
Killen Falls Plan of Management

Part A



Prepared for Ballina Shire Council

by MikeSvikisPlanning

Adopted by Ballina Shire Council on 26 October 2017


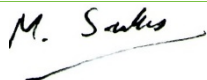
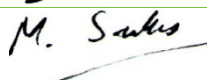
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1 Introduction

Killen Falls has been a popular spot for Tintenbar and Newrybar locals and visitors for many decades. It was surrounded by private land up until the mid-1970s when a subdivision created the rural residential lots to the south and Council accepted the public reserve land that now provides access to the falls.

In June 2016, Council resolved that a plan of management be prepared for Killen Falls to assist with the long term planning of the site.

This plan of management seeks to:

- provide options for management of the site
- identify potential opportunities for future development of facilities, access, and use of the site
- document a risk management strategy for the site.

Further information on a range of issues including the early neighbour and community consultation is included in Part B to this plan of management.

This plan of management was adopted by Ballina Shire Council at its meeting on 26 October 2017.

1.1 Objectives

The objectives of the plan of management are to:

- Manage the land consistent with the provisions of the *Local Government Act 1993*.
- Provide for the safety of visitors to the subject land.
- Ensure the ecological viability of the land by protecting its biodiversity and promoting rehabilitation of rainforest.
- Protect and respect the aesthetic, heritage, recreation, education and scientific values of the land and Emigrant Creek.

- Investigate facilities proportionate to site use that allow public enjoyment of the land.

1.2 Core Objectives

Pursuant to section 36 of the *Local Government Act 1993*, it is intended that the subject area remains categorised as “Natural Area – Bushland”.

Section 36J of the *Local Government Act 1993* identifies core objectives for management of Community land categorised as bushland as follows:

- (a) *to ensure the ongoing ecological viability of the land by protecting the ecological biodiversity and habitat values of the land, the flora and fauna (including invertebrates, fungi and micro-organisms) of the land and other ecological values of the land, and*
- (b) *to protect the aesthetic, heritage, recreational, educational and scientific values of the land, and*
- (c) *to promote the management of the land in a manner that protects and enhances the values and quality of the land and facilitates public enjoyment of the land, and to implement measures directed to minimising or mitigating any disturbance caused by human intrusion, and*
- (d) *to restore degraded bushland, and*
- (e) *to protect existing landforms such as natural drainage lines, watercourses and foreshores, and*
- (f) *to retain bushland in parcels of a size and configuration that will enable the existing plant and animal communities to survive in the long term, and*
- (g) *to protect bushland as a natural stabiliser of the soil surface.*

2 Killen Falls Management Area

2.1 Land to which this Plan Applies

The land subject to this plan of management is Lot 1 DP 251994 (the subject land). Lot 1 is approximately 1.3 hectares and is primarily a riparian strip with its northern boundary being Emigrant Creek (Figure 1).

The subject land is located at the termination of Killen Falls Drive. A commercial macadamia plantation is located on Lot 12 DP 245987, on the northern (and eastern) side of Emigrant Creek. A 3 hectare rural residential property on Lot 2 DP 251994 forms the southern boundary of the Council land. Immediately to the west of the Council land is the Rous Water property, which contains the Emigrant Creek Dam. The nature of the property boundaries in this location indicates that the bed of Emigrant Creek, including the rocks that form the waterfall and the swimming hole, are not on Council or private land and remain Crown land.

Lot 1 DP 251994 was dedicated to Council as a Public Reserve at the subdivision of the parent lot in 1975. Killen Falls Drive was also dedicated to Council as a public road.

A number of the recommended actions in this plan affect the Killen Falls Drive road reserve.

2.2 Site and Facility Description

The subject land is a riparian strip that has been the subject of rehabilitation in accordance with a vegetation restoration plan for more than ten years. A canopy of camphor laurels has been removed and replaced with a healthy mix of endemic rainforest species. It is generally in stable condition other than where some visitors have been straying from the main track to access the creek.

Improvements to the subject land include the walking track, the viewing platform at the falls, a wooden seat, some fencing and some signage. All other features such as the car park and rubbish bins are located in the adjacent road reserve.

The condition of the walking track is poor other than for an elevated boardwalk across a shallow gully, which is in good condition. The track surface is compacted dirt and heavily affected by exposed tree roots. It is slippery when wet and has minimal directional signage. The warning signage at the end of the track is in good condition. The viewing platform was built in 2015, is galvanised metal and wood, and is in good condition. The wooden seat is in poor condition and unusable. The fencing is in fair condition in some locations, but is in poor condition with sections missing in other locations.



Figure 1: Lot 1 DP 251994, Killen Falls Drive, Tintenbar (the subject land)

3 Management Context

3.1 Legislative and Policy Framework

The subject land is owned by Ballina Shire Council and is classified under the *Local Government Act 1993* as Community land. It was dedicated to Council in 1975 as part of the subdivision of the parent lots.

It does not have an individual plan of management and is therefore subject to the *Ballina Shire Plan of Management for Community Land (2015)*. Under that plan, it is categorised as “Natural Area – Bushland”. If Council adopts this site specific plan of management then pursuant to section 1.3 of the *Ballina Shire Plan of Management for Community Land*, the provisions of that plan will no longer apply. The next time that plan is reviewed, the reference to the subject land can be deleted.

Section 35 of the *Local Government Act 1993* requires that Community land is to be used and managed in accordance with the plan of management applying to the land. This plan of management seeks to satisfy the requirements of section 35 of the Act. Pursuant to section 36 of the *Local Government Act 1993*, it is intended that the subject area remains categorised as “Natural Area – Bushland”.

It is not intended that the primary use of the subject land be altered. It is a bushland reserve that is being restored as a rainforest. It has a pedestrian track to a viewing platform above a waterfall. The purpose of the existing and proposed facilities on the subject land is to enable public enjoyment of it while implementing measures directed to minimising or mitigating any disturbance caused by human intrusion. There is no intention to issue leases or licences over the subject land.

The subject land is zoned Deferred Matter under Ballina LEP 2012, which means that it is still subject to Ballina LEP 1987. The subject land is zoned entirely Rural 1(b) (Secondary Agricultural Zone) under Ballina LEP 1987 (Figure 2). It has been mooted in the past for inclusion in an environment

protection zone but the timeframe and likelihood of this outcome are unknown.

The objectives of the Rural 1(b) zone are split into primary and secondary as follows:

The primary objective is to regulate the subdivision and use of land within this zone:

- (a) to encourage the productive use of the land and enable development ancillary to agricultural land uses, particularly dwelling-houses, rural workers’ dwellings and rural industries, and*
- (b) to permit a range of uses which are compatible with the rural character of the land, particularly tourist oriented developments and recreation establishments and recreation facilities, and*

The secondary objective is to ensure that development within the zone:

- (a) maintains the rural character of the locality, and*
- (b) does not create unreasonable or uneconomic demands, or both, for the provision or extension of public amenities or services.*

Within this zone brothels; caravan parks for permanent occupation; residential buildings (other than dwelling-houses); shops (other than general stores) are prohibited. All other development is permitted with or without Council consent.

The strategies and actions arising from this plan of management are expected to be development “permitted with Council consent”. If not then they are likely to be “permitted without Council consent” as a result of *State Environmental Planning Policy (Infrastructure) 2007* or *State Environmental Planning Policy (Exempt and Complying Development)*, which both permit a range of minor development as either exempt or complying development depending on the scale and circumstances.

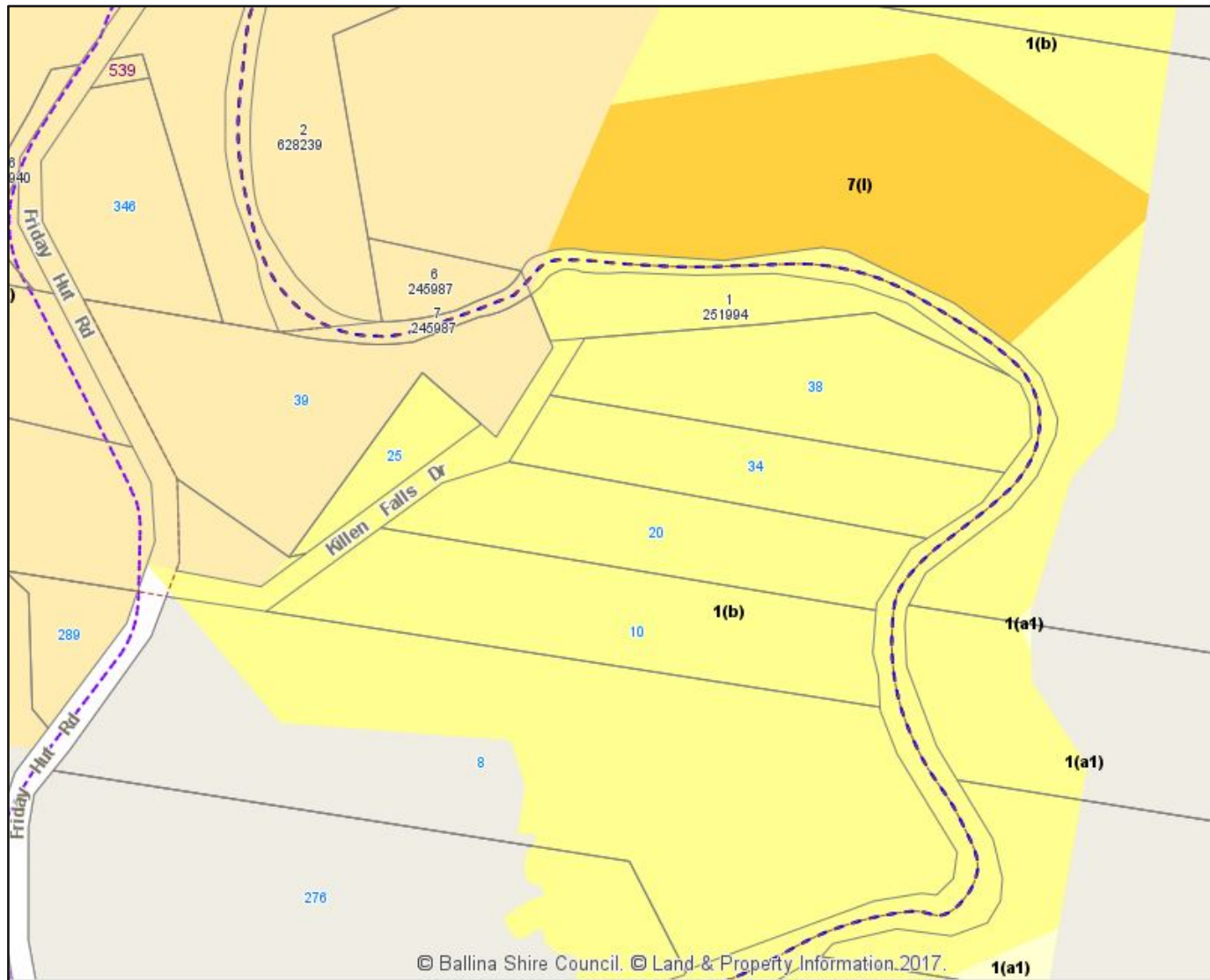


Figure 2: The subject land is zoned Rural 1(b) (Secondary Agricultural Zone) under Ballina LEP 2012

3.2 Visitation Numbers and Characteristics

It is difficult to be precise about how many people visit Killen Falls each day or each week. It is likely that visitation is higher in summer months when swimming is more popular and during school holidays when young people have more time for leisure. It is also likely that weather affects site usage. Residents advise that Killen Falls is a lot more popular now than five to ten years ago. Conversations with site visitors indicate that social media plays a role in this popularity. There are four ways to gauge visitation levels – count the numbers on site, ask people in a survey about visitation, speak to the neighbours, and traffic counts. At Killen Falls it was appropriate to access traffic counts for vehicle movements because most visitors drive to the site and it is not within walking distance to any urban areas.

A site count was undertaken on Sunday 22 January (school holidays) between 10 am and 2 pm, and 233 adults and 46 teenagers visited Killen Falls. This is a total visitor count of 279. Nine dogs (on leads) were also counted as entering the site. The day of the site count was warm and sunny. All visitors came by vehicle and parked at Killen Falls Drive, either in the car park or along the road. Three tour groups visited. One group of 18 persons was on a commercial tour and stayed approximately 20 minutes. One group of 16 persons visited for about 30 minutes. The other group of 36 persons was from a private school (a language school) and they stayed approximately one hour. Prior to 10 am on the day of the count, there was only one vehicle in the car park, suggesting visitors generally arrived in mid to late morning. After 2 pm, there were still about six cars in the car park but arrival numbers had slowed considerably. The hourly breakdown of visitor numbers was:

| | | |
|------------------------|---|-------------|
| 10 am – 11 am | = | 49 persons |
| 11 am – 12 pm (midday) | = | 101 persons |
| 12 pm – 1 pm | = | 89 persons |
| 1 pm – 2 pm | = | 40 persons |

The online survey (which was also completed by some visitors on-site on 22 January) undertaken in January/February 2017, indicates that about 75% of respondents visited less than five times per year, and only 1 in 20 visited more than ten times per year. Approximately 44% of respondents lived in postcodes in the LGAs of Ballina, Lismore and Byron. About 33% of respondents lived interstate or overseas.

The most popular things to do at Killen Falls are viewing the falls from the platform (87% of respondents) and swimming (72% of respondents). Most people came with family and friends.

In relation to changes at Killen Falls, the five most popular answers were – install toilets; better walking trail to creek; more parking; better walking track to viewing platform; and vehicle speed controls.

Neighbours along Killen Falls Drive have observed a sharp increase in visitor numbers to Killen Falls over the last five years. One neighbour collected over 1,300 signatures from visitors (on a petition asking for improved facilities) over a few days in late January and early February 2016. Another neighbour observed in December 2016, that there were 72 cars parked in Killen Falls Drive and more than 50 people swimming in the pool below the falls.

Council undertook a traffic count survey at the entrance to the nine-space car park at Killen Falls Drive from 12 December 2016 until 22 December 2016 (Part B – Appendix E). This was a school holiday period in warm weather, when the falls are known to be popular, and it included a weekend (17 and 18 December). However, the location of the counter at the entrance to the car park meant that if you visited the falls and parked along Killen Falls Drive then you would not have been counted. This is common in peak times as the car park is small. On balance, the traffic count is likely to have undercounted the volume of traffic that was linked to the site. However, it is still an important indicator of overall visitor numbers to the site.

Over the count period, the number of vehicles ranged between 127 and 146 vehicles per day, with an average of 134 vehicles per day. Peak hourly rates varied from zero at night time through to 31 vehicles per hour in the

middle of the day. The most active period at the site was between 10 am and 4 pm, and during this time the average was between 14 and 20 vehicles per hour. This peak vehicle activity period correlates quite well with the site count undertaken on Sunday 22 January 2017.

If it is assumed that a vehicle carries, on average, three occupants then the traffic count indicates that in a summer school holiday period the site could be attracting about 402 visitors per day, with average peak use of between 42 and 60 visitors per hour in the middle of the day. The highest peak hour would generate 93 visitors per hour. These hourly visitor volumes also correlate well with the site count undertaken on Sunday 22 January 2017.

At 402 visitors per day (every day), the site would generate visitor usage of 146,730 visits per annum. However, it is much more likely that these rates occur, at most, for the six warmest months of the year and that for the six cooler months the rates should be about half the peak. This assumption would yield a visitor rate of 109,947 per annum. A third option, which might represent a conservative approach, is to assume that 402 visitors per day occurs throughout the eleven weeks of school holidays, and for the remainder of the year rates are split evenly between half the peak rate (a “shoulder” period) and a quarter of the peak rate (a “low” season, when the days are short and the water is cold). This option yields a visitor rate of 74,298 per annum. On balance, the evidence suggests that Killen Falls has a high visitation rate.

These annual visitation numbers cannot be regarded as accurate because of the limitations on when data was collected and the assumptions that have been made upon its extrapolation. The online/site survey and traffic count data undertaken for this plan of management are a simple snapshot at one time. They do, however, give a general guide to the level of use of the site and those that use it.

As a comparison, it is worth considering the patronage at Ballina and Alstonville pools which in one sense are the modern alternative to swimming at a local creek. In 2015/16, Alstonville pool was open from 1 September to 15 May, and Ballina pool (and slide) from 19 September to 24 April. Alstonville had 70,096 patrons and Ballina pool had 89,860 patrons. The current year is heading towards similar numbers. During the week ending Sunday 22 January 2017, Alstonville pool received 2,078 patrons for an average of 296 per day; and Ballina pool received 3,967 patrons for an average of 566 per day.

At its peak, the visitation to Killen Falls (at about 402 visitors per day) falls between the daily visitation volumes of Council’s two swimming pools.

4 Values of the Management Area

4.1 Existing Facilities and Infrastructure

Existing facilities and infrastructure on the subject land (and in the road reserve adjacent to it) are basic and include a nine-space landscaped car park, a car and bus turn-around area at the northern end of the car park, twin wheelie bins for rubbish, some seating, some basic signage, a viewing platform above the waterfall and the 330 metre track to the waterfall. A temporary toilet was trialled at the site for three months over Christmas 2016 and early 2017. These items are illustrated at Figure 3.

4.2 Site and Facility Condition

The subject land is a riparian strip that has been the subject of rehabilitation in accordance with a vegetation restoration plan for more than ten years. A canopy of camphor laurels has been removed and replaced with a healthy mix of endemic rainforest species. It is generally in a stable condition other than where some visitors have been straying from the main track to access the creek.

Improvements to the subject land include the walking track, the viewing platform at the falls, a wooden seat, some fencing and some signage. All other features such as the car park and rubbish bins are located in the adjacent road reserve.

The condition of the walking track is poor other than for an elevated boardwalk across a shallow gully, which is in good condition. The track surface is compacted dirt and heavily affected by exposed tree roots. It is slippery when wet and has minimal directional signage. The warning signage at the eastern end of the track is in good condition. The viewing platform was built in 2015, is galvanised metal and wood, and is in good condition. The single wooden seat located on the subject land is in poor condition as it is affected by wood rot. The fencing is generally in fair condition. Some boundary fencing has been affected by rot. Some track fencing has been removed by visitors to gain access to the creek. Some fencing may be able to be restored and reused.



Figure 3: Infrastructure on the subject land

4.3 Landform, Geology and Soils

Emigrant Creek is a tributary of the lower Richmond River and commences in heavily modified farm land north of Newrybar. The catchment runs north/south and is traversed by the Pacific Highway (old and new). The northern 1,910 hectares drain into the Emigrant Creek Dam (an on-river storage) built in 1968 (and upgraded in 2002). Environmental flow water leaving the 18 hectare lake above the dam wall, runs south past the subject land, eventually connecting to Maguires Creek along the Teven Road and then the Richmond River at West Ballina.

The banks of Emigrant Creek near the subject land vary from steep sided to low, rocky and undulating. The northern boundary fronting Emigrant Creek has extensive surface rock. Most of the subject land is not flood affected but land near to the creek bed will at times be affected by high velocity flows and potentially flash flooding. Debris loads in high flows could be significant, particularly after long periods of dry weather or storm conditions that knock trees and limbs into the waterway.

Morand describes the red soils of the subject land as originating from the Mount Warning volcano. They are a deep, well structured red clay loam (Krasnozem). It is deep and free draining, and subject to basalt floaters and rock layers including sedimentary rocks such as slate. They often occur in high rainfall areas that, in combination with warm temperatures, grow lush rainforest (Bower Bush Works, 2004).

4.4 Vegetation and Habitat

A vegetation management plan was prepared for Killen Falls in 2004 (Bower Bush Works, 2004) and it documented the vegetation of the subject land at that time. It was described as Management Area 3. The plan noted that the alignment of the walking track was formerly a vehicle access to the top of the falls. Restoration work was already being undertaken in 2004, and the site had been regenerating slowly for about 20 years. Bower Bush Works

described it as highly modified, weed dominated and exposed. It was a simple to complex notophyll closed and open forest dominated by camphor laurel in combination with a shrubland dominated by lantana and woody weeds. It contained 45 species of trees and shrubs, 18 vines and 12 ferns, as well as herbs and grasses. A threatened vine (Arrow head) and shrub (Quassia) were identified. It also contained 33 exotic plant species.

The subject land would have been part of the Big Scrub rainforest prior to white settlement. The Big Scrub was approximately 75,000 hectares of subtropical rainforest associated with the Mount Warning Volcanics, located approximately between east Lismore, Alstonville, St Helena and Dunoon. By the turn of the 1900s, much of the Big Scrub had been reduced to a series of isolated remnants that comprise less than 1% (or 300 hectares) of the original vegetation. The private land immediately opposite the subject land is a genuine Big Scrub remnant that is an excellent seed source for all areas in the locality. It is part of the Killen Falls Vegetation Restoration Management Plan area. The land opposite the subject land is considered by Bower Bush Works to be of regional and even national significance due to its environmental attributes.

The Council land has, since 2004, been subject to extensive work by neighbours and the Big Scrub Landcare group in conjunction with Council. A lot of work recommended by Bower Bush Works has been undertaken. The weed removal and extensive rainforest regeneration now ensure the subject land provides an important link between the rainforest remnants on both banks of Emigrant Creek. Council's land will add further to the biodiversity of this area as it matures and expands.

Bower Bush Works predicted in 2004 that up to 13 threatened mammals, eight threatened birds, one threatened reptile and a threatened beetle would likely occur in and around the subject land given the proximity of a Big Scrub remnant across the creek. The caves behind and around the falls were known to be used by endangered micro bats as a daytime roosting spot. It is believed that the high level of daylight use in recent years has disrupted the bats, and they may no longer roost at the site.



Figure 4: Much of the land surrounding Killen Falls was still cleared in the late 1970s and early 1980s
(Photo provided by the Lane family)

4.5 Heritage

White settlers came to the area in the 1850s, primarily to log valuable rainforest timber from the Big Scrub rainforest. Good quality soils and high rainfall made the area an obvious place for agriculture once the timber had been removed. The neighbouring property, to the north of Killen Falls, was owned by the Killen family circa 1885, and the falls are believed to be named after them (Bower Bush Works, 2004).

The Ballina Community Based Heritage Study (BSC 2008) states:

The shire's waterfalls that were utilised by the public for recreation include Cawleys, Dalwood, Tosha and Marshalls Falls on the Alstonville Plateau and Killen Falls at Newrybar. Evidence of the use of these falls is scant, mostly derived from oral accounts and photographic evidence (these photos taken to promote these places). The scant nature of this evidence does not diminish the significance these areas had as places of recreation. The broader context of the history of the use of the natural environment for leisure demonstrates the popularity and widespread patronage of natural recreational spots.

Killen Falls is not listed in the current Local Environmental Plan as a heritage item.

Emigrant Creek Dam was constructed between 1967 and 1968, and at that time it provided the major water supply to Lennox Head and Ballina. Prior to the completion of dam safety strengthening works at Emigrant Creek Dam in 2002, there was no effective means of restricting and/or controlling access to the dam for security/risk management purposes. Once the dam strengthening works were completed, the informal car park area and adjacent areas at Killen Falls Drive required substantial remediation due to the extent of site disturbance/spoil and the impact of construction vehicles.

Following discussions between Rous County Council and Ballina Shire Council at that time, it was generally agreed that site rehabilitation would occur as follows:

- Rous would prepare landscaping plans for all of the disturbed areas;
- Site rehabilitation would include the construction of an access path to an observation area overlooking Emigrant Creek Dam as well as a formalised car parking area to accommodate visitors to both Emigrant Creek Dam and those visiting Killen Falls (noting that the car park and some of the access track to the dam are located on Ballina Shire Council property);
- Rous would construct the improvements in the plan;
- The car park areas would subsequently be handed over to Ballina Shire Council for maintenance as part of the Ballina Shire road network.

Rous completed the works in June 2003. It was always intended that the nature of the site be kept “low key”.

The path from the car park to the top of the waterfall was constructed in its current alignment at about this time. A Rous Water information sheet identified the walk as the “Boodgeraga Walk” (approximately 330 metres long) and it is named after the Wiabul word for fig tree (Rous Water, 2007). The walk to view the dam was identified as the “Water Walk”.

The viewing platform above the falls was constructed by Ballina Shire Council in 2015, as a response to the incidence of visitors walking down on to the river bed above the falls and approaching the edge. This was assessed to be a hazardous situation and a fixed viewing platform would reduce that behaviour.



Figure 5: Camping at Killen Falls in the 1970s. Note the dam wall in the background
(Photo provided by the Lane family)

4.6 Aboriginal Heritage

It can be assumed that all streams and waterholes were used by Aboriginal people throughout the Tintenbar area prior to white settlement.

Killen Falls, however, is not registered as a site on the AHIMS register. At the time of preparing this draft plan of management, the Jali Local Aboriginal Land Council had not responded.

5 Issues in the Management Area

5.1 Safety and Risk

Slip and trip type injuries are possible, both when walking through the site and getting in and out of the water at the pool below the falls. If the track to the viewing platform is improved, this risk will diminish for the initial 330 metres of the access. It will be difficult to diminish this risk for the balance of the track without major changes to the environment. It is also not possible to diminish the slip hazard along Emigrant Creek and the pool below the falls without major changes to the environment. Proper hazard signage and track ratings should make it clear that Council does not recommend walking further than the viewing platform or swimming in the pool below the falls.

There is no traditional jumping rock at Killen Falls and the pool is obviously shallow. Even so, the hazard signage at the viewing platform should make it clear that jumping is extremely dangerous and being near the edge is dangerous too. The unformed creek access, next to the viewing platform, which is currently used to access the rocks at the top of the falls, needs to be blocked by fencing and an additional warning sign.

Snakes are an issue in hot weather in the vicinity of Emigrant Creek. They occur throughout the area, and warning visitors of the danger in the site hazard signage is an appropriate response.

It was observed at site inspections that some visitors brought alcohol onto the reserve and took it down to the pool below the falls. It would be very difficult to clean up broken glass if bottles were smashed, either intentionally or accidentally. Alcohol can also create behavioural issues with some visitors and make the subject land less attractive to families and more attractive for parties. The subject land can only be declared an “alcohol prohibited area” under the *Local Government Act 1993* with the approval of the Local Area Commander of Police, and this normally occurs where there is an increased

risk of alcohol-related crime or anti-social behaviour. In the absence of reports from the Police, the area could be signposted as “glass free” to reduce the risk from broken glass.

Hazard warning signs consistent with Australian Standards should be located at appropriate points on entry to the site, along the walk and at the falls, and replaced if stolen or vandalised.

Tour operators that visit Killen Falls should be contacted to ensure they have a Council permit (and insurance) to operate on Council land. This is currently required by Council policy but needs to be enforced to ensure that those bringing visitors to the subject land are adequately insured.

5.2 Water Quality and Swimming

For a long time Killen Falls has been a place to view a waterfall and swim in the pool below the falls. For most of its history, Killen Falls has been surrounded by private land, and access has been at the discretion of neighbours (other than by trespass). Council does not identify Killen Falls as a location for swimming.

Rous Water (as the Water Authority) manages the Emigrant Creek Dam. As part of its water quality monitoring, Rous Water regularly collects water samples upstream of the falls, in the dam. The creek receives environmental flows from Emigrant Creek Dam, approximately 500 metres upstream of the falls.

Water quality data for the dam is provided in Part B – Appendix G. The water quality samples have not been collected for the purposes of assessing whether they comply with standards for recreational purposes such as swimming. However, they do give an indication of overall water quality. The

Rous Water data is based on 80 samples taken between 2003 and 2015, with 13% of samples during wet weather, 62% during dry weather and 25% somewhere in between. The E. coli counts ranged from 3 per 100 ml of water through to 8,320 per 100 ml of water. The average count over the

80 samples was 624 per 100 ml of water, and the median count was 125 per 100 ml of water. The standard normally required for swimming water is less than 40 E. coli per 100 ml of water, to avoid illness (Table 1). When levels exceed 500, there may be a significant risk of illness.

| Category | 95 th Percentile of enterococci (cfu/100 mL) | Basis of derivation | Estimation of probability |
|----------|---------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------|
| A | ≤40 | No illness seen in most epidemiological studies | GI* illness risk <1% AFRI** risk <0.3% |
| B | 41–200 | Upper level is above the threshold of illness transmission reported in most studies | GI illness risk >1–5% AFRI risk >0.3–1.9% |
| C | 201–500 | Represents a substantial elevation in the probability of adverse health outcomes | GI illness risk >5–10% AFRI risk >1.9–3.9% |
| D | >500 | Above this level there may be a significant risk of high levels of illness transmission | GI illness risk >10% AFRI risk >3.9% |

* GI = gastrointestinal

** AFRI = acute febrile respiratory illness

Table 1: Microbial assessment categories for fresh water (source NHMRC 2008)

Note: Enterococci is a group of faecal bacteria common to the faecal matter of warm-blooded animals, including humans; a subset of the faecal streptococci, but generally the vast majority; now referred to in Europe as the intestinal enterococci. Escherichia coli (E. coli) is a bacterium found in the gut, used as an indicator of faecal contamination of water (from warm-blooded animals and humans).

Like the majority of natural swimming locations in the Shire, the water quality is variable depending on weather, especially rainfall, and land uses in the catchment. Water quality data for the site collected from the dam above the falls shows that variability. The safety to users can change at any time without warning (due to an outbreak of blue-green algae or a branch dropping into the waterhole from upstream). Council does not have a life

guard on duty or any lifesaving equipment at or near the site. Notwithstanding this, the site still attracts some users where the 'wild state' of the locality is the attraction to swim there.

If Council permits access to Killen Falls then it is permitting the public to access land under its care and control. However, if Council is aware that

the public enter this land now (which they do), it therefore already has a duty of care to the public.

It is important that Council indicates to the public that it is not recommending Killen Falls and the waterhole as place to swim. Council will have to manage the site to ensure that it takes reasonable steps to guard site users against reasonably foreseeable risk of injury arising from being on the subject land. This would likely include:

- Site safety inspections to be conducted on a regular basis.
- Any ropes or devices (such as swings) for entering the pool should be removed as soon as practicable.
- Expand the information on Council's Beachwatch website regarding water quality at Killen Falls such as blue-green algae outbreaks, as well as pollution signs.
- Hazard warning signs should be replaced if stolen or vandalised.
- Install warning signage at the site indicating that the site is not routinely monitored by Council for water quality parameters and therefore swimming is not recommended.
- If Council decided to promote the site as a swimming location, regular water quality monitoring should be undertaken and suitable associated signage erected. This would require significant resourcing.

5.3 Toilets

During the last few years, there has been a consistent campaign from some local residents and visitors to get Council to install an eco-friendly toilet near the car park at the end of Killen Falls Drive. The campaign has included a 1,300 signature petition collected in January/February 2016, and multiple letters and representations. Up until recently, signs were erected at the car park, asking visitors to lobby Council to install a toilet. The nearest public

toilet to the site is located at the Tintenbar Sports Ground, approximately 5 kilometres to the south (via Tintenbar village). The incidence of human waste along the track and around the car park has been well documented by neighbours. Some neighbours have also received requests from site visitors to use their private toilet.

Council considered a report in June 2016, which canvassed the option of installing a toilet at the site. In November 2016, Council decided to support a temporary toilet at Killen Falls car park on a three-month trial basis. This toilet was installed at the northern end of the car park and operated between 12 December 2016 and 12 March 2017. On the day of the visitor site count, it was observed to be used approximately 20 times in four hours by visitors. Details of the three-month trial are as follows:

- One low-flush toilet was installed.
- The quantity of effluent pumped out over the three-month trial was 6,408 litres (an average of 71 litres per day). It was serviced twice a week, with four emergency pump-outs required when the holding tank was full between pump-outs.
- The trial cost \$5,560 (approximately \$62 per day).

The two questions that arise are:

- Is a toilet required? and
- What sort of toilet can be installed on this site if it is required?

A toilet would normally be installed in response to managing public health, safety and regulatory risks (such as pollution). In this case, the site has a high visitation rate by visitors of all ages and physical abilities. There is anecdotal evidence that visitors are staying long enough to use the surrounding riparian rainforest as a toilet when there is no other option. The usage rate of the temporary toilet trial has further demonstrated the need for a toilet on the site. The survey response indicates that most users want a toilet. The absence of a public toilet anywhere close to Killen Falls,

combined with a high rate of interstate and overseas visitors indicates that a toilet is required on this site.

The second question, concerning what sort of toilet, would depend on a range of factors. There is no sewerage at the site. In this case, the site users are short-stay; there is a peak load during the middle hours of the day; and there is a seasonal peak during warmer months and school holidays. We could also assume that about 7% of visitors would use the toilet, if the ratio of toilet users to site visitors observed during the January site count is typical. We know that the site generates about 70 litres of effluent per day during the summer months. The absence of reticulated power and water are issues, as is the proximity of Emigrant Creek (about 40 metres away). The logical location for a toilet is at the end of the car park and near the start of the walking track. In a similar situation at Brunswick Heads Nature Reserve (North Head Road), NPWS has installed a wheelchair accessible, low-flush, hybrid, two-stall septic treatment system, with a primary tank that retains solids and a secondary tank to treat the displaced liquid. Treated effluent from the secondary tank is pumped out periodically for off-site disposal. This type of toilet requires approximately 50 square metres of land, and an open area of at least this size is available near the car park. On-site disposal is not possible at Killen Falls due to the proximity of Emigrant Creek. Installation could be undertaken for about \$130,000 (excluding GST), with pump-out costs on top of that. The regularity of pump-outs depends on the level of usage and storage tank size. Water for hand washing could be from a rainwater tank linked to the toilet roof. A no-flush compost system might work on this site but Council would still need to dispose of excess liquid, which could be problematic.

A qualified wastewater consultant should be engaged to design or recommend a system that would suit the characteristics of this site and deal with the waste for the least cost and without significant environmental impacts.

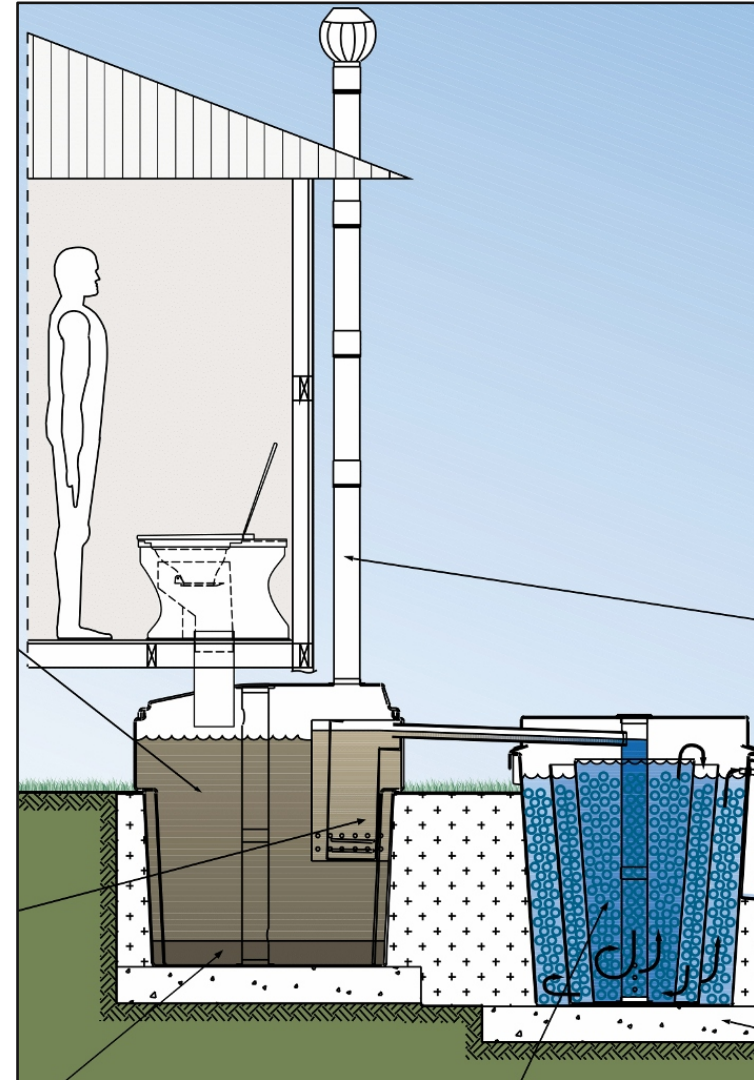


Figure 6: Low-flush, pump-out, hybrid system
(Source: NPWS sewerage manual)

5.4 Rubbish and Seating

There are already two wheelie bins at the Killen Falls car park, which are emptied regularly. The bins are well positioned in the car park. Although the locals still pick up loose rubbish, the bins are used by visitors and are adequate. When the car park is full, they are difficult to collect but moving them is not recommended as it is likely to reduce their use.

A single, low bench seat is provided on the Council land at the northern end of the car park. It has rotted out over time and is no longer usable. It is a place where visitors could stay in the shade and enjoy the locality while waiting for others. It is suggested that the timber top could be replaced using the existing brackets and footings.

5.5 Privacy and Trespass

The privacy issue stems from the volume of visitors accessing the site in peak times. One private dwelling is close to the car park and is directly affected by noise, headlights, damage to the road verge, and the general 'activity' of cars and people coming and going from the car park. Some residents have erected larger gates and better fencing to discourage trespass and privacy intrusions.

Landscaping may assist with some of these impacts. In particular, additional landscaping on the road reserve in front of Lot 3 DP 251994, in combination with locating overflow parking further up Killen Falls Drive, would assist with privacy issues on this lot. Landscaping may be more effective if undertaken on private land as well. Treatment of the road verge for better overflow parking is discussed later in this plan of management.

Trespassing to the northern side of Emigrant Creek has been an issue. Better fencing of the track to the viewing platform, with clear signage asking people to stay on the track should assist with this. The gap beside the viewing platform, which still allows access on to the top of the falls (and the other side), also needs to be blocked off and signposted.



Figure 7: Trespass and privacy issues related to accessing Killen Falls

5.6 Killen Falls Drive

Killen Falls Drive is a bitumen sealed road suitable for low speed traffic either accessing private driveways or the car park. There is no speed signposted until just short of the car park, where it is signposted as 10 kph. Observations by multiple persons suggest that some cars drive down Killen Falls Drive at more than 40 kph, and then arrive at a busy car park full of pedestrians, creating a dangerous mix of cars and people on foot. Given that vehicles often park well up Killen Falls Drive in the road reserve, it makes sense that the entire road be signposted as a 40 kph shared vehicle and pedestrian zone. This should be combined with speed reduction cushions on the road, which are well marked and signposted, and ensure traffic reduces speed soon after turning in from Friday Hut Road. The speed at the entrance to the car park should be a 10 kph shared zone, with a speed cushion located full-width at its entrance to ensure that drivers slow down.

5.7 Friday Hut Road

Friday Hut Road is the only way vehicles can access Killen Falls Drive. It is a narrow, sealed rural road that is in variable condition. It has an 80 kph speed limit at the intersection with Killen Falls Drive, and this intersection is on a bend with poor sight lines. Anecdotally, it is common for vehicles to overshoot the turn-off to Killen Falls Drive, and this leads to dangerous manoeuvres to get back to it.

Council should undertake a traffic assessment of this intersection and consider if the speed limit on Friday Hut Road should be reduced, whether the turn-off needs to be properly signposted (it currently identifies the street but not the falls or the dam), and whether anything can be done to improve sight lines or the functioning of the intersection.

5.8 Parking

The key goal with the parking on this site is to make it safer for site users and pedestrians, and to improve congestion and impact on local residents.

Parking at the site currently caters for nine vehicles and includes a car or bus turn-around area at the northern end. The sign to the turn-around area is faded and this area is often used as a car space. This turn-around area needs to be marked as a “no parking” area on the road surface, and a new sign should be erected to identify its purpose.

The roadway immediately behind the parking spaces needs to be identified, via road surface marking, as a “no parking” area to prevent cars parking there during peak periods, which restricts the reversing options for cars in the marked bays.

The speed at the entrance to the car park should be maintained as a 10 kph shared zone, with a speed cushion located full-width at its entrance to ensure that drivers slow down.

A designated disabled car space should be identified by on-road markings and signage.

Overflow parking occurs in unmarked parts of the road reserve south of the car park, along Killen Falls Drive. Parts of the verge have been damaged by this action and this needs to be addressed. Permeable products such as “Geohex” can be easily laid in the road verge at signposted locations to provide overflow parking that can still be mowed, is permeable to rainfall, and retains the look of a rural road verge rather than a large car park. These areas should be located along Killen Falls Drive in locations where the road reserve is wide enough. These overflow areas could also be used by any buses that access the site, to prevent them driving into a full car park. Figure 8 shows the location of the suggested car park improvements. No land acquisition is required to achieve the overflow parking.

Overnight parking is not a major problem at this stage but that could change with social media or any increase in facilities (such as a toilet). Parking

signage needs to clearly state that overnight stays are prohibited. In neighbouring shires, this usually means no parking between 1 am and 5 am.

Other suggestions for parking include time-limited parking and paid parking. Both these suggestions can be effective in creating turnover in car parking spaces, and in the case of paid parking, generate fees for maintenance. However, it is unlikely that a nine-space car park would generate sufficient

fees to pay for infrastructure (signage and a parking ticket dispenser) or cover the cost of enforcement required to ensure that fees are paid. Most site users are already short-stay and fee avoidance would be common. Equipment at the site could easily be vandalised. Power would need to be connected to the car park to allow credit card payment of fees. Unless parking fees were set at a high level, it would be unlikely to be cost effective. These suggestions are not recommended for this site.

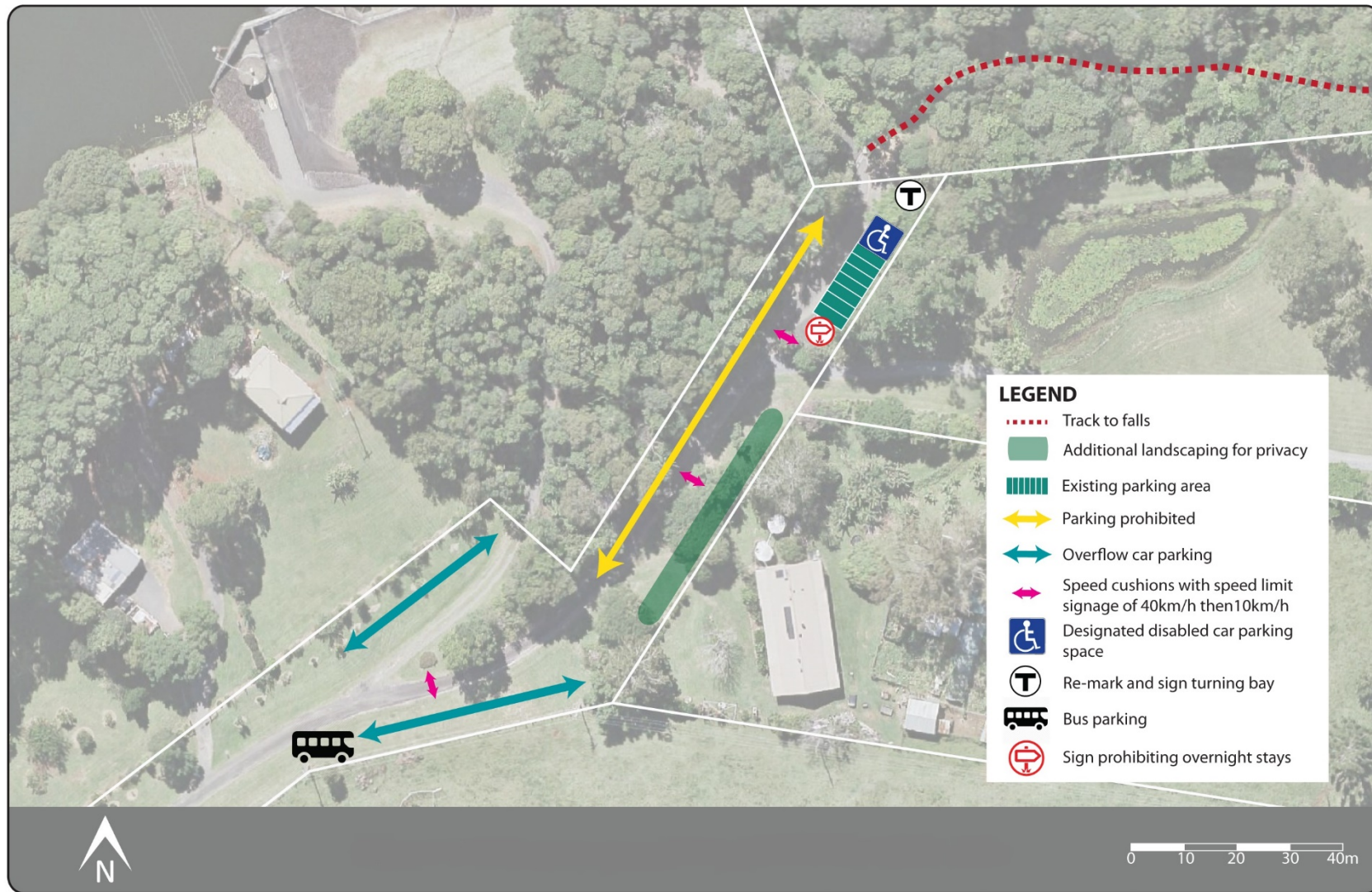


Figure 8: Car parking improvements

5.9 Other Access Options and Prohibition of Access

One suggestion is that a public road be constructed to access Killen Falls from the northern side of Emigrant Creek. This option is not recommended for the following reasons:

- significant impacts on a commercial macadamia plantation located on prime agricultural land;
- environmentally disruptive to a genuine Big Scrub remnant rainforest area;
- it would be constructed within the Emigrant Creek Dam catchment;
- expensive to purchase the land (more than 1 kilometre long plus a car park area);
- expensive to build due to the length of road and a gully crossing;
- impact heavily on privacy on the northern side due to existing house location;
- transfers the same issues from the southern side of Emigrant Creek to the northern side; and
- requires maintenance of two access roads and car parks and any other facilities because Killen Falls Drive will remain open to access private property and the Emigrant Creek Dam viewing area and Water Walk.

It has also been suggested that access to Killen Falls beyond the viewing platform should be prohibited. Although the viewing platform is popular with visitors (103 out of 118 respondents used the platform), 85 out of 118 respondents also went beyond the platform, down to the creek and went swimming. Fencing that restricted access to the creek has been removed in the past, and it would be very difficult to maintain any sort of barrier in this location. Even if an effective barrier could be erected and maintained, it may result in trespass on adjacent properties on both sides of Emigrant Creek as visitors seek new access points to the falls and the pool below. If swimming were declared prohibited, how would it be enforced? Would Council take legal action against locals and visitors for swimming at the falls or issue fines? How much would such action cost in staff time? Other sites

where access has been prohibited due to injuries and deaths are still popular with swimmers, despite barriers and signage. On balance, it is unlikely that access to Emigrant Creek below the falls can be prohibited. Visitors can be warned of dangers and hazards, and discouraged from going beyond the viewing platform or swimming in the pool below the falls, but prohibition is unlikely to be successful.

5.10 Environmental Restoration

Site users and neighbours are in favour of the continued rehabilitation of the Council land. There is a vegetation management plan for the site (prepared in 2004), which has been implemented effectively over the past thirteen years with Council assistance and grant funding. Continuing the rehabilitation of the subject land is important given its current level of visitation. In particular, keeping visitors on the track and limiting 'rat runs', particularly down to the creek between the car park and the top of the falls, is important. An obvious gap next to the western edge of the viewing platform needs to be blocked to discourage access to the top of the falls, where visitors may be tempted to approach the edge. It is recommended Council supports the further rehabilitation of the rainforest areas on the subject land in conjunction with landcare groups and neighbours.

5.11 Tracks and Signage

The walking track to the falls is not clearly identified at its entrance, and there is no information on its suitability for different ages or abilities. These are recommended. It is also recommended that signage along the walk (waist height) should be used to encourage visitors to stay on the track, warn about risks and help protect the rehabilitation of the rainforest.

Signage at the viewing platform needs to discourage visitors from accessing both the top and bottom of the falls, and to warn of hazards and the degree of difficulty involved.

The track needs to be considered in three parts – the walking track to the viewing platform (approximately 330 metres long); the track from the viewing platform down to Emigrant Creek; and the track from Emigrant Creek along the creek bed to the base of the falls.

The track to the viewing platform is in fairly poor shape. It is compacted earth and therefore slippery when wet. The track is heavily affected by surface tree roots, which present a trip hazard in many spots. It is not properly fenced along parts of its length, which allows users to easily leave the track. A small gully overflow has been fixed with a short boardwalk and rocks for erosion control. It is recommended that this track be fenced from the car park to the viewing platform to stop ‘rat runs’ to the creek or private property and to protect rehabilitation areas. It should also be signposted, asking people to stay on the track for environmental reasons. The track should be up to 1.2 metres wide, fully constructed along its current alignment, with no substantial vegetation clearing. It should be a crushed rock surface with timber edge to contain the material or *Geohex* if it is cost effective. The goal should be to upgrade the track to Australian Walking Track Grading System (Part B – Appendix F) Grade 2 – *“No bushwalking experience required. The track is hardened or compacted surface and may have a gentle hill section or sections and occasional steps. Walks no greater than 10km.”*

The track, from the viewing platform down to Emigrant Creek, is steep and rocky and is slippery when wet. It is also, at least partly, in a high velocity flood area. It would be difficult to construct a trail, and steps are required. The steps could be simple but to withstand flood impact they would need to be well constructed and secured, and that would be expensive. One improvement that would make this track section safer and would be easier to implement is a low handrail to give walkers something to hang on to other than the surrounding vegetation. The handrail posts would need to be fixed but the rail could be pipe or heavy chain. A handrail in this section is recommended to increase user safety. With a handrail, this track section could satisfy Australian Walking Track Grading System (Part B – Appendix F) Grade 3 - *“Suitable for most ages and fitness levels. Some*

bushwalking experience recommended. Tracks may have short steep hill sections a rough surface and many steps.”

The final section is the ‘track’ from Emigrant Creek, along the creek bed to the base of the falls. This is a mix of bedrock and pools, and is entirely within a high velocity floodway. One option would be to use concrete stepping stones in conjunction with natural rock areas. Although it may make the walk to the base of the falls safer, it would have a high visual impact in a scenic area and be expensive to construct. It would be difficult to achieve without polluting Emigrant Creek and potentially impacting on native fish, amphibians or platypus. This work is not recommended.

5.12 Dogs

Dogs are currently permitted on a lead on the subject land and are brought to the falls. Owners permit dogs to swim in the pool below the falls. This could be a risk to other users and wildlife. Dogs swimming in the waterhole would not assist with water quality. Dogs off lead will also enter the upper ends of the caves behind the waterfall, which could disturb any bats or other wildlife that might be using it as a roosting area.

Unless dogs are on leads, it would not be possible to stop them from straying onto adjacent private land near the falls. Permitting dogs also brings with it the need for dog faeces bags. The site is noted for its environmental restoration and proximity to a Big Scrub remnant, and dogs are not consistent with wildlife protection in an ecologically important area.

Under the *Companion Animals Act 1988*, dogs are prohibited in the following places:

- In or within 10 metres of any children's play areas
- Recreation areas where dogs are declared prohibited
- Wildlife protection areas.

Dogs should not be permitted on the subject land.

6 Management Strategies and Actions

An outline of the recommended strategies and actions is provided below:

- Site risk and safety inspections and water quality monitoring are recommended. Water quality monitoring should be carried out periodically at the falls using the criteria normally assessed for human contact.
- Given visitation rates at the site during peak times, a traffic assessment is required for Friday Hut Road at the Killen Falls Drive intersection to assess speed limits, signage and sight lines.
- Access to the falls should continue to be via Killen Falls Drive with measures implemented to slow down traffic and make it safer for pedestrians, including speed reduction for the entire road and speed cushions to make it happen.
- The continuation of rainforest rehabilitation will be a major ecological improvement that will benefit users and the environment over time. The existing viewing platform above the falls should remain.
- A permanent toilet is recommended for the site, to be located at the northern end of the car park near the beginning of the track to the falls. A hybrid system is likely to be the best option for this site given its proximity to water. The design and wastewater capacity of the toilet should be assessed by a wastewater management professional.
- Parking overflow areas should be designated along Killen Falls Drive, as well as bus parking. Additional signage is recommended to control parking and a designated turning area. Landscaping is suggested close to the nearest dwelling to increase privacy. Parking signage improvements are recommended, including no overnight stays. A designated disabled car space in the existing car park should be identified with on-road markings and signage.
- The rotted timber bench seat near the car park should be replaced utilising existing brackets and footings.
- Signage at the northern end of the car park should identify the entrance to the viewing platform track and provide information regarding its suitability for different ages or abilities, as well as distances and hazards. The hazard signage at the viewing platform should clearly identify that jumping is extremely dangerous and access to the top of the falls is not recommended.
- Council signage should indicate to the public that Council does not recommend Killen Falls as place to swim, and that water quality is unreliable and often does not meet safe swimming standards.
- Fencing is required along the full length of the viewing platform track, along with signage to stop 'rat runs' down to Emigrant Creek and to prevent access onto private land on the northern and southern sides. The unformed access next to the viewing platform, which is currently used to access the creek and rocks at the top of the falls, needs to be blocked by fencing and an additional warning sign.
- Track improvements are needed along the 330 metres of the viewing platform track to make it accessible to a wider range of walking abilities and to reduce slip and trip hazards. Beyond the viewing platform, the only improvement would be a low, fixed handrail to the steep section to improve safety for site users.
- Dogs should not be permitted on the subject land, and it should be declared glass free.
- Tour operators who visit Killen Falls should be contacted to ensure they have a Council permit (and insurance) to operate on Council land.

No facilities are recommended at the falls itself. It is not recommended that Council promotes or advertises Killen Falls.

6.1 Summary of Strategies and Actions

The approach taken with this plan of management is to document strategies and actions, and then cluster them into three priority options to manage and develop the site. Council can then consider these options that represent a minimal, moderate and major approach in terms of risk and safety, timing, feasibility and cost. Risk and safety is the dominant factor in prioritising the

actions. They are a cumulative set of options with Priority 1 being the baseline of actions that should be undertaken. Priority 2 (if adopted) will be in addition to Priority 1, and Priority 3 (if adopted) will be in addition to Priorities 1 and 2.

Priority 1 = Are required for public safety or risk reasons; can be implemented within 12 months of adopting the plan of management; are relatively low cost.

Priority 2 = Can be implemented within 1 to 3 years of adopting the plan of management; are more expensive to implement.

Priority 3 = May take more than 3 years to implement after adopting the plan of management; are more expensive to implement; may not be feasible once investigations are completed.

| Objective | PRIORITY 1: Strategies and Actions | Cost (ex GST) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Ensure the ecological viability of the land by protecting its biodiversity and promoting rehabilitation of rainforest; And Protect and respect the aesthetic, heritage, recreation, education and scientific values of the land and Emigrant Creek. | Declare the subject land to be a dog prohibited area. | Minimal cost |
| | Provide signage requesting that visitors stay on the designated track and keep out of rainforest rehabilitation areas. | \$720 |
| | Provide stickers or signage encouraging patrons not to litter. | \$250 |
| Minimise impacts arising from the use of the subject land on adjacent private land (in particular trespass and privacy). | Provide fencing and an additional warning sign to prevent access from next to the viewing platform, which is currently used to access the creek and rocks at the top of the falls. | \$375 |
| | Follow up with tour operators that visit Killen Falls to ensure they have a licence with Ballina Shire Council to operate on public land and that they have appropriate insurance in place (consistent with Council policy). | Minimal cost |

| Objective | PRIORITY 1: Strategies and Actions | Cost (ex GST) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Provide facilities proportionate to site use that allow public enjoyment of the land; And Provide for the safety of the users of the subject land. | Alert the public of potential risks on the subject land by providing signage based on Australian Standards for hazard signage. | \$1,500 (at \$375 per sign) |
| | Provide signage advising that Council does not make any claim that the water in Emigrant Creek meets the standard required for swimming, and that swimming is not advised. | \$375 |
| | At the northern end of the car park, provide signage that identifies the viewing platform track and supplies information regarding its suitability for different ages or abilities, as well as distances and hazards. | \$750 |
| | Provide additional signage to properly identify an existing designated turning area at the northern end of the car park. Parking signage improvements are recommended, including no overnight stays and no parking opposite the current nine bays. | \$1,125 |
| | Provide an edge-to-edge speed hump at the entrance to the car park and designate a 10 kph speed limit in the car park as a shared zone. | \$2,100 |
| | Provide road markings and signage to identify a designated disabled car space in the existing car park. | \$750 |
| | Declare the entire area to be glass free to make it safer for users and discourage anti-social behaviour. | Minimal cost |
| | Replace the rotted timber bench seat near the car park utilising existing brackets and footings. | \$200 |
| | Undertake periodic water quality monitoring at the falls using the criteria normally assessed for human contact. Note: Water quality monitoring will only be undertaken if Council seeks to promote the site as a swimming location. | \$2,500 (per annum) |

| Objective | PRIORITY 1: Strategies and Actions | Cost (ex GST) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Provide facilities proportionate to site use that allow public enjoyment of the land; And Minimise impacts arising from the use of the subject land on adjacent private land (in particular trespass and privacy). | Provide a permanent toilet at the northern end of the car park, near the beginning of the track to the falls. The design and wastewater capacity of the toilet should be assessed by a wastewater management professional. This public toilet is not planned for construction until Rous County Council contributes 50% of the cost. | \$130,000 installation \$10,000 for design and approval \$15,520 per annum recurrent costs |
| | Undertake track improvements along the 330 metre length of the viewing platform track to make it safer and to reduce slip and trip hazards along its length. | \$25,550 |
| | Undertake site safety inspections at the falls not less than monthly. | Undertake at same time as water quality assessment |

Table 2: Priority 1 Strategies and Actions – Summary and Costs

| Objective | PRIORITY 2: Strategies and Actions | Cost (ex GST) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Minimise impacts arising from the use of the subject land on adjacent private land (in particular trespass and privacy). | Establish additional landscaping near the front boundary of Lot 3 DP 251994 to increase privacy for the dwelling on this lot. Install bollards as part of landscaping near the front boundary. | \$3,700 |
| | Fence both sides of the viewing platform track along its entire length to decrease access to the northern side of Emigrant Creek and to Lot 2 DP 251994. | \$10,500 |
| Provide facilities proportionate to site use that allow public enjoyment of the land; And Minimise impacts arising from the use of the subject land on adjacent private land (in particular trespass and privacy). | Beyond the viewing platform, install a low, fixed handrail along the steep section to improve safety for site users who access the creek. | \$2,400 |
| | Implement measures to slow traffic along Killen Falls Drive to make it safer for pedestrians, including speed reduction (40 kph) for the entire road from the turn-off to the car park and speed cushions (with signage) to make it happen. | \$6,700 |
| Ensure the ecological viability of the land by protecting its biodiversity and promoting rehabilitation of rainforest. | Complete an updated assessment of the biodiversity values of the Council owned land adjacent to Killen Falls. | \$8,000 |
| | Revise the Killen Falls Vegetation Restoration Plan 2004 based on the updated assessment of the biodiversity values of the site. | \$3,000 |

Table 3: Priority 2 Strategies and Actions – Summary and Costs

| Objective | PRIORITY 3: Strategies and Actions | Cost (ex GST) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| <p>Ensure the ecological viability of the land by protecting its biodiversity and promoting rehabilitation of rainforest;</p> <p>And</p> <p>Protect and respect the aesthetic, heritage, recreation, education and scientific values of the land and Emigrant Creek.</p> | <p>Protect, maintain and continue to rehabilitate environmentally sensitive areas, and continue with rainforest rehabilitation on land in Council control.</p> | <p>\$10,000 per annum recurrent costs</p> |
| <p>Provide facilities proportionate to site use that allow public enjoyment of the land;</p> <p>And</p> <p>Provide for the safety of the users of the subject land.</p> | <p>Identify parking overflow areas along Killen Falls Drive as well as bus parking. Use <i>Geohex</i> or similar material to control erosion and damage to the road verge in these locations. Use signage to identify the preferred locations and parking patterns.</p> | <p>\$43,415</p> |
| <p>Provide facilities proportionate to site use that allow public enjoyment of the land;</p> <p>And</p> <p>Minimise impacts arising from the use of the subject land on adjacent private land (in particular trespass and privacy).</p> | <p>A traffic assessment should be conducted for Friday Hut Road at the Killen Falls Drive intersection to assess speed limits, signage and sight lines.</p> | <p>\$10,000</p> |

Table 4: Priority 3 Strategies and Actions – Summary and Costs

The full suite of possible strategies and actions is presented in Figure 9.

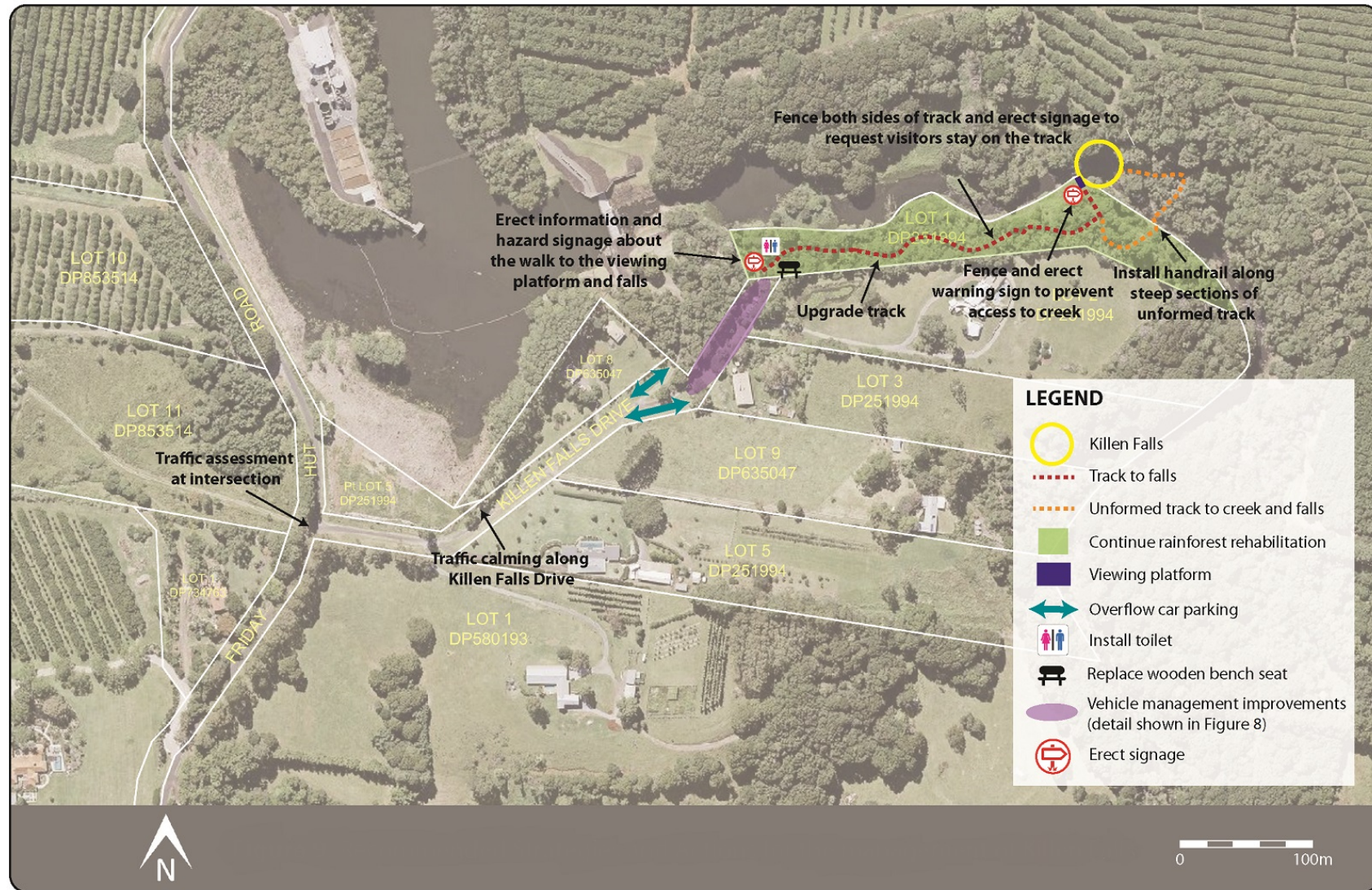


Figure 9: Possible Strategies and Actions illustrated on a site map

Discussion of the costs of strategies and actions, and how they might be funded is included in Part B to this plan of management.

Site photographs and infrastructure examples are shown in Part B – Appendix H.

6.2 Monitoring

As this site has never been subject to a specific plan of management, it is important that the actions are monitored to establish if the anticipated outcomes have been achieved.

The plan of management should be monitored on an annual basis, and comprehensively reviewed after five years.

References

Ballina Shire Council, 2008. Ballina Community Based Heritage Study

Ballina Shire Council, 2015. Ballina Shire Plan of Management for Community Land

Bower Bush Works, 2004. Killen Falls Vegetation Restoration Management Plan

Rous Water, 2007. Welcome to the Water Walk – Information Sheet # 2