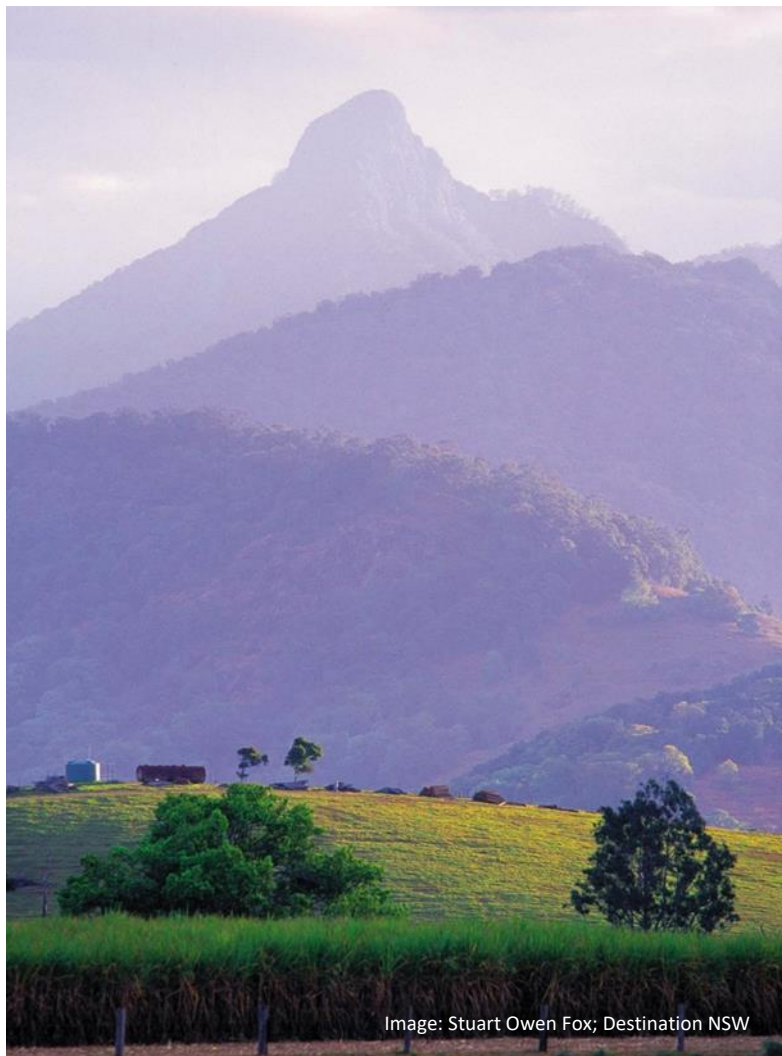


Wollumbin Summit Track

Visitor Safety

Risk Assessment



September 2019

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1. INTRODUCTION

The NSW National Parks and Wildlife Service (NPWS) has a duty to consider the safety of visitors to national parks and is required to take steps to ensure that risks are appropriately managed. This requirement relates to NPWS's role as a land manager and its obligations to visitors and to NPWS staff and contractors.

NPWS aims to provide visitors with a safe and enjoyable experience. However, the natural environment will always present risks to visitors—these risks can be managed, but never eliminated.

This 'Wollumbin Summit Track Visitor Safety Risk Assessment' has been undertaken in accordance with the NPWS risk management framework, specifically the *OEH Risk Management Policy* (OEH 2018) and the *OEH Risk Management Procedures* (OEH, 2019), *NPWS Visitor Safety Policy* (NPWS, 2013); and by applying the *OEH Health & Safety Risk Matrix* (OEH, 2017).

This assessment has been undertaken by Siân Waythe, Senior Project Officer, Risk, Compliance and Sustainability of the NPWS Safety and Business Performance Team for NPWS' Tweed Byron Area. Assessments were made using the best available information be that published work, agency records or anecdotal advice.

This risk assessment does not address the safety of park staff and contractors working on the Wollumbin Summit Track.

2. OBJECTIVES

The objectives of the risk assessment are to:

- Identify visitor safety risks associated with the visitor use of the Wollumbin Summit Track.
- Analyse these risks to determine the level of risk.
- Advise on options to mitigate identified risks.

3. WOLLUMBIN SUMMIT TRACK DESCRIPTION

Location

The Wollumbin Summit Track is located with Wollumbin National Park, 12km south-west of Murwillumbah in north-eastern NSW.

Management responsibility

The Wollumbin Summit Track is managed by the Tweed - Byron Area for NPWS. Wollumbin National Park is not a co-managed park but the Bundjalung People, represented by the Wollumbin Consultative Group, have a strong interest in the management of the mountain. They are opposed to walkers accessing the summit.

Track length

The track is approximately 8.8 kilometres in length (return trip), starting from the Breakfast Creek carpark. The route is up and back on the one track (ie no loop). The return trip (takes 4 to 6 hours, depending on the speed of travel fitness of the walkers. The steepest and most challenging section is the final 30 minutes of the ascent 100m to the summit, where climbers use chains to ascend and descend over the rockface. The track rises 720m in altitude to the summit at 1096m.

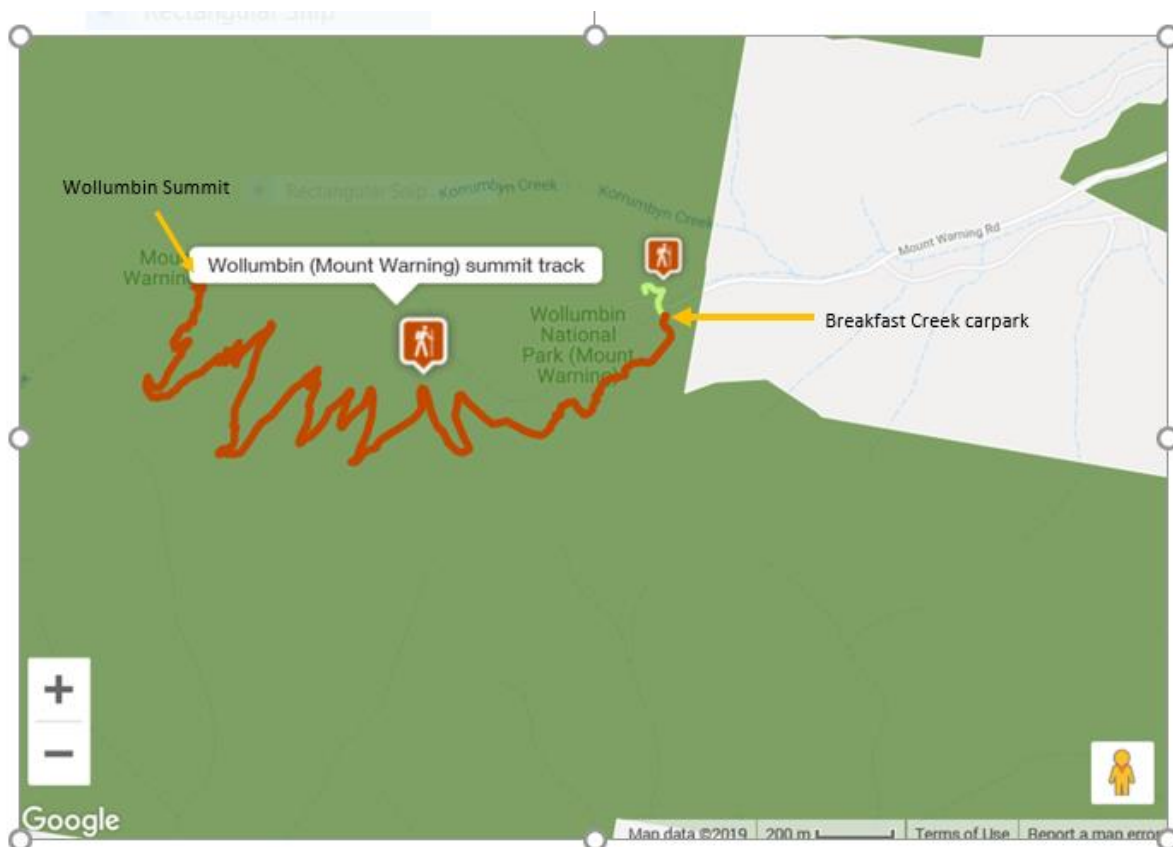


Figure 1 Wollumbin Summit Track

Track grading and condition

The *Australian Walking Track Grading System* is used to grade walking tracks from a walker's comfort perspective. The higher the grade the harder the walk and/or the less services provided. The Wollumbin Walking Track is graded as Grade 5 using the (AWTGS). The gradient in parts is very steep, especially near the summit.

Australian Standards 2156.1 and 2156.2 are used to classify walking tracks and then set design, inspection and maintenance standards. Under AS2156.1, the Wollumbin Summit Track is assigned Class 3. Class 3 elements are:

- *Track conditions:* Generally a modified track surface, sections may be hardened. Width variable and less than 1200mm. Mostly clear of obstacles.
- *Gradient:* May exceed 1:10 for short sections but generally no steeper than 1:10. Steps may be common.
- *Signage:* Signs and track markers may be used for direction. Limited signage for management and interpretation purposes.
- *Infrastructure:* Facilities generally not provided except for specific safety and environmental considerations.
- *Terrain:* Users need no bushwalking experience and a minimum level of specialised skills. Users may encounter natural hazards (steep slopes, unstable surfaces, minor water crossings). Users responsible for their own safety.
- *Weather:* Storms may affect navigation and safety.

The track is largely a natural surface, with many steps. The final summit ascent has a metal chain section. There are bridges and stepping stones over watercourses and decking in some flatter sections. At the summit, and at strategic viewpoints, there are viewing platforms with handrails.

The track is signposted with safety warning and interpretational signs.

Area staff advised that priorities for maintenance are based on safety, cultural and environmental considerations.

Track Access

Access to the Wollumbin National Park is unrestricted with the exception of closures during heavy rainfall, high winds or fire events. Following heavy rainfall, the access road is impassable. The local council close the road with a gate.

Access is free and there are no booking system.

A proportion of walkers commence their ascent in the night to reach the summit for dawn. Camping within the park is not permitted (reference start of track warning sign), but it does occur.

There are no commercial operators approved to conduct guided walks within Wollumbin National Park. The Wollumbin Consultative Group do not support tours to the summit.

4. CULTURAL & NATURAL HERITAGE VALUES

Wollumbin is a sacred place to the Bundjalung People and was declared an Aboriginal Place in 2015.

Wollumbin National Park's subtropical rainforest forms part of the Gondwana world heritage-listed rainforests of north-east NSW and south-east Queensland. This forest provides habitat for many endangered and protected native species.

Wollumbin is the core of an extinct volcano. The surrounding ranges form the caldera. The summit of Wollumbin is 1096m above sea level.

5. VISITATION AND TOURISM VALUES

The Wollumbin summit walk has been identified as one of the best day walks in Australia (<https://www.outdooraustralia.com/articles/18-of-the-best-day-walks-in-australia-04869>) and is a very popular walk with visitors to the NSW North Coast. The summit offers spectacular 360 degree views over the caldera, rainforest, farms and out to sea.

The walk attracts an estimated 170 000 visits per year. Visitation to Wollumbin National Park, and specifically the summit walk is a significant contributor to the local economy.

There are no Ecopass or other commercial tour operators on the mountain.

Visitor profile

Southern Cross University (SCU, 2018) undertook a survey of walkers at Wollumbin National Park in April 2014. Their findings are provided in Tables 1-3 and summarised here:

- Visitors are predominantly young adults (61% of adult visitors aged 18-34).
- Overwhelming most visitors (92%) are from Australia, and most of these are from Queensland (72%).
- Families with children made up 24% of groups. On the day of the survey the ratio was 20% children, 80% adults.

Almost all visitors (95.3%) attempt to reach the summit, and most (87%) achieve it.

Individual safety appeared to be relatively minor consideration of walkers (refer to Table 3).

Interestingly only 2.1% of walkers did not progress beyond the bottom of the chain section (ie they were deterred by the chains, steepness, safety signage or Aboriginal cultural sensitivity signage.)

Most visitors (60%) are repeat visitors, with 49.8% those repeat visitors visiting at least annually. These are not new visitors seeking a one-time iconic experience. Only 0.6% of identified climbing Wollumbin as a 'bucket list' activity.

'Reaching the summit' was the most popular reason (at 33.7%) for visiting Wollumbin National Park.

Table 1 Wollumbin Summit Track Visitor Profile (SCU, 2018)

AGE (n = 774)	#	%
18-24 years	221	28.6
25-34 years	253	32.7
35-44 years	143	18.5
45-54 years	110	14.2
55-64 years	36	4.7
65+ years	11	1.4
GENDER (n = 777)		
Male	373	48
Female	404	52
PLACE OF RESIDENCE (n = 772)		
International	59	7.6
Australia	713	92.4
- Queensland	(473)	(72.2)
- New South Wales	(161)	(24.6)
- Other States/Territories	(21)	(3.2)
LEVEL OF EDUCATION (n = 763)		
Primary school	6	0.8
High school	174	22.8
Trade qualification	152	19.9
Undergraduate degree	248	32.5
Postgraduate degree	183	24.0
TRAVEL PARTY SIZE (n = 720)		
One	33	4.6
Two	181	25.1
Three or four	258	35.8
Five or more	248	34.4
TRAVEL PARTY TYPE (n = 746)		
Unaccompanied traveller	43	5.8
Adult couple	122	16.4
Family group – parent(s) & child(ren)	176	23.6
Friends &/or relatives travelling together	396	53.1
Business associates travelling together	9	1.2

Table 2 Wollumbin Summit Track Visitor Experience (SCU, 2018)





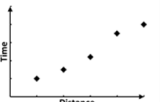
Repeat visitation to Wollumbin (n = 794)	Frequency	Percentage	
Yes	478	60.2	
No	316	39.8	
Frequency of repeat visitation (n = 175)			
Very frequently (more than twice a year)	26	14.9	
Frequently (1-2 times a year)	61	34.9	
Occasionally (once every 2-3 years)	15	8.6	
Rarely (less than once every 3 years)	73	41.7	
Participation in summit walk (n = 792)			
Did not attempt summit walk	37	4.7	
Started, but returned before reaching half-way marker	36	4.5	
Half-way marker	16	2.0	
Bottom of chains	17	2.1	
Summit	686	86.6	
Participation in Lyrebird walk (n = 793)			
Yes	99	12.5	
No	694	87.5	
Median time spent on-site (Hours)			
Did not attempt summit walk (n = 31)	1.0		
Returned before half-way (n = 28)	1.5		
Half-way (n = 14)	2.2		
Bottom of chains (n = 15)	3.5		
Summit (n = 648)	4.0		

Table 3 Reasons for Visiting Wollumbin National Park (SCU, 2018).

Reason	#	%
Summit	264	33.7
Physical activity / exercise / fitness	91	11.6
Hiking	79	10.1
Friends / family / colleagues	73	9.3
Sunrise	66	8.4
View	38	4.9
Nature / rainforest / beauty	38	4.9
Sightseeing / holiday	28	3.6
Adventure / challenge	22	2.8
Fun / enjoyment	11	1.4
Bucket list	5	0.6
Spiritual	5	0.6
Other (e.g. passing through; camping; team building)	63	8.0

Of the 4.7% of visitors who did not attempt the summit walk the reasons given were:

- Not enough time / too late (15%)
- Children (11%)
- Health/physical ability (11%)
- Respect for Aboriginal place (8.1%)
- Others in group can't/don't want to (5.4%)
- Not seeking a summit experience (5.4%)
- **Safety fears (2.7%)**
- Recognisance only (2.7%)
- Unprepared (2.7%)

8.6% start the summit walk but don't reach the summit. Reasons provided for this were:

- Not enough time (1.9%)
- Health/physical ability (1.8%)
- Children (1.3%)
- **Safety fears (0.6%)**
- Respect for Aboriginal place (0.4%)
- Others in group can't/don't want to (0.3%)
- Not seeking a summit experience (0.1%)
- Recognisance only (0.1%)
- Done it before (0.1%)

Child hikers

On SCU's survey day 20% of visitors were children. Parents with children represented 23.6% groups surveyed.

During the risk assessment inspection (18 June 2019) family groups with children as young 8-10 years old were observed trekking the full distance to the summit. Some children running and scrambling ahead of their parents or carers.

A review of social media on the Wollumbin Summit Track indicated that parents with babies on backpacks had recently made the summit ascent.

6. RECORDED INJURIES & FATALITIES

Area staff advised that most injuries reported to them ranged from minor slips and falls to broken legs or ankles. This anecdotal evidence is supported by the 40 records of injuries or fatalities in Tables 4 - 6 below, sourced from Area records, WSO and local media reports. In addition, the injuries and fatalities, a further two walkers were lost and another two required rescuing due to bad weather.

These records, although only a fraction of the actual number of visitor safety incidents occurring provide a good insight into the range of serious incidents encountered on the Wollumbin summit track. Minor injuries would be common and unreported. Data on fatalities or serious injuries is likely to be more reliable as these incidents appear to be regularly covered in local media.

There were two recorded fatalities on the Wollumbin Summit Track in recent years (see Table 4).

Table 4 Recently Recorded Fatalities in Wollumbin National Park

Date	Incident details	Source
25/6/19	Fatality , 80yo woman, unconscious and could not be resuscitated, 1.5km into the walk.	WSO INC 107019261
6/12/16	Fatality , male, American tourist in his 20s killed when lightning struck at tree near the summit. Same incident resulting in injury to his companion, an American woman also in her 20s.	WSO INC107016498 northernstar.com.au

On 6 December 2016 the Northern Star newspaper published a timeline of Wollumbin rescues 2010-2016 (see Table 5). Table 6 represents 2016-2019 data from emergency service records and media reports.

Tables 5 and 6 demonstrates a continual and high response commitment by local emergency services to walkers on Wollumbin coming into difficulty.

There is not enough detail to determine how many of these incidents occurred in the chain section. However, the incident on 8/7/17 (see Table 6) did occur in the chain section, and it is likely that the incidents on 8/9/14 (see Table 5), 18/8/19 and 20/7/18 (see Table 6) also occurred there.

If we combine records in Tables 5 and 6, seven of the recorded injured or ill were children, were 24 adults and the remaining 13 age information was not recorded. Events involving children represent at least 16% of recorded injuries or fatalities. However, if we remove the five suspected heart, brain, psychological or old age-related conditions, the three fatigued persons and the four persons lost or stranded from the analysis, then injuries to children represented 19% of total injuries recorded. This correlates positively with SCU's (2018) field observations that 20% of walkers were children. Accepting the small sample size of both the SCU's field survey and these injury statistics, it may be concluded that children are as likely as adults to experience injuries requiring emergency service rescue.

The costs to emergency services (both government, charity-run or volunteer-run) in the region for rescuing injured Wollumbin walkers are significant.

Table 5 Wollumbin National Park Rescues 2010-2016 (source: Northern Star newspaper).

Date	Incident details	Source
6/12/16	<p>Fatality, male, American tourist in his 20s killed when lightning struck at tree near the summit.</p> <p>Same incident resulting in injury to his companion, an American woman also in her 20s.</p>	northernstar.com.au
15/10/16	<p>A 7yo girl suffered a fractured arm and other injuries. She was walking on the track with her father, when another group of walkers approached. The girl moved to the edge of the track and lost her footing, falling down an escarpment about 10m high. Westpac Lifesaver 4 helicopter winched a doctor and paramedic to treat her. The injured girl was winched from the scene and flown to Gold Coast University Hospital for treatment.</p>	northernstar.com.au
9/10/16	<p>A 41yo woman broke her ankle halfway up the summit and needed to be carried down, with the four-hour operation using two police cars, one Ambulance, one SES crew and the Tweed District Rescue Squad.</p> <p>Rescue squad deputy captain Rhett Murray said volunteers also had to help another woman who rolled her ankle up the mountain.</p>	tweedailynews.com.au
28/3/16	<p>Local Afghanistan war hero was airlifted from the mountain after he suffered a PTSD-related panic attack.</p>	northernstar.com.au
21/9/15	<p>A 42yo woman fell and sustained an ankle injury.</p>	tweedailynews.com.au
20/6/15	<p>A 27yo woman was evacuated by the Westpac Life Saver Rescue Helicopter after a suspected ankle fracture.</p>	tweedailynews.com.au
12/4/15	<p>A woman in her 30s was stuck halfway up the track with an injured ankle; and an 11-year-old girl was injured around the same spot.</p>	tweedailynews.com.au
30/11/14	<p>A woman was rescued by the Westpac Helicopter performing a winch recovery off Mt Warning.</p>	northernstar.com.au
8/9/14	<p>A huge rescue operation involving 24 personnel took place on Mt Warning after a local woman in her 60s injured her leg about 50 metres from the summit. Volunteers and ambulance personnel then embarked on a journey to reach the women. Around this time, rescuers decided a medical team couldn't be winched down by helicopter, due to heavy wind gusts and low visibility.</p>	northernstar.com.au
3/9/12	<p>A 20yo Gold Coast woman was winched to safety by the Westpac Rescue helicopter after the hiker hurt her ankle while trying to descend from the top of Mt Warning.</p>	tweedailynews.com.au
13/9/11	<p>A 40-year-old man complained of chest pains. A rescue helicopter was dispatched but the man recovered and descended the mountain unaided by rescuers.</p>	tweedailynews.com.au
8/11/10	<p>A doctor and paramedic with the Westpac Life Saver Rescue Helicopter were winched down on to Mt Warning to treat an elderly man suffering chest pains. They were winched into the site after heavy cloud cover made it impossible for the helicopter to land. Once stabilised the man was winched back into the helicopter and transported to John Flynn Hospital on the Gold Coast.</p>	northernstar.com.au
30/7/10	<p>A woman, 57yo, suffered a serious hip injury after a fall while climbing Mount Warning. Westpac Life Saver Rescue Helicopter has responded to the call. She has been taken to hospital.</p>	tweedailynews.com.au
7/6/10	<p>A 16yo girl suffered a suspected leg injury after falling near the halfway mark while climbing down the mountain. She had to be winched off Mount Warning by helicopter.</p>	tweedailynews.com.au
25/4/10	<p>A Gold Coast woman in her 50s, who broke her leg climbing the mountain. She caught her foot in a tree root and fell awkwardly about 2.5kms up the popular 4.5km tourist trail and needed to be airlifted out.</p>	northernstar.com.au

Table 6 Wollumbin rescues 2016-2019 (source: Area records and *media reports*).

Date	Time	Location	Incident	Injury	No. of People	Gender	Age	Agency	Notes
18/08/2019 ²	8:00	Summit	Injury after fall	Possible head injuries, stable	1	M	11	Westpac Rescue Helicopter	Winched by Lifesaver Helicopter
2/02/2019	18:16	Unknown	Injury	Unknown	1	F	35	SES	Winched by Lifesaver Helicopter
16/09/2018	18:18	1km from carpark	Fatigue	Nil	1	M	Unknown	SES	Assisted walk out
17/08/2018	12:50	0.4km from summit	Injury	Ankle	1	F	61	SES	Patient carried out
12/08/2018	15:06	2km from carpark	Injury	Unknown	1	Unknown	Unknown	SES	Patient carried out
20/07/2018	15:07	Summit	Injury	Broken leg	1	F	12	SES / Police	Patient carried out in darkness
15/07/2018	13:52	2km from carpark	Injury	Ankle	1	M	Unknown	SES / Police / VRA	Assisted walk out
14/07/2018	8:03	Heli Point 4	Injury	Broken Leg	1	M	17	SES	Winched by Lifesaver Helicopter
26/06/2018	14:04	Summit	Seizure	Nil	1	Unknown	14	SES	Winched by Lifesaver Helicopter
10/06/2018	12:11	Unknown	Lost	Nil	2	F	Unknown	SES / VRA	Wandered off track
10/06/2018	16:25	2km from carpark	Fatigue	Nil	1	F	Unknown	SES	Assisted walk out
3/06/2018	11:19	1km from carpark	Injury	Ankle	1	F	45	SES / Police	Patient carried out
11/05/2018	16:34	Unknown	Injury	Unknown	1	M	Unknown	SES	Patient carried out
3/02/2018	12:09	4km from carpark	Injury	Broken Leg	1	F	18	SES / Police / VRA	Patient carried out
22/01/2018	10:43	Heli Point 3	Injury	Ankle	1	F	40	SES / Police	Winched by Lifesaver Helicopter
12/12/2017	16:44	Unknown	Lost	Nil	1	M	25	SES	Wandered off track
5/10/2017	5:20	1km from carpark	Injury	Ankle	1	F	Unknown	SES	Patient carry out to Ambulance at carpark
9/08/2017	6:24	Summit	Fatigue	Nil	1	M	Unknown	SES / Police	Winched by Lifesaver Helicopter
31/07/2017	10:01	Unknown	Injury	Minor Leg Injury	1	F	Unknown	SES	Patient carry out
11/07/2017	14:53	Unknown	Injury	Ankle	1	F	22	SES/Police/VRA	Winched by Lifesaver Helicopter
8/07/2017 ¹		Chain section, Summit	Injury	Face & shoulder stable	1	F	47	Westpac Rescue Helicopter / Ambulance	Winched by Lifesaver Helicopter
20/01/2017	23:05	Summit	Weather	Nil	2	Unknown	Unknown	SES / Police / VRA	Assisted return from summit due to wet weather
1/01/2017	8:58	Unknown	Injury	Ankle	1	F	Unknown	SES / VRA	Transferred to Ambulance at carpark
6/12/2016	4:50	Summit	Death / Injury	Lightning strike	2	M & F	Unknown	SES / Police / VRA	Were camping on summit overnight
28/03/2016	18:30	Summit	Fatigue	Nil	1	M	Unknown	SES / VRA	Winched by Lifesaver Helicopter

Shading = record of incident common to in tables 4-6.

¹ Source: Echo NetDaily – 10/7/2017

² Source: Echo NetDaily – 19/8/2019 and nbnnews.com.au 18/8/19.

7. LEGAL AND POLICY CONSIDERATIONS

Civil Liability Act 2002

Under common law is that NPWS owes a duty of care to take care of the safety of those who enter on land that it manages. Under the *Civil Liability Act 2002*, NPWS is not negligent in failing to take precautions against a risk of harm unless:

1. the risk was foreseeable (that is, it is a risk of which NPWS knew of, or ought to have known)
2. the risk was not insignificant
3. in the circumstances, a reasonable person in the NPWS's position would have taken additional precautions to limit or remove the risk (S5B).

When determining what precautions, a reasonable person in NPWS's position would take in the circumstances, the *Civil Liability Act* provides guidance. Section 5B (2) provides that when determining whether a reasonable person would have taken certain precautions, you should consider:

- (a) the probability of the harm occurring
- (b) the likely seriousness of the harm
- (c) the burden of taking the precautions
- (d) the social utility of the activity that creates the risk of harm.

NPWS does not owe a duty for recreational activities where it has given warnings about the risks involved. Section 5M (1) of the *Civil Liability Act* provides that '*a person does not owe a duty of care to another person (the plaintiff) who engages in a recreational activity to take care in respect of a risk of the activity if the risk was the subject of a risk warning*'.

Section 5K describes 'recreational activity' to include:

- '(a) any sport (whether or not the sport is an organised activity), and*
- (b) any pursuit or activity engaged in for enjoyment, relaxation or leisure, and*
- (c) any pursuit or activity engaged in at a place (such as a beach, park or other public open space) where people ordinarily engage in sport or in any pursuit or activity for enjoyment, relaxation or leisure.'*

In order to receive the benefit of this protection from liability for injuries arising out of recreational activities, the following must be observed:

- **Risk warnings must be given in a manner that is reasonably likely to result in people being warned of the risk before engaging** in the recreational activity. It is not necessary to show that a particular person actually received or understood the risk warning (S5M (3)).
- **Risk warnings may be given orally or in writing** (S5M (4)). Risk warnings can be given by way of warning signs. They may also be given in brochures, park website, maps and entry passes, etc. (as long as the person is reasonably likely to be warned of the risk in this way). Also, when NPWS staff are in the park they can give oral warnings to anyone they observe on the track or approaching the track.
- **Risk warnings must be given by or on behalf of NPWS** (ie NPWS cannot rely on risk warnings given by other persons) (S5M (6)). It is recommended that the NPWS logo be included on any signs or written materials handed out which warn of a risk.

Also note that NPWS cannot rely on a risk warning for protection from liability for negligence if:

- NPWS has failed to comply with any New South Wales or Commonwealth laws providing specific practices or procedures for the protection of personal safety (S5M (7))
- A risk warning has been contradicted by an oral or written representation as to risk made by or on behalf of the NPWS to the injured person (S5M (8)).
- The person who suffers harm is an 'incapable person' (i.e. a child or person suffering from a physical or mental disability), except if they are under the control of or accompanied by a capable adult who has been warned of the risk, or if a parent (whether accompanying the child or not) has received the risk warning (S5M (2)).

In addition, park visitors may sometimes be unaccompanied incapable persons (ie children or persons with a physical or mental disability, who lack the capacity to understand risk warnings. It may be interpreted that in these cases, that warning signs may not always be sufficient to protect NPWS from liability.

The *Civil Liability Act* states that a land manager will not be liable for harm resulting from an **obvious risk** of a **dangerous recreational activity** (S5L). A 'dangerous recreational activity' is defined as a recreational activity that involves a significant risk of physical harm (S5K). However, where a risk of a dangerous recreational activity is not obvious (as understood above), NPWS may still be liable.

National Parks and Wildlife Regulation 2019

Under *National Parks and Wildlife Regulation 2019* (C25) a person must obtain consent for any activity or recreational pursuit that involves risking the safety of that person or other people. Clause 25 (2) contains a non-exhaustive list of risky recreational activities for which the consent of the park authority is required, unless they are provided for in a plan of management. These risky activities currently include caving, abseiling, base jumping, bungee jumping, rock climbing, parachuting, canyoning, whitewater, boating, paragliding, parasailing and hang gliding. Bushwalking is not ordinarily deemed a risky recreational activity.

Work Health & Safety Act 2011

Civil liability obligations often overlap with work health and safety (WHS) obligations. The main statute dealing with WHS in New South Wales is the *Work Health and Safety Act 2011* (WHS Act). Under the WHS Act, the NPWS has obligations to:

- Ensure the health, safety and welfare of employees.
- Ensure the health, safety and welfare of persons other than employees at a place of work (e.g. members of the public who are on park).

Enterprise Risk Management Policy and Procedures

The *OEH Enterprise Risk Management Policy* (OEH, 2018) outlines OEH's approach to enterprise risk management and prescribes a minimum set of risk management standards for all business areas across the agency. In adopting this systematic management of risk, OEH seeks to control unacceptable risk while at the same time continuing to identify opportunities, foster creativity and innovation to encourage learning and improvement and support the achievement of objectives.

OEH's relevant risk appetite statements are:

- OEH encourages activities that maximise opportunities through change and innovation, and identifies activities where it is important to avoid or minimise risks.
- OEH has zero tolerance for lack of effective WHS management systems.

- OEH has a high appetite for compliance with relevant legislation, regulation, industry codes, standards, internal policies and sound corporate governance principles.
- OEH has a high appetite for opportunities to improve our customer, stakeholder and staff engagement and safety.
- OEH has a high appetite for opportunities to demonstrate innovation and leadership in environmental and heritage conservation and national park management.

The policy is supported by the *OEH Enterprise Risk Management Procedures* (OEH, 2019), which detail the steps to followed when undertaking a risk assessment and provide tools to inform the assessment.

Visitor Safety Policy

NPWS' Visitor Safety Policy and Procedures provides a framework for managing visitor safety risk within NSW national parks. It builds around NPWS' obligations arising from the *Civil Liability Act*, *National Parks & Wildlife Regulation*, *Work Health & Safety Act* and the agency's risk enterprise management procedures.

The Policy states that:

- Visitor safety risks are to be assessed using the Health & Safety Risk Matrix.
- Management responses to visitor safety hazards should consider the setting, ease of access and levels of visitation.
- More significant risks should be given higher priority for resources than less-significant risks.
- NSW Police has statutory responsibility for all search and rescue operations. NPWS will provide assistance to search and rescue operations as appropriate.

Tree Risk Management Policy

NPWS' Tree Risk Management Policy (NPWS' 2013) and procedures provide guidance to staff on managing hazardous trees within NSW national parks. It documents a systematic approach to tree risk management from identifying hazardous trees, through assessment, treatment and finally documenting the hazard, its risk rating and its treatment in NPWS' systems – WSO and AMS.

Appendix B of the procedures contains a tree hazard checklist for field staff to use.

Note that NPWS has not adopted a quantified state-wide tolerability level for tree risk. Nor a statewide requirement on inspection frequency. But in determining a local inspection schedule NPWS should consider inspection prior to peak visitation times and after severe environmental conditions (eg fire, prolonged rainfall, high winds, intense lightning activity, flooding and rain after prolonged dry periods.)

8. HAZARD IDENTIFICATION & RISK ASSESSMENT

Principles

This risk assessment is guided by the OEH Risk Management Policy principles:

- Priority will always be given to the protection of life and property, consistent as far as possible with the protection of environmental values, both natural and cultural.
- Risks will be treated in accordance with their rating, with risks rated as extreme being addressed first, followed, as resources permit, by those rated high, then medium and lastly low.

Hazard identification

Site and visitor behaviour hazards (listed in Table 7) were identified through a site visit on 18 June 2019 and review of WSO reports, media reports, incident data and visitation data

This initial hazard identification was further refined to a list of 11 visitor safety risks for the Wollumbin Summit Track:

All sections:

1. Hazardous trees or branches falling on walker(s) causing serious injury or fatality.
2. Rock fall, landslide or slope instability along the track causing serious injury or fatality to walker(s).
3. Slips, trips or falls due to rough surfaces, exposed roots, creek crossings, wet ground etc. causing serious injury or fatality to walker(s).
4. Walker(s) leaving the track and becoming lost leading to serious injury.
5. Lack of walker skill, experience or health condition leading to serious injury, illness or fatality.
6. Walker(s) exposed to extreme weather (heat, cold, heavy rainfall and thunderstorms) conditions resulting in serious illness (ie heat stroke/exhaustion, dehydration or hypothermia) or serious injury (lightning strike).
7. Walker(s) bitten or stung by snakes, spiders, ticks or insects resulting in illness or fatality.
8. Delays in emergency response to lost or injured walker(s) endangering patient survival.
9. Built asset (elevated platforms, handrails, constructed pathway) failure causing serious injury or fatality to walker(s).

Chain section only:

10. Failure of the chain and anchor system causing serious injury or fatality to walker(s).
11. Slips, trips or falls ascending and descending the chain section causing serious injury or fatality to walker(s).

A summary of the risk assessment is provided in Table 8. Detailed analysis of each risk is provided in Section 9, as well as, treatment plan recommendations.

Table 7 Wollumbin Summit Track Hazard Identification

Site hazards					
Length of walk	X 4-6hrs	Steepness of walk	X	No/restricted drinking water	X water only at carpark
Steps	X	Chain/rope sections	X	No constructed shelter	X
Ladders		Unfenced cliffs/slopes	X	No/restricted toilet facilities	X toilets only at carpark
Elevated platforms	X	Treefall	X	No/limited mobile phone coverage	X on track but not at carpark
Roads/vehicles		Rockfall/landslide	X	Poor condition of track	X
Remote access	X	Hostile neighbours		Poor condition of park infrastructure	X
Wet weather/storms	X	Creek crossings	X	Fire	X
Cold weather	X	Wet ground	X	Snow/ice	
Hot weather	X	Rocky ground	X	Flood/rivers	X
Coast/waves/tide		Snakes	X	Ticks/leeches/insects	X
Visitor behaviour hazards					
Overcrowding	X 170K pa	Theft	X	Selfies	X but handrails at summit
Lack of parking	X	Unfit for walk	X	Ill-prepared (lack of water, clothing, skills)	X
Partying/drinking/drug taking		Cycling/mountain biking		Travelling with children	X babies & children of all ages
Foolish behaviour/skylarking	X	Boating/kayaking		Swimming/surfing	X swimming in creek
Bushwalking	X	Fishing		Camping overnight	X dawn summiteers
Events (rogaining, fun runs)	X	Horse riding		Night walking	X dawn summiteers
Events (concerts, fireworks)		4WD driving		Rock climbing/abseiling/canyoning	X but not near summit track
Trail running, exercising	X	Drones		Skiing/snowboarding	

Table 8 Visitor Safety Risk Assessment for Wollumbin Summit Track

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Existing Control Type ³	Control Effectiveness ⁴	Potential Exposure ⁵
1	Hazardous trees or branches falling on walker(s) causing serious injury or fatality.	Hazardous trees High wind conditions Fire events Geological instability	Serious injury or fatality. Loss of reputation and trust.	Major (fatality) Moderate (long term impairment)	Unlikely Possible	Medium Medium	Hazardous tree inspections and removal of hazardous trees or limbs. Regular track inspections and maintenance. Park closure during heavy rainfall, high winds or fire events. Specific safety messaging on website attraction page to avoid visiting in high winds. Staff respond to hazard reports from the public. Staff training in hazardous tree identification.	Elimination & Administration	Medium-High	Major
2	Rock fall, landslide or slope instability along the track causing serious injury or fatality to walker(s).	Rock fall, landslide or slope instability	Serious injury or fatality. Loss of reputation and trust.	Catastrophic (multiple fatalities) - at emergency helicopter points & base of chain section Major (fatality)	Rare - at helipads & base of chain section Rare	Medium Medium	Slope stability assessment (GHD, 2018). Specific rockfall safety signage. Regular track inspections by field officers. Park closure during heavy rainfall, high winds or fire events.	Isolation & Administrative	Medium-High	Catastrophic
3	Slips, trips or falls causing serious injury or fatality to walker(s).	Uneven surfaces, exposed roots, creek crossings, wet ground Walking in darkness or poor weather	Serious injury or fatality. Loss of reputation and trust.	Major (fatality) Minor (broken leg/ankle)	Unlikely Likely	Medium Medium	General safety and specific walking in darkness signage. Regular inspections by field officers. Park closure during heavy rainfall, high winds or fire events.	Engineering, Administrative & PPE	Medium	Major
4	Walker(s) leaving the track and becoming lost leading to serious injury or illness.	Visitor behaviour Walking in darkness or poor weather	Serious injury or illness. Loss of reputation and trust.	Moderate (night walking) Minor	Possible Possible	Medium Low	General, specific 'stay on track' and half-way safety signage. Distance and location information at emergency helicopter points. Marked track. Mobile phone coverage most of track.	Administrative	Low	Major
5	Lack of walker skill, experience or health condition (eg heart attack) leading to serious injury, illness or fatality.	Walker lack of skill, experience or health condition (eg heart attack).	Serious injury or fatality.	Major (fatality) Minor (broken leg/ankle)	Possible Probable	High Medium	General safety, half-way warning and chain section signage. Specific messaging warning of the strenuous climb on attraction website. Well-marked track.	Administrative	Low	Major
6	Walker(s) exposed to extreme weather (heat, cold, heavy rainfall and thunderstorms) conditions resulting in serious injury or fatality (ie heat stroke or exhaustion, dehydration, hypothermia or lightning strike).	Rapidly changing weather conditions High rainfall area Under-prepared walkers	Serious illness, injury or fatality.	Major (fatality) Minor (temporary illness)	Unlikely Possible	Medium Low	General safety and thunderstorm warning signage. Specific messaging on attraction website. Park closure during high rainfall, high wind or total fire ban days.	Isolation, Administrative & PPE	Medium	Major
7	Walker(s) bitten or stung by snakes, spiders, ticks or insects resulting in illness or fatality.	Snakes, spiders, ticks or insects	Serious illness or fatality.	Major (fatality) Insignificant (temporary illness)	Unlikely Likely	Medium Low	General safety signage. Well-marked track. Specific information on attraction page on website to bring a first aid kit.	Administrative & PPE	Low	Major

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Existing Control Type ³	Control Effectiveness ⁴	Potential Exposure ⁵
8	Delays in emergency response to lost or injured walker(s) endangering patient survival.	Poor weather restricting helicopter access Terrain and closed forest Mobile phone blackspots Disruptions to normal mobile coverage	Serious injury or fatality. Loss of reputation and trust.	Major (fatality)	Rare	Medium	Mobile phone coverage most of track. Safety and locational signage. 4 helicopter winch points and helipad at summit. Emergency service personnel regularly deployed on Wollumbin rescues (experienced). Relatively close proximity to emergency services and hospitals. VRA for ground-based rescues. High visitation levels.	Engineering & Administrative	Medium	Catastrophic
9	Built asset (elevated platforms, handrails, constructed pathway) failure causing serious injury or fatality to walker(s).	Poor design Insufficient maintenance Overuse Vandalism	Serious injury or fatality. Loss of reputation and trust.	Catastrophic (multiple fatalities) Major (fatality) Minor (broken leg/ankle)	Rare Unlikely Possible	Medium Medium Low	5-yearly engineering inspections of elevated platforms. Regular 6-monthly inspection and maintenance by field staff. Staff respond to visitor reports of asset damage.	Engineering & Administrative	Medium	Catastrophic (Extreme)
10	Failure of the chain and anchor system causing serious injury or fatality to walker(s).	Poor design Insufficient maintenance Overcrowding - too many walkers on the chain section Overuse Vandalism	Serious injury or fatality. Loss of reputation and trust. Temporary or permanent closure of the track.	Catastrophic (multiple fatalities) Major (fatality) Minor (broken leg/ankle)	Rare ¹ Unlikely Possible	Medium ² Medium Medium	Regular inspection and maintenance by field staff.	Engineering & Administrative	Medium	Catastrophic (Extreme)
11	Slips, trips or falls ascending and descending the chain section causing serious injury or fatality to walker(s).	Overcrowding - too many walkers on the chain section Poor visitor behaviour Poor design Insufficient maintenance	Serious injury or fatality. Loss of reputation and trust.	Catastrophic (multiple fatalities) Major (fatality) Minor (broken leg/ankle)	Rare Possible Probable	Medium High High	The chain and anchor system. Specific safety signage at the chain section. Park closure during high rainfall events.	Engineering, Administrative & PPE	Medium	Catastrophic (Extreme)

Notes:

¹ & ² Using the risk matrix in *Quick Reference Guide – Asset Performance Assessments – Walking tracks and elevated structures* (Table 2 assessment of risk and barrier location) yielded ¹ (Likely) and ² (Extreme). However, given that there are no recorded incidents of this magnitude, we have used the OEH Health & Safety Risk Matrix ratings.

³ & ⁴ Control Type³ and control effectiveness⁴ are rated as per the *OEH Health & Safety Risk Matrix* (see Appendix 1).

⁵ Potential exposure is the highest (worst case) consequence that could occur if all existing controls failed.

Constraints and acknowledgments:

1. This report considers risk to visitor safety but these risks may also apply to staff working on or using the track. No consideration of specific tasks undertaken by staff maintaining the track has been undertaken, but it is fair to deduce that working rather than just walking the track could increase risks to staff safety.

2. This report does not look at risks to emergency services in undertaking helicopter or land-based searches, rescues or recoveries.

3. The author acknowledges that local Aboriginal community are opposed to walkers accessing the mountain above the 600m mark, the installation of new assets or modification to the natural environment. This assessment is respectful of these views, but it focussed primarily on assessing and protecting visitor safety.

9. DETAILED RISK ASSESSMENTS

Risk 1. Hazardous trees or branches falling on walker(s) causing serious injury or fatality.

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
1	Hazardous trees or branches falling on walker(s) causing serious injury or fatality.	Hazardous trees High wind conditions Fire events Geological instability	Serious injury or fatality. Loss of reputation and trust.	Major (fatality) Moderate (long term impairment)	Unlikely Possible	Medium Medium	Hazardous tree inspections and removal of hazardous trees or limbs. Track inspections and maintenance. Park closure during heavy rainfall, strong winds or fire events. Specific safety messaging on website attraction page to avoid visiting in high winds. Staff respond to hazard reports from the public. Staff training in hazardous tree identification.	Elimination & Administration	Medium - high	Major

Discussion

The risk of a fatality or a serious injury from tree fall are both considered to be medium. There is also a risk of walkers suffering minor injuries, such as striking their head on low branches and eye stick injuries.

Most of the track is within closed forest. The forest is a dynamic environment with trees or limbs falling regularly. The risk of tree fall is increased in the few exposed sections (the summit) or where walkers stop and linger (emergency helicopter points); or immediately following rain, or during strong winds; or following a fire. Geological instability may also increase the risk of tree fall. Access to the summit track is restricted during, or immediately following heavy rainfall events due to the flooding of the access road. This reduces the overall risk to walkers by reducing the walker numbers on the mountain, but does not reduce the risk to individual walkers already on the mountain when the wet or windy weather starts.

Fallen trees may present a hazard if blocking the track and causing visitors to negotiate a barrier at a dangerous location. Falling trees may also cause damage to track infrastructure and delay rescue operations.

Through the Tree Management Policy and procedures NPWS has not set a statewide requirement on hazardous tree inspection frequency. But given the high volume of walkers and high rainfall experienced at least a six-monthly inspection regime is reasonable. (Consistent with regime for geological instability hazards recommended by GHD, 2018). Inspections should be scheduled for immediately prior to peak visitation periods (ie new year, holiday periods). These inspections should be supplemented with inspections post severe environmental conditions (eg fire, high or prolonged rainfall (150+mm in 24hrs), high winds, intense lightning activity, flooding and rain after prolonged dry periods.) Inspections must include both tree hazard and tree management infrastructure, such as barrier fencing and signs in the park and alerts or messaging on the national park website.

Area staff advise that they are aware of the Tree Risk Policy and use it to identify hazardous trees. Inspections are logged in AMS. Tree inspections are undertaken quarterly or following heavy rainfall or storms. Also covered in monthly general inspections. An AMS report for 2014-19 records that removals of fallen trees is regularly recorded (examples on 5/3/19, 9/1/19 and 2/9/19), but hazardous tree inspections are rarely recorded (one record on 12/10/16), or are recorded without sufficient detail to identify these events in AMS.

Reports of hazardous trees and fallen trees from staff and the public are recorded in AMS.

Area staff advise that they are training in hazardous tree assessment but require more training.

The Area have developed a *Visitor Access Management Plan* (Tweed-Byron Area, 2019) for the Wollumbin Summit Track that specifies these controls to reduce risks to visitor safety in heavy rainfall or strong winds:

1. Weather conditions monitored in BOM Meteye by Park Ranger or designated Officer
2. The park will be closed when:
 - Predicted high rainfall events: forecast rainfall is greater than 80mm in one event AND / OR
 - Predicted high wind event: forecast wind is greater than 70km/hr
3. The day before either of these forecast conditions:
 - NPWS officers will check both Summit Walking Track and Lyrebird Walking Track to ensure all visitors have left the Park (wearing helmets and other appropriate PPE)
 - Park Closed signs installed on tourist sign at intersection Mt Warning and Kyogle Rd and entrance to Park at carpark. Hazard tape placed across start of Summit Walking Track. Photographs to be taken of signs and uploaded into AMS.
 - Council gate closed – with permission from Tweed Shire Council.
 - Park neighbours notified, Elements updated and Local Tourist Information Centres informed.

In addition: Numerous creek crossings on the Mt Warning Rd are liable to flooding and closure during rainfall events. These will assist preventing visitor access to the Park.

Field observations

Park management appeared to be generally consistent with NPWS' Tree Risk Management Policy and Procedures (NPWS, 2013.)

On the risk assessment inspection evidence of recent tree falls were sighted (Refer to Figure 2).

There were no specific warnings about tree hazard on website or on park signs. But there is a warning sign informing walkers not to proceed to the summit during thunderstorms.



Figure 2 Recent tree fall on the Summit Track.

Recommended treatment plan actions

1. Continue to implement NPWS Tree Risk Policy and Procedures to identify, assess, manage, report, record and inspect hazardous trees.
2. Add a specific warning about walking in Wollumbin National Park during high winds on park signs and national park website.
3. Log hazardous trees (or groups of hazardous trees) in WSO and use WSO to record their hazard assessment and risk treatment plan. Log cyclic inspections and works arising from the treatment plan in AMS.
4. Train staff in tree hazard assessment. (Note: the need to provide more specialised tree assessment training for field staff is being considered in the redrafting of the *Tree Risk Policy and Procedures*.)

The effectiveness of these controls, when combined with existing controls, is assessed to be medium to high. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Major (fatality)	Rare	Medium
Moderate (long term impairment)	Unlikely	Medium

Risk 2 Rock fall, landslide, cliff or slope instability along the track causing serious injury or fatality to walker(s).

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
2	Rock fall, landslide or slope instability along the track causing serious injury or fatality to walker(s).	Rock fall, landslide or slope instability	Serious injury or fatality. Loss of reputation and trust.	Catastrophic (multiple fatalities) - at emergency helicopter points & base of chain section Major (fatality)	Rare - at helipads & base of chain section Rare	Medium Medium	Slope stability assessment (GHD, 2018). Specific rockfall safety signage. Regular track inspections by field officers. Park closure during high rainfall events.	Isolation & Administrative	Medium-High	Catastrophic

Discussion

Wollumbin is the core of the Tweed shield volcano, last active 23 million years ago. It is a volcanic landscape with steep slopes, dense rainforest vegetation and high rainfall. Rainfall events, tree fall or track overuse may cause the rapid or gradual rock fall or landslip events. On steep slopes, soils are usually shallow and run-off exceeds infiltration (GHD, 2018).

GHD (2018) undertook a slope stability assessment of the Wollumbin Summit Track for NPWS. GHD identified 22 hazards near the track described as rock topple, translational debris slide, translational debris creep and rock dislodgement by water. The GHD (2018) report should be read in full to meaningfully consider the geological hazards present.

GHD (2018) also indicated inferred hazards, where evidence of past failures may infer likely hazards and their locations. GHD mapped three zones: Zone 1: Rockfalls and slides (closer to the summit), Zone 2: Translational debris slides (mid slope), and Zone 3: Rotational debris slides and flows (mid to lower slope). Heavy rain is the common trigger for all these geological events.

GHD (2018) assessed the total estimated annual risk (preliminary) to be $12. \times 10^{-7}$ annual probability of individual being killed (or 1.9 fatalities per 100 years), which is low based on the GeoGuide LR7. This low assessed risk is based on the lower likelihood of an individual being at the wrong place at the wrong time, which is likely to be the case because access to the track following heavy rainfall is restricted by the closure of the Mt Warning Rd, as well as, most walkers' preference to avoid trekking in poor weather.

There are no records of fatalities or injuries from a rockfall or landslide.

To mitigate the risks and develop a more detailed quantitative risk assessment, GHD (2018) in summary proposed:

1. Managing track access in response to forecast heavy rainfall (eg (a) pre-emptive gate closing, (b) monitoring access by staff or surveillance cameras and signs).
2. Scaling of loose trackside boulders.
3. Track inspections at least six-monthly and following rainfall event of 150mm in 24 hours.
4. Maintain a register of descaling works and new hazards.
5. Mitigate harm to walkers already on the mountain when heavy rainfall occurs by providing (a) a walker registration system and (b) refuge shelters in safer areas.
6. Undertake further investigation to support a quantitative risk assessment including (a) Review of hazards and their detachment and travel probabilities with reference to frequency of trigger weather events; (b) Review of temporary spatial probability using daily patronage data and comparing this to rainfall records; and (c) Development of a risk profile for different weather conditions to assist in deciding when to close the track and how strictly to enforce the closure.

Of most concern to the Area is hazard H16 – a translational debris slide, located immediately above Emergency Helicopter Point 3. H16 is described as rapid speed but small-scale hazard. Refer to Figures 3-5.

Due to the dense canopy there are few viewing points along the track on the way to the summit. The Emergency Helicopter Points provide these vantage points and are popularly-used by walkers as rest and vantage points. Hence, the risk of a geological event injuring or killing a walker at these gathering points is higher than in other sections of track where walkers are only momentarily in one space and they would be passing single/double file.

The risk rating for gathering points (eg Emergency Helicopter Point 3) is assessed to be medium. The risk rating for the remainder of the track is also medium.

Field observation

Rocks of approximately 150mm in diameter are evidence of a previous rockfall event immediately upslope of the Emergency Helicopter Point 3. Refer to Figures 3 and 5.

During the site inspection on 18/6/19 several individuals (at least 3 groups) were taking a rest/drink break at Emergency Helicopter Point 3.



Figure 3 H16 translational debris slide above the track at Emergency Helicopter Point 3.

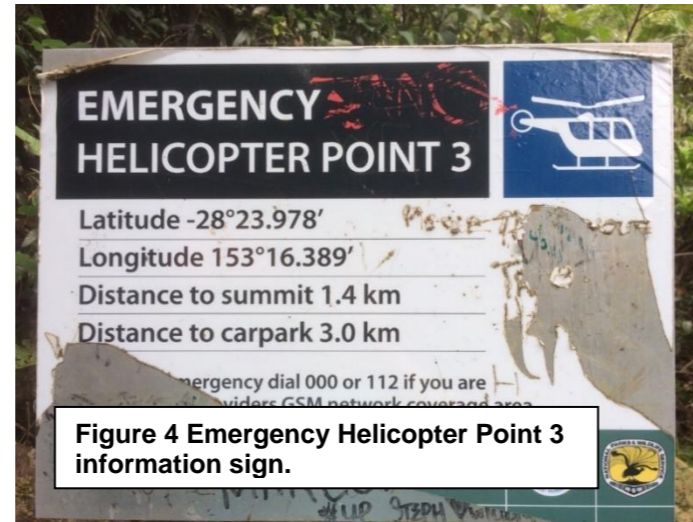


Figure 4 Emergency Helicopter Point 3 information sign.

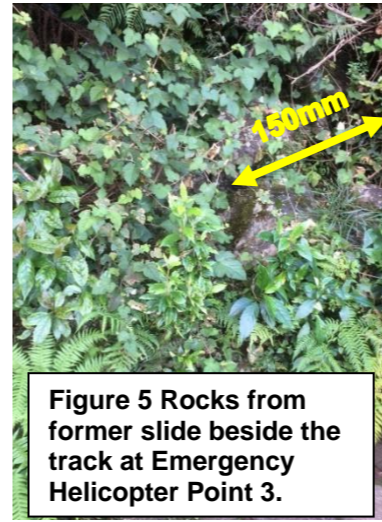


Figure 5 Rocks from former slide beside the track at Emergency Helicopter Point 3.

Area staff advise that the park access gate is proactively closed when heavy rainfall events are forecast, which accords with recommendation 1 listed above.

Area staff advice and AMS records confirm that track inspections are occurring on a 6-monthly basis or post heavy rainfall events, which meets recommendation 3 above.

The online NPWS bushwalker trip intention form, launched on 30 August 2019, will meet recommendation 5(a).

However, some of the other treatment plan actions proposed by GHD (2018) do not appear to have been implemented by the Area.

Recommended treatment plan actions

Implement GHD's (2018) outstanding recommendations by:

1. Managing track access in response to forecast heavy rainfall (eg monitoring access by staff or surveillance cameras and signs).
2. Undertake further investigation to support a quantitative risk assessment including (a) Review of hazards and their detachment and travel probabilities with reference to frequency of trigger weather events; (b) Review of temporary spatial probability using daily patronage data and comparing this to rainfall records; and (c) Development of a risk profile for different weather conditions to assist in deciding when to close the track and how strictly to enforce the closure.
3. Scaling of loose trackside boulders. Priority to be given to hazards impacting gathering points such as Emergency Helicopter Point 3. *Note: scaling works are not supported on cultural heritage grounds, alternatives may be considered including installation of barriers to halt or divert rock movement away from gathering spots, or barriers and signs to warn walkers against stopping at higher risk locations. For the latter to be effective, new resting and viewing spots will need to be created at lower risk locations.*
4. Maintain a register of descaling works (*in AMS*) and new hazards (*in WSO*).
5. Mitigate harm to, or facilitate rescue for, walkers already on the mountain during heavy rainfall events by providing refuge shelters in safer areas.

The effectiveness of these controls, when combined with existing controls, is assessed to be medium to high. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Catastrophic (multiple fatalities) - at emergency helicopter points & base of chain section	Rare - at helipads & base of chain section	Medium
Major (fatality)	Rare	Medium

Risk 3 Slips, trips or falls due to rough surfaces, exposed roots, creek crossings, wet ground etc. causing serious injury or fatality to walker(s).

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
3	Slips, trips or falls causing serious injury or fatality to walker(s).	Uneven surfaces, exposed roots, creek crossings, wet ground Walking in darkness or poor weather	Serious injury or fatality. Loss of reputation and trust.	Major (fatality) Minor (broken leg/ankle)	Unlikely Likely	Medium Medium	General safety signage. Regular inspections by field officers. Park closure during storm or high rainfall events.	Engineering, Administrative & PPE	Medium	Major

Discussion

Minor injuries (cuts, abrasions, sprains, strains, and/or broken bones) as a result of slipping or tripping on rocks, exposed tree roots and/or unstable ground have been recorded. Creek crossings, wet areas along the track and during rainfall increase the likelihood of falls. The likelihood of tripping or slipping is increased in wet weather, darkness or with fatigue. Whilst all falls have the potential to be fatal, this risk is increased for sections of track within 2m of the slope edge/ cliff. This includes vantage points at Emergency Helicopter Points or other informal lookouts. This risk is assessed as medium.

Falls in the chain section are discussed in more detail in Risk 10 (below).

A review of WSO indicates that most visitor injuries are unreported in NPWS systems. This includes most of the events listed in Table 6, all of which required emergency service rescue.



Figure 6 Showing natural surface of track, with rocks, wet ground and tree roots presenting trip and slip hazards.



Figure 7 Edging strips on steps to reduce slips.

Field observation

The risk of slips, trips and falls on the majority of the Wollumbin Summit Track is similar to what you expect and accept on most walking tracks in rainforest environments. The wet conditions experienced in rainforest make the ground slippery. Rocks, thick leaf litter, tree roots and constructed steps add to the hazards.

The Wollumbin Summit Track attraction page on the national parks website recommends walkers wear sturdy shoes.

No specific warning signs or alerts for slips, trips and falls were observed in the park and on the website. An information sign at the start of the walk informs walkers wear suitable footwear. A recommendation for 'sturdy enclosed shoes' is preferable.

Area staff advise that the park access gate is proactively closed when heavy rainfall events are forecast.

Recommended treatment plan actions

1. Add visitor safety incident data in Tables 4-6 to WSO, and record future incidents in WSO.
2. Gather more intelligence on the nature and frequency of visitor safety incidents. (eg Conduct post walk surveys, provide a portal for visitors to report visitor safety incidents, share data with local emergency services or monitor media reports of rescues).
3. Standardise safety messaging on both the walk entry sign and website to: (a) warn walkers of all known risks; to advise walkers to (b) bring water and food, a torch, mobile phone and warm and wet weather clothing; (c) wear sturdy enclosed shoes, a hat, sunscreen and insect repellent; (d) check weather and local alerts; and (e) download the Emergency+ app.

The effectiveness of these controls, when combined with existing controls, is assessed to be low to medium. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Major (fatality)	Unlikely	Medium
Minor (broken leg/ankle)	Likely	Medium

Risk 4 Walker(s) leaving the track and becoming lost leading to serious injury.

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
4	Walker(s) leaving the track and becoming lost leading to serious injury or.	Visitor behaviour Walking in darkness or poor weather	Serious injury. Loss of reputation and trust.	Moderate (night walking) Minor	Possible Possible	Medium Low	General, specific 'stay on track' and half-way safety signage. Distance and location information at emergency helicopter points. Well-marked track. Mobile phone coverage most of track.	Administrative	Low	Major

Discussion

Wollumbin National Park is a relatively small park and the track is well-marked. A review of WSO, Area records and media reports revealed one rescue of two lost walkers in 2018. The risk of walkers leaving the track, becoming lost and experiencing a serious injury is assessed to be low for day walking and medium for walking in darkness.

Walkers who leave their attempt too late in the day, or whose trek is slow or delayed, may end up descending the mountain in darkness. In winter the track is dark by 4:30pm. Walking in darkness increases the risk of walkers becoming disorientated and losing the track. Ascending in early hours of the morning to summit at dawn is a known bucket list event. During the inspection dawn summiteers on their way down the mountain were encountered. Camping on the mountain is prohibited to discourage climbing in darkness, but it appears to have little effect.

Field observation



Figure 8 Stay on track warning sign.



Figure 9 Emergency Helicopter Point providing location and distance information.



Figure 10 Winter warning sign.

The track is well marked, with regular “Stay on Track” signs (refer to Figure 8) warning walkers of the risks to safety and the environment of leaving the track. During the risk assessment inspection, there was little evidence of walkers leaving the track, with the exception of toilet stops and informal tracks to vantage points. SCU’s (2018) survey showed that walkers are very summit-focused, so it is unlikely that many walkers stray far from the track.

Information signs at the start of the walk warn walkers of walking in darkness, cold weather at the summit and getting lost; and informs walkers to carry adequate food and water and wear suitable footwear. To reduce the likelihood of walkers descending the mountain in darkness, there is an additional warning sign at the half-way point advising walkers to “turn a back if it is after 1:00pm in winter” (refer to Figure 10).

The Wollumbin Summit Track attraction page on the national parks website is very thorough providing warnings covering walking in darkness, wet weather, high winds or thunderstorms; the difficulty of the terrain. It advises walkers to bring water and food and wear sturdy shoes, suitable clothing, hat, sunscreen, and a first aid kit; and to download the Emergency+ app and check local alerts before leaving for the walk. A recent update (30/8/19) to the website provides a link to the online trip intention form.

At the four Emergency Helicopter Points and the helipad on the summit distance and location information is provided (refer to Figure 9). There is mobile phone coverage for most of the track, with the exception of the start of the track and in Breakfast Creek carpark.

Recommended treatment plan actions

1. Consider further options to deter predawn summit attempts, such as closing the carpark at night, community education via media and social media, or enforcement blitzes.
2. Standardise safety messaging on both the walk entry sign and website to: (a) warn walkers of all known risks; to advise walkers to (b) bring water and food, a torch, mobile phone and warm and wet weather clothing; (c) wear sturdy enclosed shoes, a hat, sunscreen and insect repellent; (d) check weather and local alerts; and (e) download the Emergency+ app.

The effectiveness of these controls, when combined with existing controls, is assessed to be low-medium. The residual risk rating on completion of the Risk Treatment Plan is assessed as low-medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Night walking - Moderate	Rare	Medium
Day- walking - Minor	Possible	Low

Risk 5 Lack of walker skill, experience or health condition leading to serious injury, illness or fatality.

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
5	Lack of walker skill, experience or health condition leading to serious injury, illness or fatality.	Walker lack of skill, experience or health condition eg heart attack).	Serious injury or fatality.	Major (fatality) Minor (broken leg/ankle)	Possible Probable	High Medium	General safety, half-way warning and chain section signage. Specific messaging warning of the strenuous climb on attraction website. Well-marked track.	Administrative	Low	Major

Discussion

At least seven relatively recent visitor safety events relating to health conditions of the walkers were recorded (refer to media reported emergency rescue data, Area records and WSO records listed in Table 4-6). Walker skill and experience may be a factor in the many slips, trips and falls also recorded. Although the Wollumbin Summit Track attracts a very high number of walkers (170 000 visits annually) with 87% attempting the summit climb, the climb is very steep in sections and takes between 4-6 hours to complete. It is not suitable for all fitness or accessibility levels. Given that the age profile of summiters is youth-biased (refer to Table 1 SCU) it may be that less agile or fit walkers do not take on the summit challenge. This self-censorship reduces the risk to themselves and to NPWS.

Field observation

A sign at the start of the walk informs walkers that the walk is 4-5 hour return and is strenuous with a final climb requiring a vertical rock scramble. The website listed the track as Grade 5, ie for very experienced bushwalkers with specialised skills. However, during the risk assessment inspection trekkers of all skill and fitness levels were encountered.

Information signs at the start of the walk warn walkers of walking in darkness, cold weather at the summit and getting lost; and informs walkers to carry adequate food and water and wear suitable footwear.

The Wollumbin Summit Track attraction page on the national parks website is very thorough providing warnings covering walking in darkness, wet weather, high winds or thunderstorms; the difficulty of the terrain. It advises walkers to bring or wear water, food, sturdy shoes, suitable clothing, hat, sunscreen, and a first aid kit; to download the Emergency+ app; and check local alerts before leaving for the walk. A recent update (30/8/19) to the website provides a link to the online trip intention form.

Recommended treatment plan actions

1. Standardise safety messaging on both the walk entry sign and website to: (a) warn walkers of all known risks; to advise walkers to (b) bring water and food, a torch, mobile phone and warm and wet weather clothing; (c) wear sturdy enclosed shoes, a hat, sunscreen and insect repellent; (d) check weather and local alerts; and (e) download the Emergency+ app.

The effectiveness of these controls, when combined with existing controls, is assessed to be low. The residual risk rating on completion of the Risk Treatment Plan is assessed as high.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Major (fatality)	Possible	High
Minor (injury)	Possible	Low

Risk 6 Walker(s) exposed to extreme weather (heat, cold, heavy rainfall and thunderstorms) conditions resulting in serious illness (ie heat stroke, heat exhaustion, dehydration or hypothermia) or serious injury (lightning strike).

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
6	Walker(s) exposed to extreme weather (heat, cold, heavy rainfall and thunderstorms) conditions resulting in illness (ie heat stroke, heat exhaustion, dehydration or hypothermia) or serious injury (lightning strike).	Rapidly changing weather conditions High rainfall area Under-prepared walkers	Serious illness, injury or fatality.	Major (fatality) Minor (temporary illness)	Unlikely Possible	Medium Low	General safety and thunderstorm warning signage. Specific messaging on attraction website. Park closure during high rainfall, high wind or total fire ban days.	Isolation, Administrative & PPE	Medium	Major

Discussion

At an altitude of 1070m above sea level, Wollumbin can get surprisingly cold overnight or during heavy rainfall events. Thunderstorms on Wollumbin bring both the risks associated with heavy rainfall and lightning strike. The warm, humid conditions experienced most of the year places unprepared walkers at risk of heat exhaustion, heat stroke or dehydration. Approximately 80% of the walk is under the tree canopy, which makes it humid but reduces heat stress from direct radiation.

Walkers on the track will be exposed to the elements (sun, humidity, wind, rain and temperature) which, if not managed, may lead to serious injury.

A review of WSO Area records and media reports revealed one rescue of two walkers in 2017 due to poor weather conditions, and a lightning strike incident in 2016 that resulted in one fatality and another injured. The risk is assessed as medium.

Field observation

Information signs at the start of the walk warn walkers of walking in darkness, cold weather at the summit and getting lost; and informs walkers to carry adequate food and water and wear suitable footwear.

Specific warning signs advising walkers not to proceed beyond this point during a thunderstorm are in place close to the summit before the chain section.

The Wollumbin Summit Track attraction page on the national parks website is very thorough providing warnings covering walking in darkness, wet weather, high winds or thunderstorms; the difficulty of the terrain. It advises walkers to bring or wear water, food, sturdy shoes, suitable clothing, hat, sunscreen, and a first aid kit; and to download the Emergency+ app and check local alerts before leaving for the walk. A recent update (30/8/19) to the website provides a link to the online trip intention form.

Area staff advise that the park access gate is proactively closed in when heavy rainfall events are forecast. This action is directed by the *Visitor Access Management Plan* (Tweed-Byron Area, 2019).

Recommended treatment plan actions

1. Standardise safety messaging on both the walk entry sign and website to: (a) warn walkers of all known risks; to advise walkers to (b) bring water and food, a torch, mobile phone and warm and wet weather clothing; (c) wear sturdy enclosed shoes, a hat, sunscreen and insect repellent; (d) check weather and local alerts; and (e) download the Emergency+ app.

The effectiveness of these controls, when combined with existing controls, is assessed to be low. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Major (fatality)	Unlikely	Medium
Minor (temporary illness)	Possible	Low

Risk 7 Walker(s) bitten or stung by snakes, spiders, ticks or insects resulting in serious illness or fatality.

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
7	Walker(s) bitten or stung by snakes, spiders, ticks, etc resulting in illness or fatality.	Snakes, spiders, ticks or insects	Serious illness or fatality.	Major (fatality) Insignificant (temporary illness)	Rare Likely	Medium Low	General safety signage. Well-marked track. Specific information on attraction page on website to bring a first aid kit.	Administrative & PPE	Low	Major

Discussion

The risk of walkers being bitten or stung by snakes, spiders, ticks, leeches etc on the Wollumbin Summit Track is similar to what you expect and accept on most NSW national park walking tracks in rainforest environments. Of these, snake bite or an allergic reaction to a bite or sting (eg bee sting or tick bite) poses the greatest risk to walkers. The risk is assessed as low to medium.

There are no records from media reports, the Area or WSO of snake or other serious bites or stings requiring medical evacuation.

Field observation

There is advice on website to carry a first aid kit, but not on the walk entry signs. There is no mention of wearing insecticide to protect walkers against leeches or ticks on either the website or park signs. In the event of bites requiring urgent medical treatment, emergency services may be contacted readily as there is mobile phone coverage for most of the track.

Recommended treatment plan actions

1. Standardise safety messaging on both the walk entry sign and website to: (a) warn walkers of all known risks; to advise walkers to (b) bring water and food, a torch, mobile phone and warm and wet weather clothing; (c) wear sturdy enclosed shoes, a hat, sunscreen and insect repellent; (d) check weather and local alerts; and (e) download the Emergency+ app.

The effectiveness of these controls, when combined with existing controls, is assessed to be low. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Major (fatality)	Rare	Medium
Insignificant (temporary illness)	Likely	Low

Risk 8 Delays in emergency response to lost or injured walker(s).

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
8	Delays in emergency response to lost or injured walker(s) endangering patient survival.	Poor weather restricting helicopter access Terrain and closed forest Mobile phone blackspots Disruptions to normal mobile coverage	Serious injury or fatality. Loss of reputation and trust.	Major (fatality)	Rare	Medium	Mobile phone coverage most of track. Safety and locational signage. 4 Emergency Helicopter Points and helipad at summit. Emergency service personnel regularly deployed on Wollumbin rescues (experienced). Relatively close proximity to emergency services and hospitals. VRA for ground-based rescues. High visitation levels.	Engineering & Administrative	Medium	Catastrophic

Discussion

The risk of delays in emergency response to lost or injured walkers endangering patient survival is assessed as medium.

Wollumbin National Park is situated close to emergency response services. The Police, State Emergency Service and Ambulance Service are available for tasking from Murwillumbah. Volunteer Rescue Association, Patients with serious injuries are airlifted to the Gold Coast Hospital. Less serious cases to Murwillumbah Hospital. The Westpac Rescue Helicopter is tasked out of nearby Lismore.

Rescue response records in Tables 4-6 show that air and land-based rescues on the Wollumbin Summit Track are common, and hence, the local emergency services are very experienced in undertaking these rescues.

NPWS could consider closing the Wollumbin Summit Track on low visibility days, but with the limited data available this seems unnecessary. It would place an additional resource burden on NPWS. The local Volunteer Rescue Authority, Police, State Emergency Service and Ambulance Service have proven proficient in undertaking ground-based rescues when helicopter access is restricted.

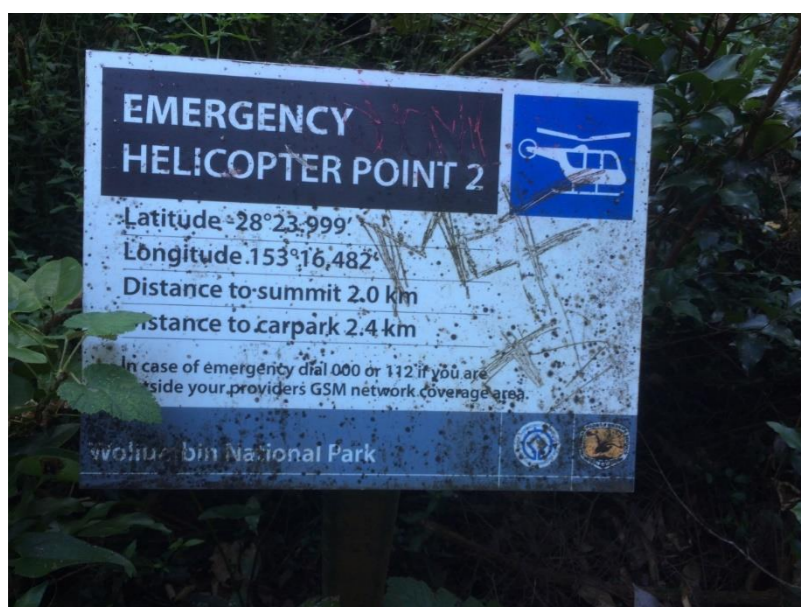


Figure 11 Emergency Helicopter Point 2.

Field observation

One problem is that whilst mobile phone coverage is available for most of the track, it is not available at the Breakfast Creek carpark (ie start of track). Walkers who choose to descend to the carpark before attempting to call emergency services will find that they cannot. The Breakfast Creek carpark is a logical place to coordinate an incident response but the lack of mobile phone coverage in the carpark would frustrate efforts and may delay emergency responses.

Information signs at the start of the walk warn walkers of walking in darkness, cold weather at the summit and getting lost; and informs walkers to carry adequate food and water and wear suitable footwear.

The Wollumbin Summit Track attraction page on the national parks website is very thorough providing warnings covering walking in darkness, wet weather, high winds or thunderstorms; the difficulty of the terrain. It advises walkers to bring or wear water, food, sturdy shoes, suitable clothing, hat, sunscreen, and a first aid kit; and to download the Emergency+ app and check local alerts before leaving for the walk. A recent update (30/8/19) to the website provides a link to the online trip intention form.

Recommended treatment plan actions

- Standardise safety messaging on both the walk entry sign and website to: (a) warn walkers of all known risks including poor or no mobile phone reception in carpark and other areas; to advise walkers to (b) bring water and food, a torch, mobile phone and warm and wet weather clothing; (c) wear sturdy enclosed shoes, a hat, sunscreen and insect repellent; (d) check weather and local alerts; and (e) download the Emergency+ app.
- Consider boosting mobile coverage at Breakfast Creek carpark or update track head signs to advise where mobile phone coverage is available.

The effectiveness of these controls, when combined with existing controls, is assessed to be medium. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Major (fatality)	Rare	Medium

Risk 9 Built asset (elevated platforms, handrails, constructed pathway) failure causing serious injury or fatality to walker(s).

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
9	Built asset (elevated platforms, handrails, constructed pathway) failure causing serious injury or fatality to walker(s).	Poor design Insufficient maintenance Overuse Vandalism	Serious injury or fatality. Loss of reputation and trust.	Catastrophic (multiple fatalities) Major (fatality) Minor (broken leg/ankle)	Rare Unlikely Possible	Medium Medium Low	5-yearly engineering inspections of elevated platforms. Regular 3-6-monthly inspection and maintenance by field staff. Staff respond to visitor reports of asset damage.	Engineering & Administrative	Medium	Catastrophic (Extreme)

Discussion

The track has a wide range of constructed infrastructure from elevated viewing platforms at the summit to bridges, emergency helicopter points, decking board, signs, seats, steps handrails and the chain section (see Figures 12 - 15). The greatest risk is failure of an elevated platform where multiple people congregate. These structures at the summit would be under the most stress during peak visitation periods (eg New Year's Day) where overcrowding on the track occurs. This risk has been assessed as medium.

Area staff advise that built asset inspections are undertaken quarterly or following heavy rainfall or storms or prior to events. Also covered in monthly general inspections. Area staff advise that AMS is used to record these inspections. An AMS report for 2010-19 records that the last 5-yearly engineering inspection of the viewing platforms occurred on 26/4/16 and the pedestrian bridges on 1/3/18. Pedestrian bridge inspections appear to be occurring 6-monthly. Area staff advise that the 5-yearly engineering reports are filed to AMS. Recent reports for the elevated platforms were sighted in AMS (Lucena, 2019). Quarterly general inspections are recorded in AMS, but no specific record of quarterly built asset inspections.



Figure 12 Low slip decking.



Figure 13 Barrier fencing and temporary exclusion tape not maintained.

Field observation

Generally, the handrails and superstructure of the viewing platforms appear to be in good condition and well maintained. But the condition of signs, handrails, etc appeared to deteriorate closer to the summit. It appeared that maintenance frequency in this section of the track is low. Examples included graffitied and dirty signs at the summit, missing handrails, sections of chain and barricade tape laying slack.

Area staff advised that viewing platforms at the summit were to be upgraded but this has not yet happened due to opposition from the Wollumbin Consultative Group on building structures or allowing access to the Wollumbin summit. These structures should be part of a cyclic inspection and maintenance regime in AMS. The poor condition of the interpretation signs on the summit and along the track puts into doubt whether this is occurring.

At the Emergency Helicopter Points walkers stop and congregate to rest, enjoy the views and take photographs. These sites are small clearings on the edge of the slope allowing helicopters to winch injured walkers to safety. There are no barriers to stop walkers from falling from these points. It is acknowledged that barriers at these sites may impede winching operations.

Recommended treatment plan actions

1. Reinstall failed sections of barrier fencing at other locations (eg see Figure 13 – between Emergency Helicopter Points 3 and 4).
Note: Area staff advise (6/9/19 that the damaged handrails were removed).
2. Upgrade handrails and other proposed works on the summit viewing platforms in accordance with recommendations from the 5-yearly engineering inspections.



Figure 14 Elevated viewing platform on the summit.

The effectiveness of these controls, when combined with existing controls, is assessed to be medium to high. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Catastrophic (multiple fatalities)	Rare	Medium
Major (fatality)	Rare	Medium
Minor (broken leg/ankle)	Unlikely	Low

Risk 10 Failure of the chain and anchor system causing serious injury or fatality to walker(s).

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
10	Failure of the chain and anchor system causing serious injury or fatality to walker(s).	Poor design Insufficient maintenance Overcrowding - too many walkers on the chain section Overuse Vandalism	Serious injury or fatality. Loss of reputation and trust. Temporary or permanent closure of the track.	Catastrophic (multiple fatalities) Major (fatality) Minor (broken leg/ankle)	Rare ¹ Unlikely Possible	Medium ² Medium Medium	Regular inspection and maintenance by field staff.	Engineering & Administrative	Medium	Catastrophic (Extreme)

Note: Using the risk matrix in *Quick Reference Guide – Asset Performance Assessments – Walking tracks and elevated structures* (Table 2 assessment of risk and barrier location) yielded ¹ (Likely) and ² (Extreme). However, given that there are no recorded incidents of this magnitude, we have used the OEH Health & Safety Risk Matrix ratings.

Discussion

The track contains a chain section commencing about 30mins from the summit for a length of approximately 100m.

The track is a Class 3 track (as assessed under AS2516.1-2001). Built elements on Class 3 tracks should be inspected at intervals of 6 months or less, be regularly maintained, and managed for public risk. Under the NPWS cyclic maintenance program, inspections and maintenance on the chains are carried out every 3 months by NPWS staff.

Under AS 2156.2—2001 (Standards Australia 2001b) provides guidance on fall prevention devices for walking track structures. The natural rockface at the Wollumbin summit is not a structure, so the expectations of AS2156.1 do not apply.

There are no records of injuries directly attributed to failure of the chain and anchor system. Any load rating or warranty on the chain or post anchors is not known. Area staff advise anecdotally of D shackles failing, and then being fixed.



Figure 15 End post and chain.



Figure 16 Chain section looking upwards.

Field observation

The chain appears to be constructed of mild steel and is attached to steel posts placed largely perpendicular to the rockface. The posts are dug into the rock or earth surface. The chain is attached to the posts with D shackles. The chain is used to provide balance and handholds for walkers negotiating the final ascent to the summit.

Review of AMS did not show any engineering assessment of the chain section. Area staff confirmed that no engineering assessment had occurred within the last 5 years. Cyclic inspections and maintenance of the chain is being recorded in AMS. Recent inspections were quarterly with last inspection on 1/9/19.

The condition of signs, handrails, etc appeared to deteriorate closer to the summit. It appeared that maintenance frequency in this section of the track is lesser. Examples included graffitied and dirty signs at the summit, missing handrails, sections of chain and barricade tape laying slack. Erosion of the track surface would be a constant hazard due to its high use and high rainfall.

Recommended treatment plan actions

1. Commission an engineering assessment of the chain and anchor system to determine its capacity to meet expected live loads, its condition and recommend a maintenance regime.
2. Implement agreed recommendations arising from the engineering assessment.
3. Area staff manage walker access on peak visitation periods/days.
4. Reinstate loose and unattached lengths of chain.
5. Update signage to advise on the best way to use the chain ascending and descending.
6. Consider the benefits and risks associated with installing an additional chain on the other side of the track to cater for many walkers on the track, avoid confusion on the safest route and to allow for the separation of ascenders and descenders.
7. Provide an alternative to climbing the rockface to the summit, such as a loop walk around the mountain to minimise risks to visitor safety and to the cultural sensitivity of the site.

The effectiveness of these controls, when combined with existing controls, is assessed to be medium to high. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Catastrophic (multiple fatalities)	Rare	Medium
Major (fatality)	Unlikely	Medium
Minor (broken leg/ankle)	Possible	Medium

Risk 11 Slips, trips or falls ascending and descending the chain section causing serious injury or fatality to walker(s).

Risk Id	Risk Event	Source	Consequences	Consequence Rating	Likelihood Rating	Risk Rating	Existing Controls	Control Type	Control Effectiveness	Potential Exposure
11	Slips, trips or falls ascending and descending the chain section causing serious injury or fatality to walker(s).	Overcrowding - too many walkers on the chain section Poor visitor behaviour Steepness of the terrain Wet weather Poor design Insufficient maintenance	Serious injury or fatality. Loss of reputation and trust.	Catastrophic (multiple fatalities) Major (fatality) Minor (broken leg/ankle)	Rare Possible Probable	Medium High High	The chain and anchor system. Specific safety signage at the chain section. Park closure during high rainfall events.	Engineering, Administrative & PPE	Medium	Catastrophic (Extreme)

Discussion

With 170 000 visitors to the Wollumbin Summit Track and 87% of those reaching the summit it is surprising that there have not been more reported serious injuries or fatalities. The chain section presents a physical and psychological challenge to walkers because of the steepness of the rock/slope and the height. Falls from the chain section to its base many metres below could be fatal. During busy times, a falling walker could knock others over increasing the likelihood of multiple serious injuries or fatalities.

Data from Tables 5 and 6 indicate that there were three events resulting in injuries requiring rescue in the chain section/summit between 2010 and August 2019 (on 8/8/14, 8/7/17 and 8/8/19). In addition, during the same period, two cases of fatigue (on 9/7/17 and 28/3/6) and one case of seizure (on 26/6/18) requiring rescue from the summit were recorded. This small number of incidents is likely to be an underestimate with no location identifier for 16 out of the 40 recorded incidents in Tables 4-6.

Visitation patterns are not uniform and during weekends, holiday periods and New Year's Eve visitation levels increase dramatically. Walkers amass at the base of the chain section. Overcrowding on the chain section increases the likelihood of walkers overtaking other walkers by ascending the track without the aid of the chain, dislodging loose rocks on walkers below or panicking slower walkers on the chain.

NJK Consulting Engineers (2016), when undertaking an assessment of the elevated structures on the summit track, commented on the risks to walkers using the chains to ascend the final 50-100m of track. They recommended that a suspended walkway/stairway be constructed to replace the chain and post balustrade system.

Field observation

Figures 14 – 18 show the chain section, specifically the chain, anchor posts and shackles; visitors ascending and descending; the terrain and safety warning signs.

The chain, D shackles and posts all appear to be in good condition.

Sections of chain had been placed out of service and were left lying on the ground or wrapped around a post. The reason for the removal of these sections of chain is unknown.

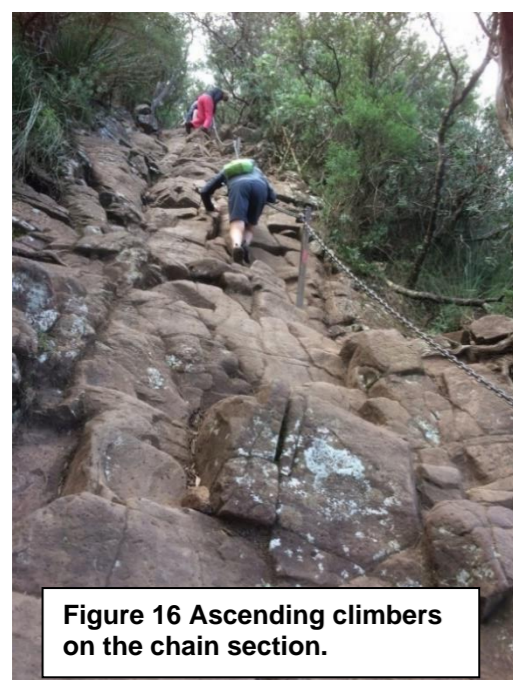


Figure 16 Ascending climbers on the chain section.



Figure 17 Warning sign at the base of chain section.

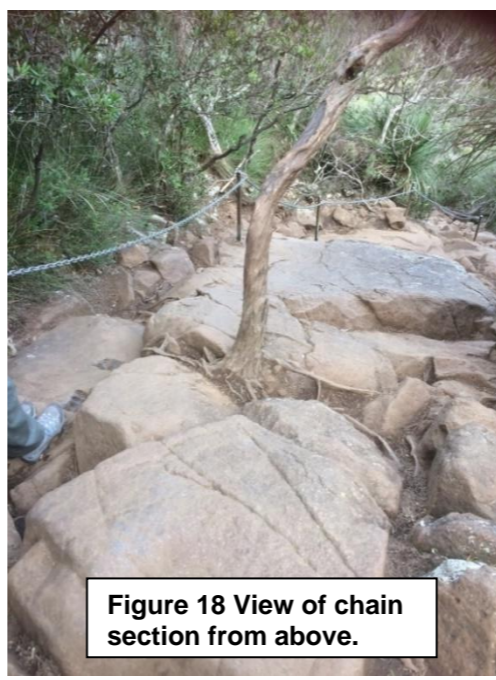


Figure 18 View of chain section from above.

Groups of young friends (20s), couples (in their 40s, 50s and 60s), and families (with school-aged children) were using the chain section on the risk assessment inspection day. Their experiences tackling this section of the track were observed. The estimated fitness levels ranged from very fit (trail runners) to the relatively unfit. Many walkers were dressed in only light clothing and carrying only a water bottle.

The chain runs up one side of the track. For some the chain is not located adjacent to the easiest route up the rockface. This situation places walkers in a dilemma – stay on the chain or move off it to the easier route. Placing the chain along one side of the track was probably a convenience of construction.

There is no separation of walkers ascending and descending so walkers must push past each other on the chain.

The chain appears to be slung too low for effective use on the descent. Walkers appeared unsure whether to go back down backwards or forwards. Walkers were observed getting their backpacks caught up in the chain.

The footholds carved into the rock are too far apart for walkers with shorter legs. It appeared easier to descend backwards in some sections but the gap between footholds made it difficult.

Walkers were generally respectful of others on the chain. But it was a winter Tuesday morning (18/6/2019), outside of holiday time so numbers were lower. Those visitors using the mountain for

fitness training appeared less willing to wait their turn and instead overtook other walkers by avoiding the chain.

The warning sign at the base of the chain section warns walkers that only 'fit and experienced walkers' should proceed. This warning appeared to be ignored with most walkers attempting the final summit climb.

Recommended treatment plan actions

1. Update signage to advise on the best way to use the chain ascending and descending.
2. Consider the merits of installing an additional chain on the other side of the track to cater for many walkers on the track, avoid confusion on the safest route and to allow for the separation of ascenders and descenders.
3. Area staff manage walker access on peak visitation periods/days.

The effectiveness of these controls, when combined with existing controls, is assessed to be medium to high. The residual risk rating on completion of the Risk Treatment Plan is assessed as medium.

Consequence Rating	Likelihood Rating	Residual Risk Rating
Catastrophic (multiple fatalities)	Rare	Medium
Major (fatality)	Possible	High
Minor (broken leg/ankle)	Probable	High

10. REFERENCES

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Wollumbin Summit Track attraction page – NSW national parks website.

Work Health and Safety Act 2011.

APPENDIX 1: HEALTH & SAFETY MATRIX

Health & Safety Risk Matrix		 Office of Environment & Heritage			
Multiply Likelihood x Consequence to achieve risk score.					
Consequence →	Insignificant 2	Minor 3	Moderate 6	Major 10	Catastrophic 20
Likelihood ↓	May have little or no impact on health and safety	May have some impact on health and safety, but will be able to recover from or repair the damage within a relatively short term	A moderate permanent disability or long term impairment	A whole fatality or severe permanent disability	Multiple fatalities or significant irreversible effects on the health of a large number of people
Likely 5 There is a very good chance this event will occur in the near future	M 10	M 15	H 30	E 50	E 100
Probable 4 This event has occurred several times or more in corporate experience	L 8	M 12	H 24	E 40	E 80
Possible 3 This event might occur once or twice in corporate experience	L 6	L 9	M 18	H 30	E 60
Unlikely 2 This event does occur somewhere from time to time, but very seldom	L 4	L 6	M 12	M 20	E 40
Rare 1 It is theoretically possible for this event to occur, but extremely unlikely that it will	L 2	L 3	L 6	M 10	M 20
Risk tolerance guide –all risks must be eliminated or controlled as soon as practical 2-9 Low Risk may be tolerated based on cost and practicality, otherwise complete actions within 6 months of approval. 10-20 Med Actions must be completed within 3 months of approval. 24-30 High Seek urgent approval to implement controls within 1 week or sooner. 40-100 Extreme Stop at risk activity immediately and make it safe. NOTE: Impact/Risks rated 10 and above, (Medium to Extreme) are deemed <i>significant</i> .					

Control Type	Example	Effectiveness
Elimination	Proper disposal of redundant items of equipment that contain substances such as asbestos, or PCBs, Removal of excess quantities of chemicals accumulated over time in a laboratory, etc.	100%
Substitution	Replacement of solvent-based printing inks with water-based ones, of asbestos insulation or fire-proofing with synthetic fibres or rockwool, the use of titanium dioxide white pigment instead of lead white, etc	High
Isolation	Removing keys from a tractor and keeping it under supervision so a child can't operate it. Disconnecting the power before repairing an electric appliance	Medium to high
Engineering	Installation of machine guards on hazardous equipment, Local exhaust ventilation over a process area releasing noxious fumes, Fitting a muffler on a noisy exhaust pipe	Medium to high
Administrative	Training and education, Signs, Job rotation to share the load created by a demanding task or tasks, Planning or scheduling certain jobs outside normal working hours to reduce general exposure, Early reporting of signs and symptoms, Instructions and warnings	Low to medium
Personal Protective Equipment (PPE)	Safety glasses and goggles, Earmuffs and earplugs, Hard hats, Safety boots, Gloves, Respiratory protection, Aprons, etc	Low

Aim to work above this line!