariro Northern Circuit Great Walk Experience Plan*, May 2024.

¹⁸ For example, the current Tongariro National Park Management Plan recommends not increasing the number of toilets in specific areas on the TAC.

¹⁹ Quote taken from page 14 of the draft Environmental Impact Assessment report.

Figure 3: Management interventions



* Activity counters are electronic monitoring devices that detect and store visitor activity data on public conservation land. Activity counter data provide an understanding of visitor activity patterns at DOC sites or 'destinations'. This helps DOC's planning of capital investment in visitor assets (such as campsites and tracks) and their ongoing maintenance. The data are the best available indicator of the public's preferences, and the benefits that DOC's investments are delivering to New Zealanders and our international guests. Uncalibrated data (the number of times the counter sensor has been triggered by a person) must not be used to indicate the number of visits or the number of unique visitors to a place. Converting counter data into visits and visitors requires calibration of the data with guidance from a DOC Technical Advisor. Due to a technical issue, activity counter reports have not been updated since 29 June 2022. DOC is working to fix this.

Key context points

Management interventions

65. It is important to understand the range of management interventions that have been put in place over time at the TAC. Prior to 2012 the boardwalk from Mangatepopo carpark to the South Crater staircase was installed in an effort to minimise environmental impacts of walkers not following a defined path through these areas. The number of toilets has been increased over the years in an effort to manage cultural and environmental issues, whilst also balancing the preference to not have facilities at the most sacred of sites on the track. Signage along the track has also been increased to help inform walkers of the risks and impacts.
66. A number of these interventions have been put in place since the peak 2018/19 seasons prior to COVID19. Weather advisories have been implemented to help ensure walkers make better judgements about whether to undertake their walk on a predicted bad weather day. A new carpark has been created at the Ketetahi end of the TAC which shuttle providers can use as well (transporting visitors from there to the start of the track at the Mangatepopo end). The booking system, Manaaki rangers, and improved training for guides and concessionaires were all put in place for the recent 2023/24 walking season.
67. There are indications that these most recent management interventions are already starting to have a positive affect on managing impacts on the TAC. The cultural report also noted Ngāti Hikairo ki Tongariro view these as positive steps for improving the quality of the TAC experience. There are also plans to implement further interventions as well, including remote monitoring of wastewater levels at toilets, installing a weather station at the highest point of the TAC, and further improvements to the booking system.
68. Given the range of interventions that have been put in place since COVID19, and that activity levels have not yet reached the peak levels of the 2018/19 season, our view is that it is important to recognise that it is very likely that DOC and the community are in a better position to manage impacts compared to when capacity limits were discussed prior to the 2018/19 season.

2023/24 activity levels

69. Daily counts of activity levels across the TAC show how variable activity is even on a day-to-day basis. There are very few periods where consistently high levels of activity take place over an extended period of time – either bad weather interrupts or holiday periods end.

70. Analysing the daily activity count from the 2023/24 main walking season shows that:
- > 98% of days are below 1,500
 - > 90% are below 1,100
 - > 70% are below 800, and
 - > 51% are below 600.
71. If all walkers above the 1,100 level were somehow not allowed to go on the TAC, and assuming that none of them rebooked for a later day, then less than 5,300 walkers would be 'lost'.
72. If we remove the variability noise from the count and use rolling 5 and 7-day averages, some other patterns start to be revealed:
- > a slower start to the main walking season from the start of October to the end of December, with activity levels nearly always below 800 a day
 - > the emergence of multi-day peaks from January through till April (most of these sustained periods of high daily averages are driven by days with activity levels above 2,000, which then drop down to 1,100 or 1,500 in following days)
 - > in between these peaks there are still several periods where the activity levels are below 800 a day (i.e. similar to the start of the main walking season).
73. Other key findings from analysing the 2023/24 activity counts and associated bookings data are:
- > most of the peaks tend to occur at predictable times – long weekend public holidays especially²⁰
 - > the majority of rebookings are for within 5 days of the original date, and most are for the following day
 - > sufficient numbers of walkers book far enough ahead to give an indication of whether upcoming days are likely to 'peak' (especially in line with knowledge of when long weekends and public holidays occur)
 - > activity levels are very responsive to weather alerts, even when the predicted weather does not eventuate.²¹

²⁰ There are also some periods in February

²¹ Our weather information was taken from the station at the Chateau, Whakapapa, so conditions on the actual TAC may have been worse/better. We understand a weather station is being placed on the TAC itself to improve the accuracy of these weather alerts.

Figure 4: Daily activity count based on counter data

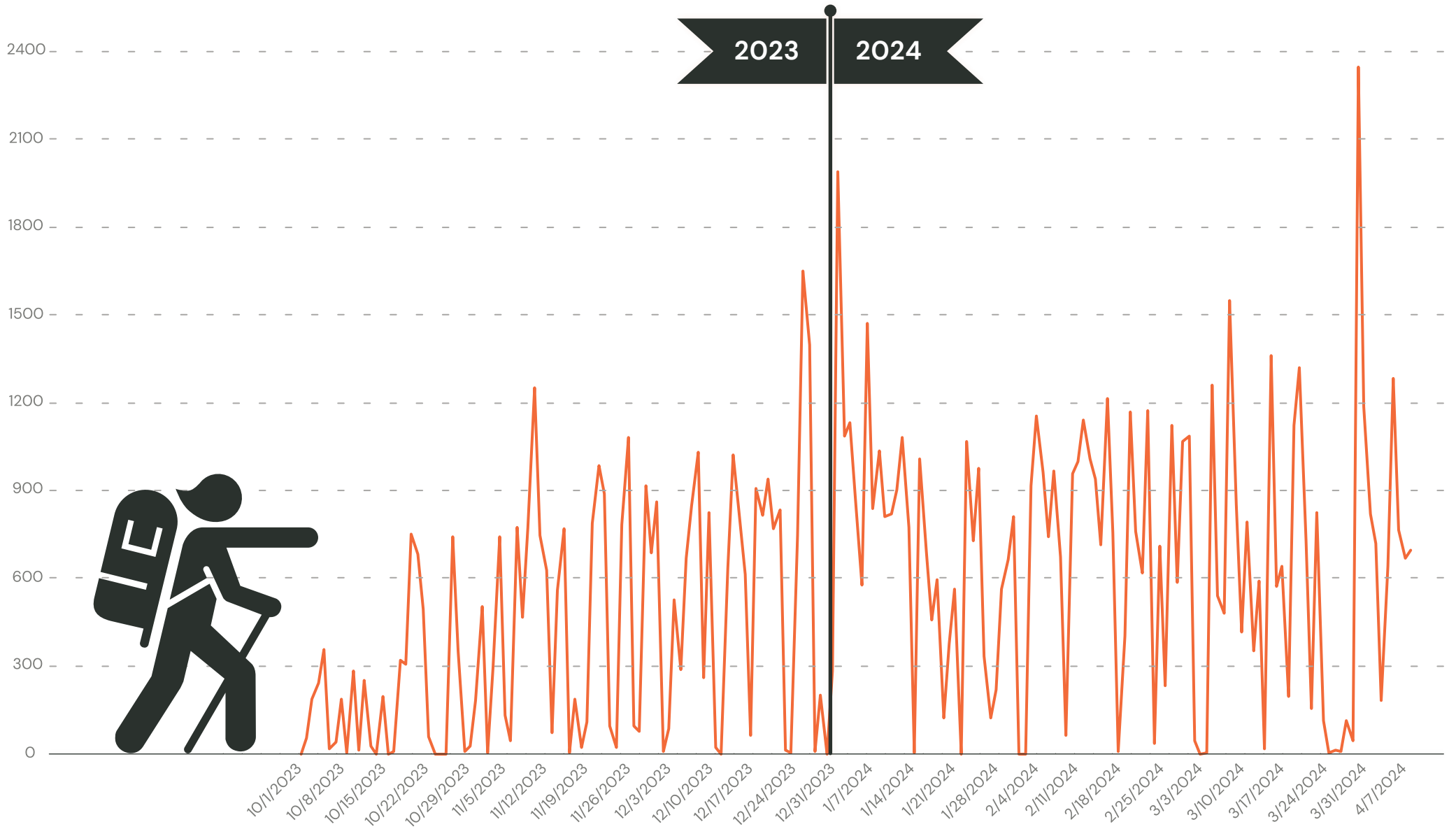


Figure 5: Daily activity count based on counter data

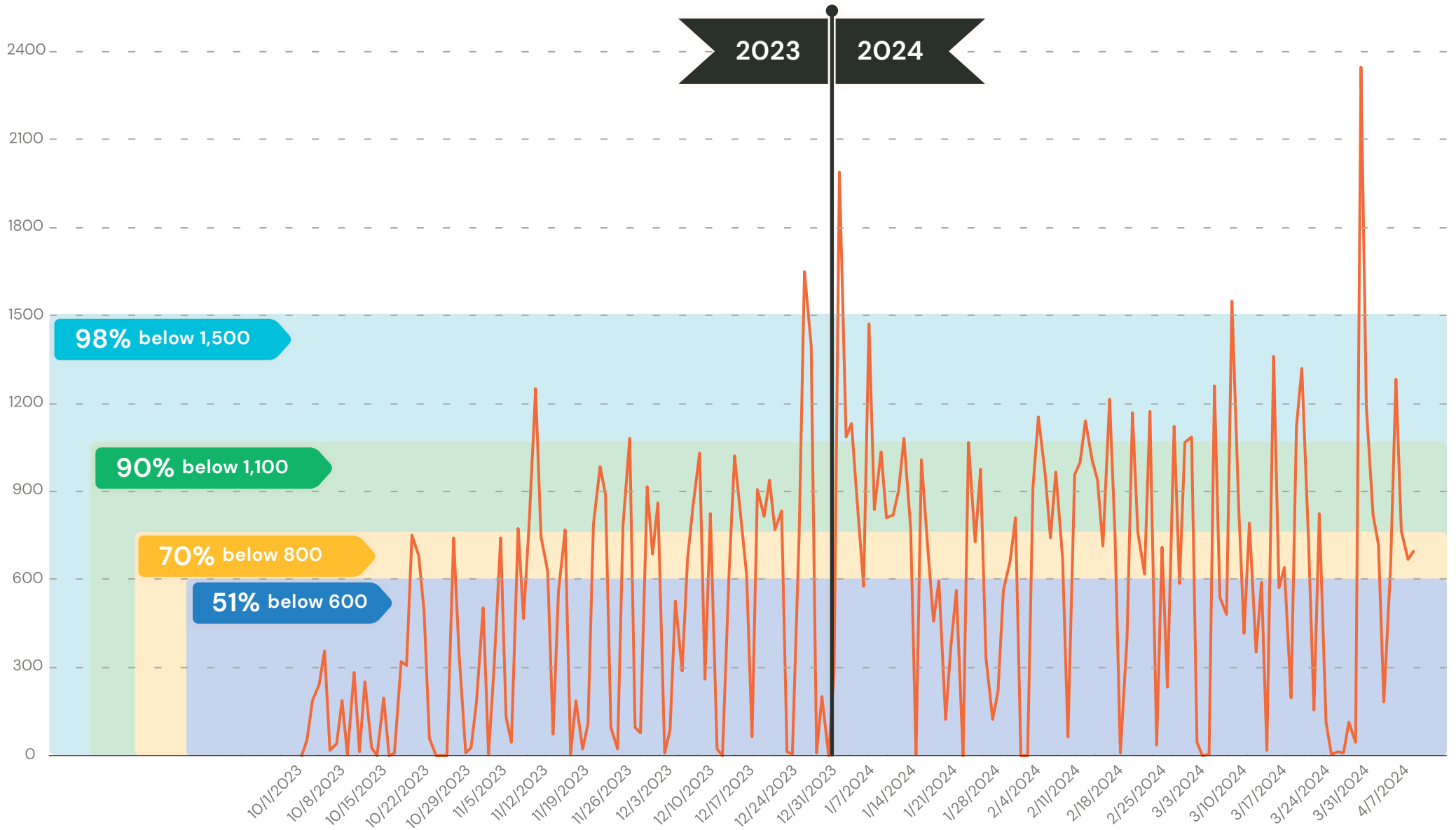
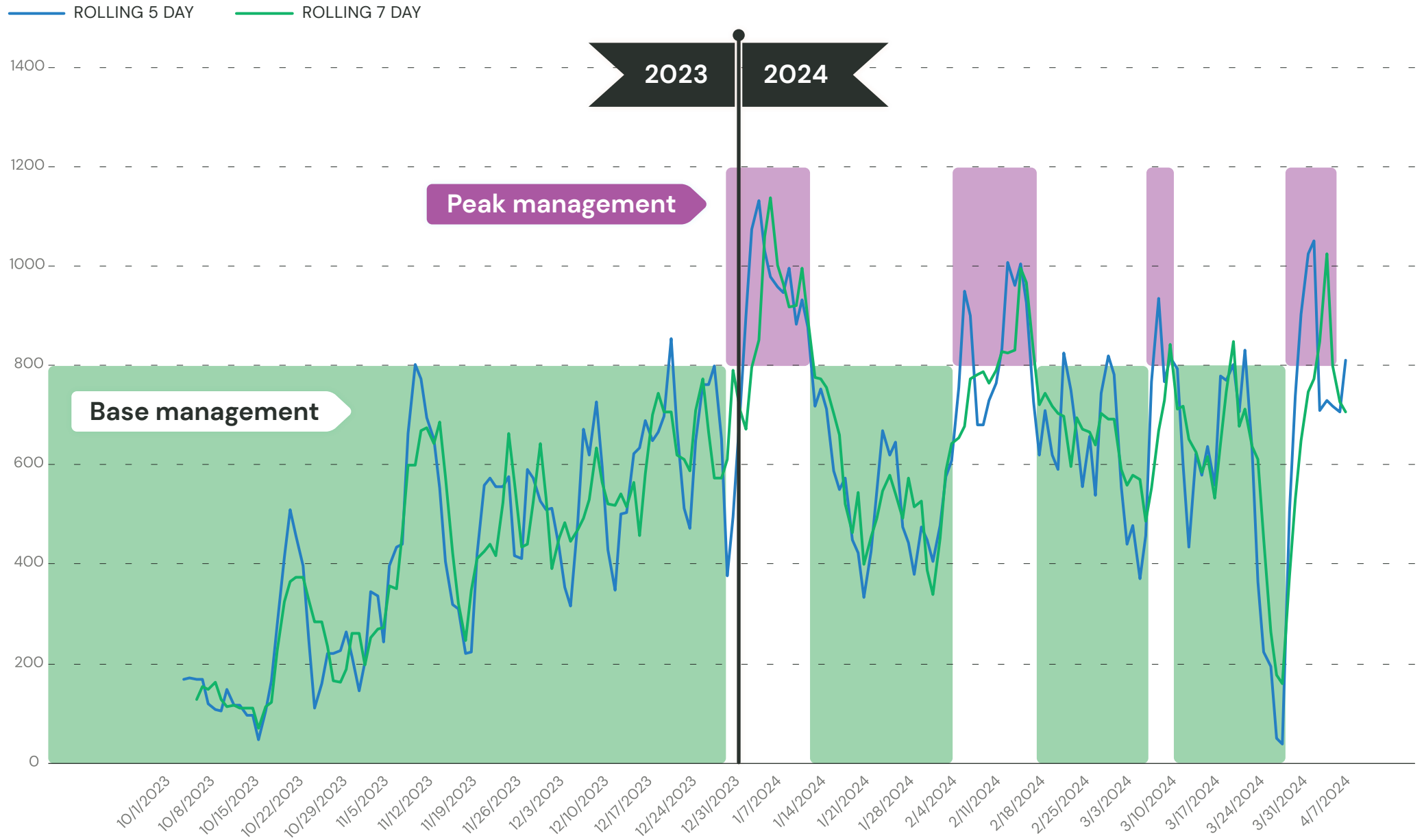


Figure 6: 5 & 7-day rolling averages based on counter



A richer concept of carrying capacity

74. We recommend shifting away from only using an 'average daily' approach to describing carrying capacity for the TAC:
- > Daily activity levels on the TAC are too variable for this approach to be helpful. The day-to-day variability and shifts across the season mean that a single 'average daily' approach does not adequately describe the TAC reality.
 - > It leads to perception issues. Those not involved in the close management of the TAC may assume that activity levels are steadier than they are, and that any carrying capacity limit means that any visitor above a chosen point will be excluded on any specific day (e.g. every day above 1,100 will be limited, rather than managing toward the average).
 - > It does not recognise manaakitanga challenges on peak days. An average daily figure could stay low whilst peak days increase significantly, hiding the pressures around dealing with the heightened peaks.
75. Instead, we recommend thinking of carrying capacity in two ways:
- > Base management levels, using annual figures as the guide
 - > Peak management levels, using daily and rolling averages as the guide.
76. We did some basic linear modelling of increased activity levels on the TAC using 2023/24 levels as a starting point. Table 5 shows how a shift from an average daily figure of 600 to 800 (potentially a comparatively small shift to someone not involved in the day-to-day management of the TAC) translates to a nearly 35% increase in annual count (from 115,000 to 155,000 assuming a 192 day season).²²
77. If activity levels follow a similar daily pattern to 2023/24, and increase in activity levels to 155,000 would see 34 days with over 1,500 walkers compared to only 8 in 2023/24. The number of days above 2,000 would only increase from 2 to 4.²³ If activity levels lifted to over 200,000 a year (a daily average of 1,100), there would be more than 60 days above 1,500 and 9 days above 2,000.
78. Table six sets out the key impacts raised in the impact assessments provided to us, and places these against the management time period that they most relate to. For example, the management of blackwater tends to be a peak management issue – ensuring there is enough capacity at the toilets for upcoming peak periods and determining when queuing levels would be too high.
79. The impacts in Table Six highlighted in blue are what we consider to be the highest priority impacts based on the information provided to us. It is important to see manaakitanga as a wide concept, encompassing safety (physical and other), education on respect for the maunga (which links to environmental matters), and ensuring a quality experience (which then touches on crowding issues).

Table 5: Examples of average daily, annual activity, and peak level counts

Average daily (current)	Annual activity count (proposed base)	Peaks
600	115,000	<ul style="list-style-type: none"> > 8 above 1,500 > 2 above 2,000
800	155,000	<ul style="list-style-type: none"> > 34 above 1,500 > 4 above 2,000
1,100	211,000	<ul style="list-style-type: none"> > 60+ above 1,500 > 9+ above 2,000

22 Each main walking season differs in length due to the timing of the Easter weekend holidays (which is generally used to mark the end of the season, as walker numbers after that point drop away).

23 This is based on a linear increase. In reality the increase would not be completely linear but may see some distribution into the 'quieter' areas. There would also be different weather alert days that would influence this. We undertook more nuanced modelling but this is beyond the scope of the current exercise.

Table 6: Mapping of key impacts against peak & base management periods

	Peak management (short & med-term, daily & 5 day rolling averages)		Base management (long-term, annual figures)
Environmental	Blackwater and litter/waste management issues		Maintenance issues & investment Biodiversity risks, invasive species etc
Social	Crowding issues on highest peak days (2,000+)	How TAC is viewed and valued as a product (not a bucket list, low-value) – community view and working to end goal together	
Cultural	Manaakitanga risks if unable to scale for highest peak days (2,000+)	Manaakitanga risks if cannot scale for multiple high-use days (1,100+)	Management participation Overall cultural heritage product impacts
Economic	Capacity issues on peak days (2,000+) lowers experience	More sustainable service if can spread over days	High value product vs low-value transactional

80. Table 6 assess the key impacts against various levels for the respective peak and base management approaches. We have derived these from the information provided to us, and from discussions with DOC staff. In many instances there is not currently sufficient information to accurately define the impact against some of the levels. But given that DOC is applying an adaptive management approach to the TAC we believe tables 7 and 8 provide a framework that can be continuously improved as more information becomes available.

Table 7. Assessment of key base management-related impacts against activity levels

	Biodiversity	Maintenance
Up to 115,000	Low to moderate risk	Built for this level if agreed capital spent
Above 115,000	Low to moderate risk	Will start showing slow decline in LoS if no additional capital
Above 155,000	Low to moderate (?) Likely to need some investment to mitigate ²⁴	Will start showing fast decline in LoS if no additional capital
Above 200,000	Moderate to high (?) Will need investment to mitigate	Will start showing rapid decline in LoS if no additional capital

Table 8. Assessment of key peak management-related impacts against activity levels

Day peak	5-day	Manaakitanga	Blackwater (human waste)
Up to 1,100	N/A	Current manaakitanga resourcing and interventions sufficient	Current facilities and cleaning approach sufficient
Above 1,100 (somewhat predictable)	Above 800	Manaakitanga resources and interventions start to be stretched, need some targeting to ensure effective	Current facilities sufficient, some additional checks & cleaning may be needed
Above 2,000 (mostly predictable)	Above 1,500	Manaakitanga resources and interventions stretched, need additional peak resourcing and/or 'pressure release' interventions (staggered starts, active nudging to other days etc)	Current facilities stretched with higher likelihood of queueing and non-facility use

24 This is only an indicative assessment by Third Bearing Limited – further monitoring would be required to determine when any shift in biodiversity risk would be likely to occur due to increased activity levels.

Is a carrying capacity limit needed now?

81. We do not see the need for a carrying capacity limit to be imposed in the immediate future based on the evidence provided to us. The main reasons for this are:
- > There are a number of areas in the assessments where further information and/or monitoring is required before being able to determine a carrying capacity limit.
 - > A lot of interventions have put in place which were not available at earlier peak seasons (especially the 2018/19 season which had activity levels over 150,000). There is wider community support for these interventions, and so it should be seen how these perform at higher activity levels.
 - > We believe there is potential for more targeted management of blackwater (human waste), including the implementation of some intended new initiatives, which may result in higher carrying capacity (and/or less toilets on the maunga).
 - > Walkers are responding well to weather alerts, and this is likely to only get better once a weather station is installed on the TAC itself.
 - > The booking system has seen quite good uptake in its first year of use and provides a strong foundation for 'nudging' behaviours if further development is done (for example, contact could be made ahead of peak days suggesting walkers may want to shift to the following or previous day for a better experience).
82. One of the other reasons why we do not believe a carrying capacity limit should be imposed in the immediate future is that it is unclear how it would be enforced. At best it would be a limit that would need to be managed to, rather than a 'hard line' (since there are very few tools in place to enforce a 'hard line' – effectively denying entry by limiting car parking access or bookings). Our view is that it is best for DOC, iwi and the community to apply an adaptive management approach to base and peak carrying capacity levels, rather than apply a limit.
83. We recognise that many of the interventions needed require additional funding. While some of this could come from DOC itself, there are limitations on how their funding can be used (for example, it is not possible for DOC to impose fees or charges specific to the TAC – these have to be in line with other walks across Aotearoa New Zealand). The International Visitor Levy has proved valuable as a source of additional funding for the TAC. Given the Social Impact Assessment notes how important the TAC is for local identity, there is a strong argument to use community tools for covering costs of interventions (for example, a coordinated funding plan may be able to access other grants and/or identify where Council may be able to support non-DOC activities or infrastructure through rates funding or fees & charges (e.g. non-DOC carparking, wider economic development support)).

When will a carrying capacity limit be needed?

84. Our view is that a carrying capacity limit will need to be considered:

- > **Base management** – when annual activity levels exceed 155,000.²⁵ This would be higher than the peak season of 2018/19, and assumes that no additional capital investment for infrastructure is forthcoming, and if any additional biodiversity monitoring information indicates that the current the low/moderate risk assessment would increase above this activity level. If additional interventions are put in place, and further monitoring indicates that the low/moderate risk assessment would not change at higher activity levels, then an annual activity limit of 200,000 could be set.²⁶
- > **Peak management** – when more than 5 daily peaks above 2,000 occur, and/or when any rolling 5 day average exceeds 1,500. We have assumed that these would be used retrospectively (i.e. happen in current season, so limits applied in following season to avoid reoccurrence). However, it may be possible to get regular reports from the booking system which would allow for an in-season predictive approach to be taken. This would allow actions to be taken to manage the likely peaks (e.g. contacting those who have booked and suggest they go a day earlier or later, apply additional resources to ensure sufficient manaakitanga etc).

Table 9: Base management carrying capacity limit

Above 155,000	If no additional maintenance and infrastructure investment is not forthcoming, and/or if biodiversity evidence points to risk shifting to moderate/high without mitigation ²⁷ .
Above 200,000	If additional maintenance and infrastructure investment is forthcoming, and if biodiversity evidence points to risk remaining at low/moderate up to this level.

²⁵ This equates approximately to an average daily activity level of 800.

²⁶ This equates to an average daily activity level of 1,000-1,100, which is where most of the impact assessments indicated as a limit.

²⁷ Most likely relating to ensuring sufficient asset maintenance funding for increased activity levels, and additional infrastructure including carparks (not necessarily on DOC land), booking systems, and storytelling methods. We note that there are limitations on new assets (e.g. number of toilets, locations on track).

Table 10: Peak management carrying capacity limit

	Predictive	Retrospective
Daily peaks above 2,000 NB: 2023/24 = 2 above 2,000	Implement approach to try and nudge walkers to the day before or after (even offering incentives if needed). Identify what additional manaakitanga actions and resources are needed to handle over 2,000 walkers in a day.	If more than 5 daily peaks above 2,000 are reached in a year, then this is likely to signal that active management of a 2,000 limit is needed. This may include a 'cap', or may need additional funding for further manaakitanga resources.
Rolling 5 day average above 1,500 NB: 2023/24 = 2 rolling ave. clusters above 1,100	If rolling 5 day average projected to go above 1,500, then need to identify what additional manaakitanga actions and resources needed. Depending on time of season, blackwater levels may need to checking to ensure capacity exists.	If rolling 5 day average above 1,500 reached in previous year, then additional management interventions will be needed to ensure adequate manaakitanga and blackwater management in following year. ²⁸

²⁸ This would need to take into account whether a similar alignment of public holidays and long weekends is likely to cause the same situation in the following year.

Tongariro Alpine Crossing – Carrying Capacity review

Third Bearing Limited is a regionally-based advisory firm that has been serving businesses, organisations, local government and central Government for over 20 years.

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