BLUE MOUNTAINS
WORLD HERITAGE INSTITUTE

FAIMS PROJECT

Bleichert Ropeway, Katoomba

2014 SURVEY REPORT

PENNY CROOK, SHAWN ROSS,
GEORGIA BURNETT, PETER SHADIE
and PHIL HAMMON

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Australian Government
Department of Sustainability, Environment, Water, Population and Communities

Project partners include:

Contents

1 INTRODUCTION

1.1 BACKGROUND

In 2012 the Blue Mountains World Heritage Institute (BMWHI) received funding from the then Australian Department of Sustainability, Environment, Water, Population and Communities, for a small-scale project to record remnants of a historic ropeway, built by German engineers Adolf Bleichert & Co, that carried shale across the Jamison Valley in the 1880s. The remains of the ropeway now lie in the Blue Mountains National Park and on private land owned by Scenic World, and their management is governed by the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*.

The BMWHI project, entitled 'The Bleichert Ropeway: A Community Study of Industrial Heritage', set out to 'gather knowledge of the Bleichert Ropeway by engaging with the local community and carrying out field studies to celebrate this heritage'. It was designed to complement the existing heritage conservation and interpretive programmes of NPWS aimed at a wider community. (See section 1.2 for more details.)

In February 2014, BMWHI approached the Federated Archaeological Management Systems (FAIMS) team about using the new FAIMS mobile application to record the remnants of the ropeway. A module recording system was commissioned and developed, and the FAIMS team became involved in the recording, in support of the BMWHI and the volunteers working on the project, and also to field-test new features of the application.

This report presents a summary of the survey activities. The inventory is presented in a separate document.

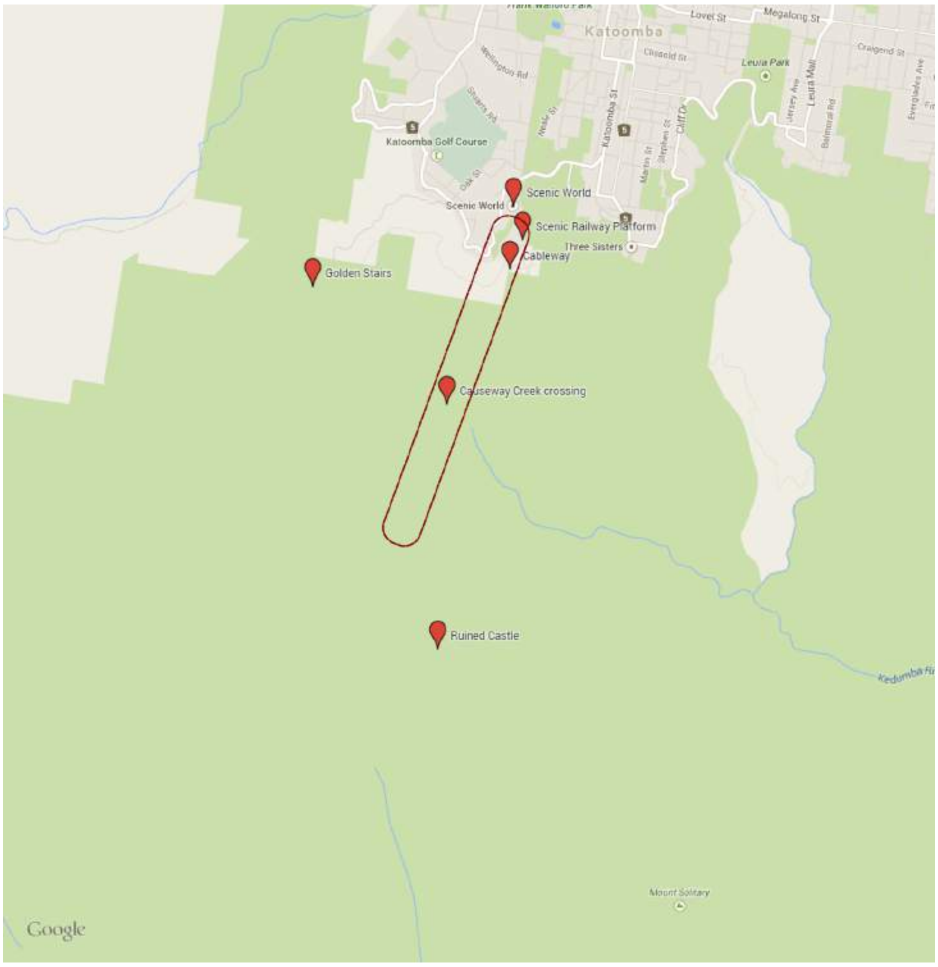

Figure 1.1 Approximate location of the survey area. (Source: Map Data ©2015 Google)

1.2 Project Objectives

The Greater Blue Mountains World Heritage Area (GBMWHA) was listed in 2000 for its outstanding natural features but the area also boasts a unique and fascinating cultural history, much of it connected to 19th-century mining pursuits and associated solutions to significant engineering challenges.

The Bleichert Ropeway was the first of its kind and made the job of removing oil shale from the vast Jamieson Valley a much easier task than the previous methods involving pack animals or bullock carts. Numerous artefacts and evidence of this Ropeway still exist in situ and therefore should be documented and conserved to ensure this important part of NSW's social, economic and technological history is not lost.

The remaining installations that provide evidence of the Bleichert Ropeway include metal and some timber artefacts. Many remain in situ (or nearly so) due to the fact that they are large and heavy, and therefore neither readily movable nor easy to souvenir. They date back some 150 years, however, so there is an urgency to document what is remaining before the further effects of weather, fire and human tampering result in the loss of this evidence.

Much voluntary research has been done over a number of years by key community groups, including local bush walking groups. A local publication by Pells & Hammon (2009), *The Burning*

Mists of Time, described the remains of the ropeway in great detail and in the context of oil shale mining in the region.

The field and documentation to date has been of an ad hoc nature but this project will engage all of these interested parties, in order to consolidate evidence of the Ropeway. The stated objectives are:

1. To facilitate a local community forum raising awareness and identifying sources of community knowledge.
2. To enhance community involvement and participation by engaging interested volunteer groups to carry out directed field-based research and data gathering.
3. To engage stakeholders to draw out knowledge and raise awareness of the value of this significant heritage asset.
4. To hold a final community celebration to learn from industrial heritage experts on the outcomes of this project.

Through the course of the project, opportunities have arisen to also better understand the cultural significance of the Bleichert Ropeway and to consider recommendations for its future conservation and interpretation, including possible listing on the NSW State Heritage Register.

1.3 Limitations

This report is intended to provide detailed documentation of the 2014 survey methods and results. It is not intended to provide a comprehensive historical nor technical context for the ropeway nor provide a detailed heritage assessment of the condition and significance of the remnants. There is no detailed analysis of previous surveys. For more information about the history and technology of the Ropeway, and mining at Ruined Castle and surrounds, see *The Burning Mists of Time* (Pells & Hammon 2009).

The inventory includes two restored bucket assemblies which are on display at Scenic World, but does not include other collected relics that have been salvaged over the years.

The items were recorded by experienced survey archaeologists with some knowledge of, but no special expertise in, 19th-century mining heritage.

1.4 Acknowledgements

John Merson and Peter Shadie of the BMWHI championed and managed the overarching Bleichert Ropeway community project. Peter coordinated all the field trips and team meetings.

John Merson and Rosalie Chapple generously provided accommodation and meeting space while the FAIMS team was in the Blue Mountains.

Phil Hammon, Scenic World, was instrumental in designing the field recording system, and kindly transported walkers on the cable way or railroad each morning and evening. We have also drawn extensively from the book he wrote with Phillip Pells, *Burning Mists of Time*.

Chris Banffy and Neil Stone, National Parks & Wildlife Service, coordinated support and equipment from National Parks (NPWS) and provided ongoing advice about the execution of the field work.

John, Peter, Chris and Phil all lead the field orientation.

It would not have been possible to complete this inventory without the amazing local walkers who volunteered their time to assist us in identifying and recording the Ropeway. They include: Phil Foster, John Cooper, John Cassey, Michael Small, Peter Curtis, Patrick Leonard and Wyn, Mylo, Kalang and Tallai Jones.

Additional members of the FAIMS team, Adela Sobotkova, Brian Ballsun-Stanton and Vincent Tran, provided key technical support during and between field sessions, including essential updates and fixes for the mobile recording system.

Thanks are also due to Russell Lowe from the UNSW School of Built Environment who provided significant input to the project through students who developed the computer simulation of the Bleichert Ropeway.

BMWHI would like to express their deep gratitude for the outstanding support and collaboration from the FAIMS team, without whom the professional survey work would not have been possible.

2 Historical Background

2.1 Mining in the Blue Mountains

Oil shale or torbanite, a 'Black Stoney substance' that burns well, is a natural resource in abundance in the Blue Mountains region, discovered in the Grose Valley as early as 1796 (Pells & Hammon 2009, pp.10–11). In situ deposits were discovered at Mount York near Hartley in 1823 and it was used for heating (Pells & Hammon 2009, pp.12, 36). It was not until 1850 that techniques were developed to distil a new kind of oil torbanite that rivalled whale and tallow oils for lamp lighting. With imports of American kerosene oil fetching a high price, interest grew in large-scale mining of oil shale (Pells & Hammon 2009, p.34).

The first known production of mineral oil in Australia was at the Pioneer Kerosene Works which was established in Mount Kembla in 1865—the same year the *Kerosene Oil and Paraffin Company Limited* began exploration in Hartley Vale (Pells & Hammon 2009, p.36).

In 1866 Campbell Mitchell (son of surveyor-general Sir Thomas Mitchell) discovered seams of oil shale and coal in the Megalong Valley.

2.2 Bleichert's Wire Ropeway

The ropeway that lies in pieces on the floor of the Jamison Valley today was built in Leipzig, Germany, by Adolf Bleichert & Co., world leaders in the design and manufacture of cable cars and ropeways, also known as wire rope tramways or aerial tramways. It was originally imported to Australia for use in a coal mine in the Gladstone area of the Jamison Valley, and moved to the Ruined Castle mine in 1888. Below, we briefly outline the history of the Bleichert Co. and its patent designs, and two installations of their ropeway in the Blue Mountains.

2.2.1 Adolf Bleichert & Co.

Until the 1850s, the mining industry relied on bullocks and rail infrastructure to transport ore from extraction pits and tunnels to distribution points. In 1856 a new aerial wire cableway was patented which promised to transport ore faster in steep terrain. The earliest wires were weak, and improvements were made, including the addition of a second cable in the 1860s.

In 1872, a young German engineer, Adolf Bleichert, patented his first bicable ropeway for a paraffin manufacturer in Saxony (Bleichert 2013, p.ch 1). The system was perfected by Bleichert in partnership with Theodor Otto, and a new patent was registered in 1874. Bleichert parted with Otto in 1876 and established Adolf Bleichert & Co. In September 1877, he registered Patent No. 2934 for an 'Improved Wire Ropeway System', receiving protection for:

- a carrying rope line-tensioning device that utilised chain and weights;
- grooved channel bearings for carrying rope towers;
- tin compound casting for connection of wire rope to chain;
- tilting carriers;
- a carrier braking system;
- a tensioning station for hauling ropes that consisted of a sled-mounted wheel connected to a weight on an adjustable chain;
- a device for automatic transfer of carriages from carrying rope to solid rail at stations;
- a curve station that allowed change of direction of both the carrying and hauling ropes;

- and, friction clutches for engaging and disengaging the carrier from the hauling rope. (von Bleichert 2013: 73-78).

Adolf Bleichert & Co. grew from 20 employees in 1877 to nearly 100 in 1878 when they built a new factory in Gohlis, Leipzig (Bleichert 2013)—a building which still survives today. Cableways were established at mines all over the world in the late 19th and 20th centuries. For more information about Adolf Bleichert & Co. see: Hewitt 1909; Spilsbury & Trenton Iron Co 1890; von Bleichert 2013; Pells & Hammon 2009.

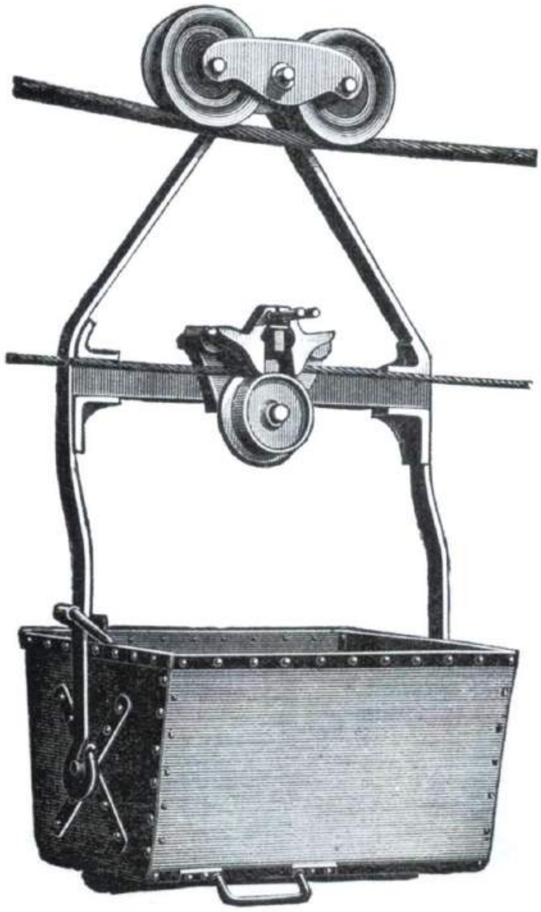

Figure 2.1 Bleichert's original design for cableway carriers. A later patent (No. 4) was used at the Ruined Castle Mine. (Source: Pells & Hammon 2009: 138)

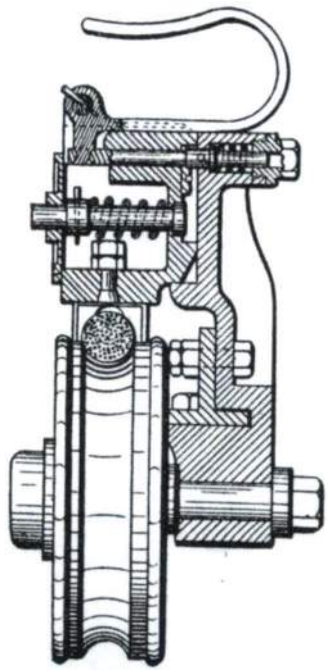

Figure 2.2 Cross section of the carrier rope grip. (Source: Pells & Hammon 2009: 135)

2.2.2 Gladstone Installation (1884–1885)

The Bleichert patent ropeway destined for Gladstone was ordered by a Leipzig-born civil engineer, Oscar Schulze, who migrated to Sydney in 1879. Schulze oversaw its construction in 1884 for the Gladstone Coal Company Ltd. Despite opening to some fanfare, including interest in the novel aerial tramway, operations were suspended in 1885 and the Company went into liquidation. The mine closed in 1886 after extracting only 1200 tons of low grade coal and the ropeway infrastructure was apparently abandoned.

2.2.3 Ruined Castle Installation (1888–1890)

While the details of acquisition are unclear, the Katoomba Coal and Shale Company (formed in January 1885), engaged Schulze to move the ropeway to a service new mine in Ruined Castle. An order for additional cable, tower fittings and buckets was placed with Adolf Bleichert & Co. in February 1888. It is not known precisely when the ropeway was dismantled, but by the end of the year, it was in operation.

It was officially opened in March 1889, hauling an average of 80 tons of oil shale per day. However, as early as June 1889, *The Katoomba Times* reported the main ropeway had given way, delaying works for a day and a half. This report gives ominous foreshadowing for subsequent events: by August 1889, faults in the cable carrying loaded skips had developed, and by January 1890, most likely in September 1889, the inbound track rope to the mine had broken causing parts of the aerial ropeway to collapse. In total, the ropeway was in operation in Katoomba for approximately nine months, and it was never used again.

2.3 Post-Collapse (1890-1944)

The Australian Kerosene Oil and Shale Co. acquired the mines, plant and equipment owned by Katoomba Coal and Shale Co., by lease in September of 1890. In February of 1891, the Katoomba Coal and Shale Co. was liquidated. Mining resumed, with new infrastructure—a 4.5 km long over-rope tramway, a 2.5 km long horse drawn tramway, and a self acting incline—and peaked in 1893. The mine closed in 1897 and reopened briefly in 1903 and 1905.

In 1925, a group of local businessmen formed a syndicate, Katoomba Colliery Ltd, to extract the ‘slack’ coal that had not been profitable to recover during previous operations. Operating from 1928, they revived the surviving infrastructure, including the steep-incline tramway, and began offering rides to passengers on weekends and public holidays to supplement their income. For a sixpence a time, visitors could travel the incline in a purpose built 14-passenger car named ‘The Mountain Devil’ (Scenic World website).

2.4 Scenic World (1945–)

In 1945, Harry Hammon and his sister Isobel Fahey, bought the lease of the Katoomba Colliery Limited and established Scenic World. The old incline railway was now to be used solely as a passenger vehicle. The former colliery site was rebuilt as a major tourist attraction, and over several decades, the rainforest reclaimed the hillsides and valley floors cleared by shale oil and coal mining.

Scenic World continues to be owned and managed by the Hammon family. It attracts hundreds of thousands of visitors each year.

Remnants of the Bleichert Ropeway are visible from walkways around the base of the Scenic Railway.

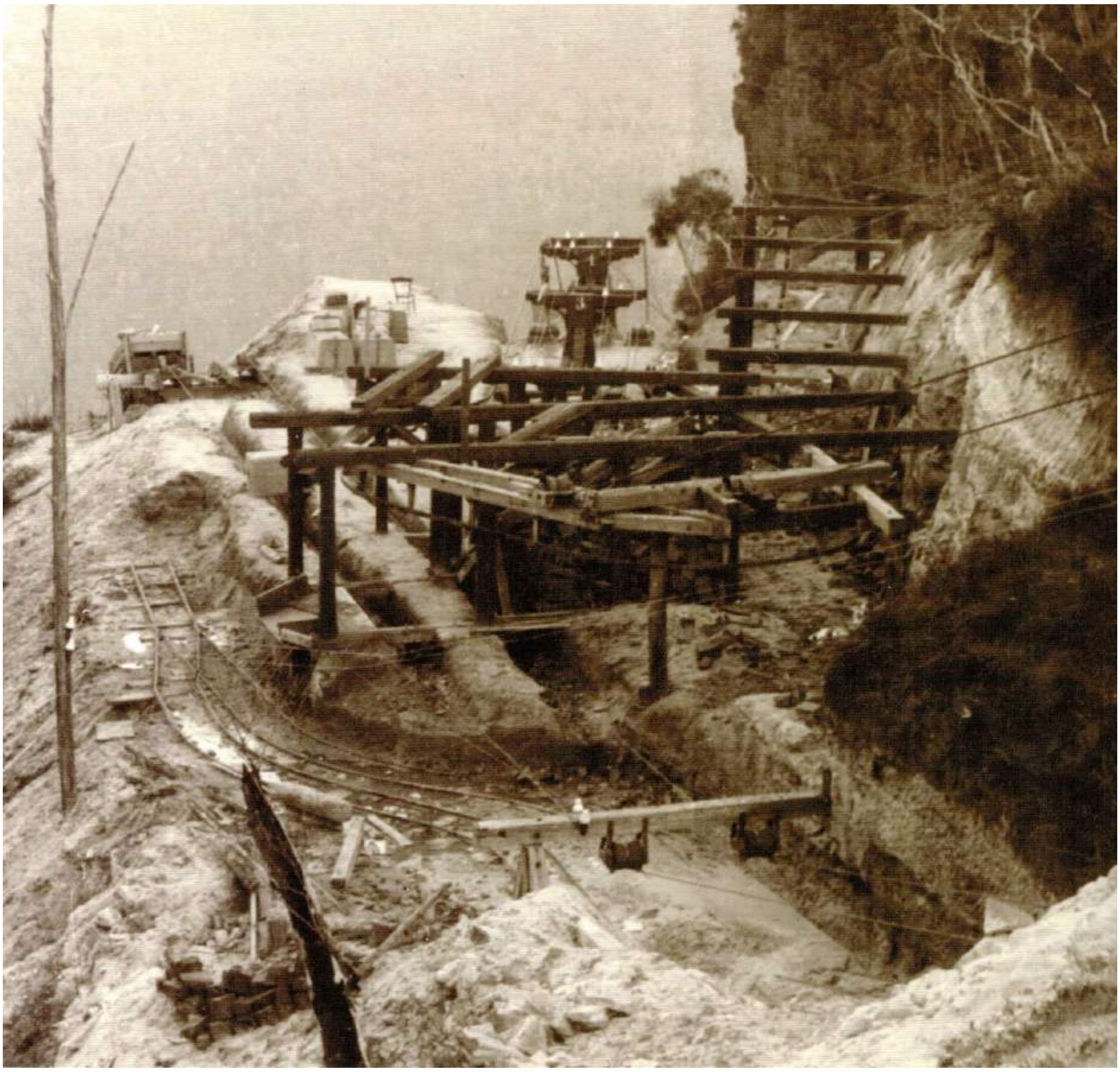

Figure 2.3 Northern unloading terminal of the ropeway. The number '3' can be clearly seen on the first tower. (Source: MacLeay Museum Sydney, original stereo photograph by Henry King, copy held by Blue Mountains Historical Society, reproduced in Pells & Hammon 2009: 86)

Figure 2.4 Tower 45, Katoomba (date unknown). (Source: Blue Mountains Historical Society, reproduced in Pells & Hammon 2009: 86 and http://fatcanyoners.org/2012/10/16/aerial-ropeway-mission/)

Figure 2.5 Comparison of the Scenic Railway in the 1880s (left) and in 2005 (right). Source: (Pells & Hammon 2009, p.190)

3 Survey Method

3.1 Aims

This survey was non-destructive in nature. Soil was not removed; at most leaf litter was carefully swept aside to facilitate measurement and photography. Some small, non-articulated artefacts (bolts, bars, wheels, etc.) were sometimes collected for group recording and photography, when it was clear that they were neither connected to other hardware nor in situ.

The primary aim of the survey was to locate, identify, and catalogue all remnants of the Bleichert Ropeway that could be found. In addition, the aim was to collect specific data for research questions concerning:

- The location of damage to buckets and carriers to provide information about impacts between Ropeway elements during its collapse.
- The thickness of timbers used in towers (based on bolt length and other aspects of hardware size).
- The construction of the track rope assemblies at towers (e.g., the use of wheels versus saddles, the number of crossbars employed, etc.).
- The construction of the Tension Pit system on the north side of Causeway Creek.
- The spacing of rope joiners on the track rope, to determine the lengths of cable imported for use and assembled on site.

These data are hoped to assist analysis of the processes of collapse of the Ropeway and potential aspects of fault in its manufacture.

In addition, it is hoped that the catalogue of Ropeway elements can serve as the basis of further research by specialists in the future.

Finally, the catalogue of Ropeway elements was intended to provide a comprehensive inventory indicating the current state of preservation of the Ropeway's remains, including the degree of souveniring, damage from corrosion and tumbling of (even quite large) artefacts down eroding slopes, and other factors contributing to the preservation or loss of Ropeway elements. This inventory may be useful for planning conservation, interpretation and cultural heritage management of the Ropeway.

3.2 FAIMS Mobile Recording System

The FAIMS Mobile Platform is a system for recording data during fieldwork. It uses Android 4.1+ devices and an independent server to enable recording, synchronisation and backup of field data. Originally designed for archaeologists, the system developed as a generalised data collecting tool also applicable to other fieldwork-based disciplines. Each recording system requires the development of a *module*, which may be built from scratch or adapted from an existing one (to learn more about the FAIMS data architecture, see FAIMS 2014).

The Bleichert Rope way module was developed in close consultation with Phil Hammon, retired Managing Director of Scenic World, who has spent decades studying the remains of the ropeway. The design was highly customised, to accommodate the specific research questions concerning the failure of the ropeway, and was based on the assumption that all the remains to be recorded were the result of a single, short-term activity: the construction, use and decay of the ropeway. That is, there was no need to date or phase the relics or sites. Furthermore, it was assumed at the time of module creation that the range of Ropeway elements, and relationships between them, were well understood, and so could be built into the system very specifically.

The data was structured in a predictive and hierarchical way. The following components of ropeway infrastructure were allocated their own Entities:

- Buckets
- Haul Rope
- Haul Rope Wheel Frame
- Rope Groove
- Rope Joiner
- Tension Station
- Tension Station Bolts
- Tower
- Tower Bolts
- Tower Pole
- Track Crossbar
- Track Rope
- Other

In each case, the type of artefact was selected, its dimensions recorded, a description or note made, its condition noted, and an image and GPS point taken. In relevant cases (e.g., bucket-carrier-carriage assemblies), damage was also recorded.

Relationships were mapped between these Entities, while images and GPS points could be linked to any individual Entity. Some Entities assumed an association between individual elements which on the ground proved to be difficult to ascertain. For example, it was not always possible to assert with certainty that, e.g., a bucket several metres from a carrier were originally attached, or that pieces of tower hardware scattered about were associated with a particular tower.

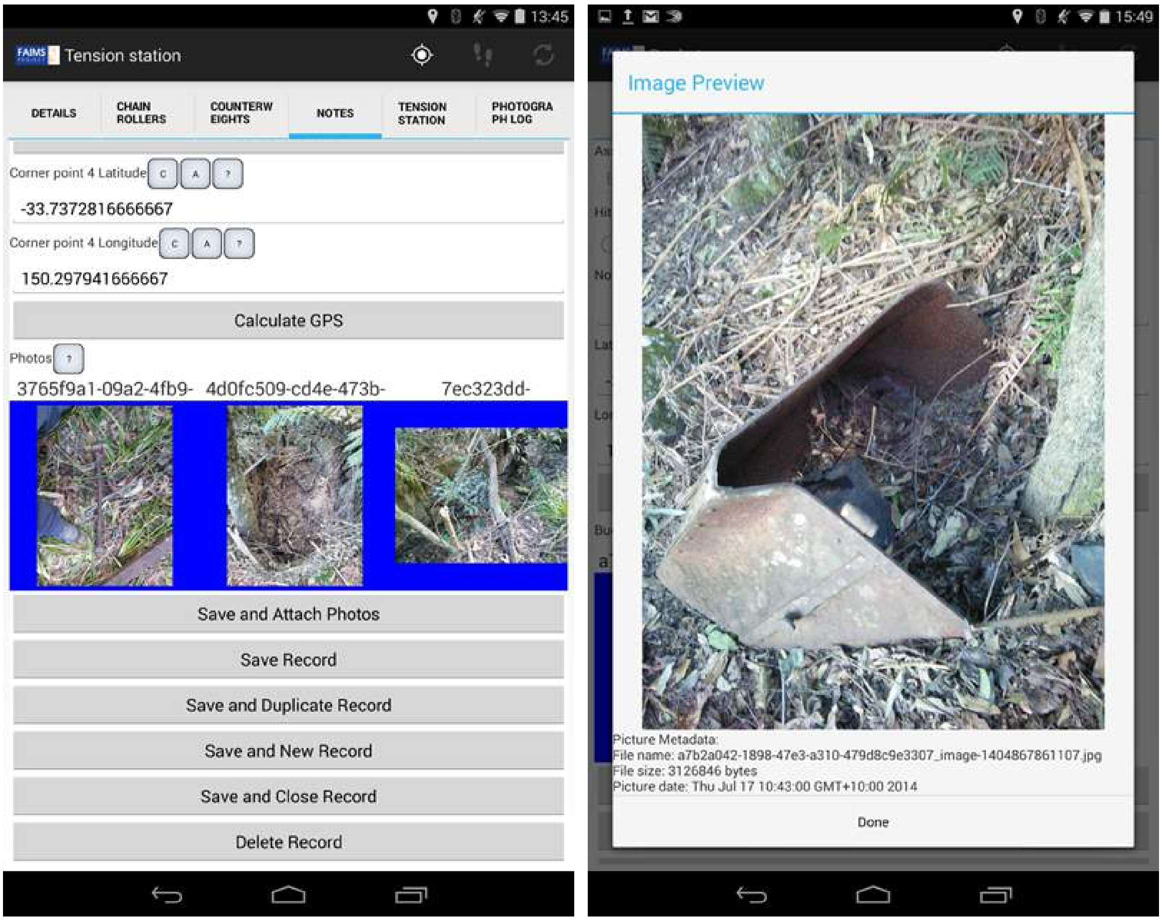

Figure 3.1 Sample screens from the Bleichert Ropeway Survey Module.

3.3 Survey Routes and Coverage

The survey began from the base of the Scenic Railway, on the north side of the Jamison Valley, where the terrain was more difficult, so progress was initially very slow. The last days of the survey, working on the south side of the Jamison Valley between Causeway Creek and Ruined Castle, were more productive since the terrain was gentler and the vegetation more open, even though there were more items to record.

The surviving track ropes provided the centreline of survey.

The approach of the survey was for bushwalking volunteers to scout ahead and fan out to either side of the track ropes, identify and flagging remains (along with tracks to them), so that the recorders could follow and capture each item in detail using the FAIMS mobile app and mirrorless camera system. As the recording and photography were time-consuming, there was much idle time for bushwalkers, most of which was spent scouting for additional Ropeway elements. Volunteers also assisted with measurements and holding scale bars, and also clearing leaf litter from objects.

A metal detector was also deployed to assist in locating leaf litter covered material.

We believe that survey coverage is comprehensive, but dense vegetation and tumbling of some artefacts (including buckets) for long distances on steep slopes may have prevented recording of some elements.

In total, we covered 2.4km of the original 3.2km ropeway. A section of the ropeway, north of the starting point, and little south of the end point were not covered owing to the difficulty of the terrain. It is hoped these will be explored in future surveys.

Figure 3.2 Measuring bolts.

Figure 3.3 Measuring bolts in situ. (Photo: P1020051)

Figure 3.4 Setting up for photographs.

3.4 Terrain

At the time of installation, the Bleichert Ropeway stretched 3.2 km across the Jamison Valley from the cliff tops of Scenic World to the landmark known as Ruined Castle (see Figure 1.1).

The survey area covered comprised 2.5 km, and crossed one waterway, Causeway Creek. The area is very steep, ranging in elevations from 800 m near the base of the Scenic Railway to 300 m near Causeway Creek on the valley floor.

From the entry point in the north to Causeway Creek, the vegetation was very dense. On the southern side, closer to Ruined Castle, the vegetation was clearer and the terrain was easier.

Lighting conditions were limited under the canopy; photography required a tripod.

Figure 3.5 Several items remain on steep inclines making recording a challenge, particularly after rain.

Figure 3.6 Low light posed a challenge for photography. (Photo P1020165)

3.5 Equipment

3.5.1 Photography

Ropeway elements were photographed with mobile device on-board cameras for quick reference, but archival and publication photography was conducted using two Panasonic Lumix micro four-thirds mirrorless system cameras: a DMC-G1 and a DMC-GF1. These cameras were fitted interchangeably with two fixed focal length lenses as required for a given feature or artefact: a Panasonic Lumix G 20 mm f/1.7 ASPH (35 mm equivalent: 40 mm) or a Panasonic Leica DG Macro-Elmarit 45mm f/2.8 ASPH (35 mm equivalent: 90 mm). All photography used available light. As such, it was necessary to use a tripod and shutter release or timer for most images owing to the dim lighting conditions under the canopy. Since a tripod was used, optical image stabilisation was disabled. Whenever possible, the camera was leveled for photographs, providing perspective on the terrain and situation of large Ropeway elements. Scales and north arrows were used in some images where appropriate, but generally omitted since the size of Ropeway elements was consistent and well known, and they remain mobile (it was clear that buckets tumbled some distance at the time of the Ropeway collapse, and continue to move with vegetation growth and erosion). Multiple images were shot of most elements; in total over 1100 mirrorless system photographs were taken. All images were shot RAW, and converted to the DNG archival format during post-processing. Image conversion and editing was done with DarkTable photography workflow and RAW developer software using non-destructive approaches. Image edits and metadata were written to XMP sidecar files accompanying the DNGs. JPEGs have also been provided.

3.5.2 GPS

The FAIMS Mobile Application switches seamlessly between internal and external GPS devices. We relied primarily on the internal GPS sensors on the tablets, supplemented by an external Garmin Glo Bluetooth GPS unit for use under heavy canopy and other difficult conditions. In the case of some items or features, multiple points were taken for individual elements. For example, GPS points were taken for each corner of the Tension Station.

3.6 Timing

The fieldwork survey for this project was carried out over 7 days of recording in June and July 2014 (12–13 June, 9–11 July, 26–28 July).

3.7 Personnel

The team of volunteer bushwalkers, in consultation with Phil Hammon, determined the entry points for the survey prior to the first day of fieldwork, and each day after that. The bushwalkers were also responsible for determining the safest route for following the surviving track rope, which was used to determine the survey route through the valley. The FAIMS team (Penny Crook, Shawn Ross and Georgia Burnett) was responsible for recording the artefacts using the mobile field recording system, with Shawn Ross serving as photographer.

Figure 3.7 Heading off on the first day of survey. From left to right: Phil Hammon, Patrick Leonard, Shawn Ross, John Merson, Georgia Burnett.

Figure 3.8 Taking a break on day 2. From left to right: Patrick Leonard, Peter Shadie and John Cooper. (P1070497)

3.8 Post-survey processing

Images were matched and the data was reorganized to create a single inventory. This allowed the removal of some Entities (such as Other). Some records were split into individual items, reflecting the uncertain associations noted above. Each individual item was given an Inventory number.

4 Survey Results

More than 362 items and features were recorded during the survey. These are grouped in 322 inventory records. A further 99 measurements were made of bolts on those items, giving a total of 466 records captured. Over 1700 photographs were taken (approximately 1100 using the mirrorless camera systems plus an additional approximately 600 using mobile device cameras).

Over one quarter of items (26.4%) were elements from bucket assemblies (carriers, carriages and the buckets themselves). Nearly one-fifth were ropes and rope joiners (19.57%). See Table 1 for a full breakdown of elements by type.

Each item type is briefly introduced below.

4.1 Distribution of Items

A small number of features such as the tension pit and tower platforms survive in situ. All other items are movable, and most have moved some distance (determined by the items' size, shape and weight, as well as by local topography and hydrology).

It is understood that the only section that collapsed in 1889–1890 was the inbound track rope from the cliff top to the tension station. Most of the objects on the ground today originated from this and other operating mishaps, but many items would also have been salvaged. After the catastrophic failure of the inbound rope, many bucket–carrier assemblies would still have been recoverable, for example, since the break effected less than one quarter of the track-rope system.

After the Ropeway was abandoned, the majority remained upright and in situ, slowly deteriorating and collapsing as bush fires, falling trees, erosion and other natural forces prevailed. Buckets and carriers probably tumbled a short distance as they fell. Some heavy items may have also moved due to erosion or vegetation growth, and lighter items have clearly been moved by walkers on the track. Others clearly have not moved for some time (see Figure 4.9).

Most remains were distributed across the survey area, although there was a concentration of tower poles south of Causeway Creek where the conditions were drier and more remnant timber survived (see Figures 4.1–4.3).

Bleichert Ropeway Summary of Items

Type	Subtype	No Records	
Bucket Assembly		85	23.5%
	Bucket	56	
	Carrier and Carriage	15	
	Carrier	10	
	Bucket, Carrier and Carriage	2	
	Carriage	2	
Haul Rope Wheel Frame		40	11.0%
	Original wheel	29	
	Replacement wheel	5	
	No wheel	3	
	Wheel Frame	2	
	Replacement wheel?	1	
Other		52	14.4%
	Miscellaneous Artefact	30	
	Miscellaneous feature	13	
	Shale deposit	9	
Rope		63	17.4%
	Track Rope	43	
	Track rope Joiner	12	
	Haul Rope	5	
	Rope Joiner	2	
	Haul Rope Joiner	1	
Rope Groove		7	1.9%
		7	
Tension Station		11	3.0%
	Rail	4	
	Counterweight Cradle	3	
	Bolt	1	
	Chain Roller	1	
	Miscellaneous feature (Remnant timber)	1	
	Pit	1	
Tower Pole		11	3.0%
		11	
Track Crossbar		93	25.7%
	Rope Saddle	12	
	Rope Saddle, Head Plate and Angle Brackets	24	
	Head Plate and Angle Brackets	23	
	Angle bracket	7	
	Head Plate	5	
		4	
	Crossbar Wheel	2	
	Crossbar, Head Plate and Angle Brackets	8	
	Rope Saddle and Angle Bracket	6	
	Rope Saddle Plate	1	
	Rope Saddle?	1	
Grand Total		362	

Table 1 Summary of the number items identified during the 2014 survey, by Type.

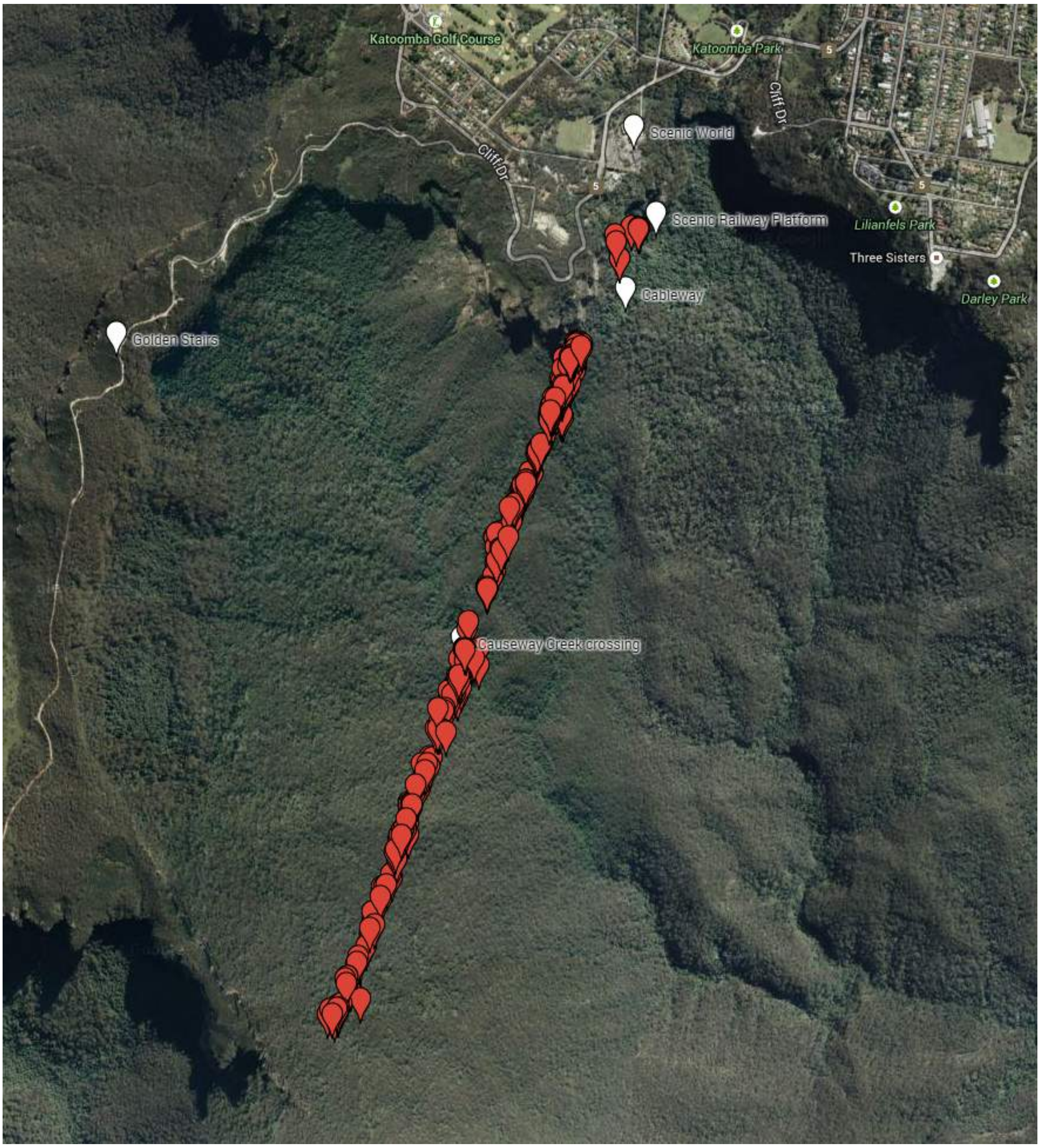

Figure 4.1 Distribution of items identified in the 2014 survey. Each point represents an inventory record, which may comprise more than one individual item.

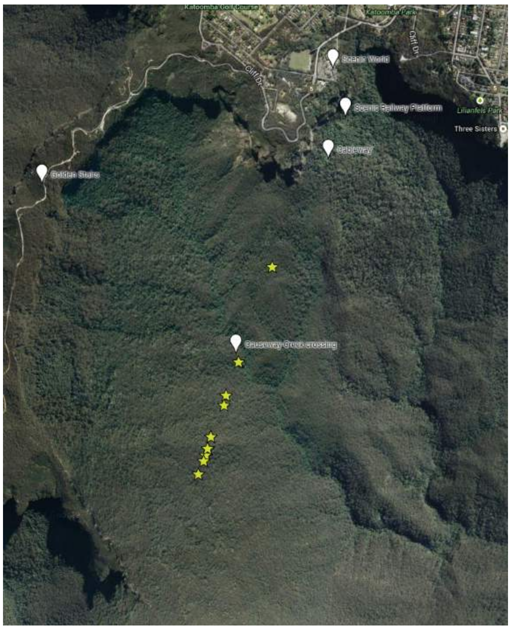

Figure 4.2 Distribution of Tower Poles, as surveyed.

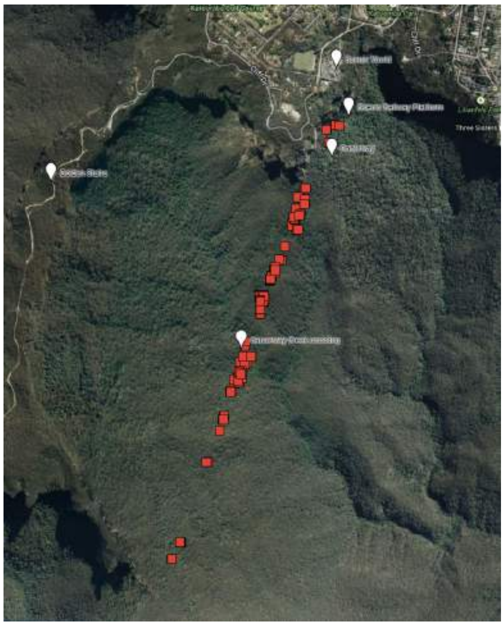

Figure 4.3 Distribution of buckets.

4.2 Buckets and Carriers

Components of the bucket assembly were the most numerous, and often most visible, remnants of the Ropeway infrastructure. Being one of the key areas of innovation, they also bear many of the patent plates and inscriptions of Bleichert's manufacture. They survive in range of conditions (see Figures 4.4–4.6). The frames of many buckets are sound but the sheet metal lining has corroded in parts and many of the Patent plaques have been 'souvenired' over the years. Others are filled with leaf litter or entirely buried. Many carriers also are partially or wholly buried. Others have trees growing through them (see Figures 4.9).

A preliminary analysis of damage to bucket assemblies showed no noticeable pattern. Further studies may require more detailed recording of the damage. Our system allowed for 'Left', 'Right' or 'Both' and while some buckets and carriers were damaged on both sides, most clearly have more damage on one side and were likely struck there first, or with the greatest force. Photographs generally reveal the relative damage.

Subtype	Left	Right	Both	No damage	Unknown
Bucket, Carrier and Carriage	1		1		
Bucket only	9	8	9	25	4
Carriage only					2
Carrier only	3	1	4		2
Carrier and Carriage	4	5	4	1	1
Total	17	14	18	26	9

Table 2 Damage to bucket-carrier-carriage assemblies.

Figure 4.4 Bucket in good condition. (Photo: P1070099)

Figure 4.5 Bucket in poor condition. (Photo: P1070092)

Figure 4.6 Bucket which has been completely crushed. (Photo: P1020148)

Figure 4.7 Detail of Patent Plate on a bucket. Most such plates had been 'souvenired' and were missing. (Photo: P1020019)

Figure 4.8 Bucket Carrier with bucket behind. (Photo: P1070286)

Figure 4.9 Carrier fixed in place by a tree trunk. (Photo P1070683)

Figure 4.10 Carriage on bucket carrier. (Photo: P1070304)

Figure 4.11 Detail of rope grip slide. (Photo: P1010997)

4.3 Towers and Tower Hardware

Several dozen towers were spaced across the length of the ropeway and elevated the wire rope. Only eleven tower poles were identified but 93 elements of tower hardware were recorded in association with 37 additional tower 'sites'.

Figure 4.12 Fallen tower pole with headplate and bracket nearby. (Photo: P1020500)

Figure 4.13 Rock platform for tower. (Photo: P1020116)

Figure 4.14 Head plate with dislodged angle brackets. (Photo: P1070066)

Figure 4.15 Detail of angle brackets. (Photo: P1070245)

Figure 4.16 Remnants of track crossbar. (Photo: P1070525)

Figure 4.17 Wheel of track crossbar. (Photo: P1070508)

4.4 Haul Rope Wheel Frames

Forty haul rope wheel frames or components were identified, including examples of the original design (Figure 4.18) and a cruder 'replacement' wheel (Figure 4.19).

Figure 4.18 Original haul rope wheel and frame. (Photo: P1070244)

Figure 4.19 Replacement haul rope wheel in frame. (Photo: P1070691)

4.5 Ropes, Rope Joiners and Rope Grooves

Tracing the remnant wire rope formed the primary method of establishing the survey area, and records of visible rope were made at intervals throughout the survey. Otherwise, rope was only recorded if there was clear evidence of wear. Rope joiners were frequent and 7 sites were recorded where grooves were worn into rock by steel cables moving across (see Figure 4.23).

Figure 4.20 Detail of rope. (Photo: P1020066)

Figure 4.21 Rope joiner. (Photo: P1070690)

Figure 4.22 Some ropes remain suspended, having been caught on trees as they fell. This one has a saddle still in place. (Photo: P1020609)

Figure 4.23 Rope grooves. (Photo: P1020142)

4.6 Tension Station

The tension station was the largest and most complex feature recorded. It comprised a pit approximately 9.5 m long, 1.9 m wide and up to 2.3 m deep (Figure 4.24). in addition to the remains of a chain roller and 3 cradles for counterweights, a number of other artefacts were found in close proximity to the pit. These included rails, and a coil or rope.

Figure 4.24 View down into the tension pit, showing three surviving counterweight cradles and remains of a chain roller in the foreground (looking south). (Photo: P1070495)

Figure 4.25 Detail of counterweight cradle in the base of the tension pit. (Photo: P1070471)

4.7 Other

Over 50 other artefacts and small features were recorded. These included concentrations of shale that may be evidence of fallen bucket loads and miscellaneous artefacts such as bolts, porcelain insulators and billy cans.

Figure 4.26 Billy can. (Photo: P1020399)

Figure 4.27 Fragments from a porcelain insulator used on telegraph tower. (Photo: P1020083)

5 Significance of the Bleichert Ropeway Relics

The following preliminary statement of significance has been written in accordance with the criteria used by the Heritage Division of the NSW Office of Environment and Heritage:

Criterion (a) *An item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area);*

Criterion (b) *An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area);*

Criterion (c) *An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area);*

Criterion (d) *An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons;*

Criterion (e) *An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area);*

Criterion (f) *An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area);*

Criterion (g) *An item is important in demonstrating the principal characteristics of a class of NSW's • cultural or natural places; or • cultural or natural environments. (or a class of the local area's • cultural or natural places; or • cultural or natural environments.)*

(Source: NSW Heritage Office 2001)

5.1 Preliminary Statement of Significance

The relics of Bleichert Ropeway comprise a collection of more than 360 components of mine-haulage infrastructure that carried shale 3.2km across the Jamison Valley in the Blue Mountains in the late 1880s. The Ropeway was designed and manufactured in Leipzig, Germany, by Adolf Bleichert & Co., world leaders in the design and manufacture of cable cars and ropeways. It was first installed in the Gladstone area of the Jamison Valley for the Gladstone Coal Company Ltd in 1884 under the supervision of Sydney-based civil engineer, Oscar Schulze, who migrated to Sydney in 1879. It was abandoned in 1885 after extracting only 1,200 tons of low grade coal. It was acquired and reinstalled by the Katoomba Coal and Shale Co., under the ongoing supervision of Schulze, to move shale from a new mine at Ruined Castle to the cliff tops at Katoomba. After initial success, the Ropeway succumbed to technical difficulty and between April and September 1889 was abandoned leaving local miners out of work and the company in liquidation. Owing to the difficult of the terrain, it appears very little was salvaged, and 125 years later many towers, buckets and ropes of Bleichert's patented Ropeway remain on the floor of Jamison Valley and in some cases still hanging from treetops, likely close to where they fell in the final collapse.

Over 360 individual items and features, mostly metal but with some timber, have been identified to date. These provide tangible evidence of a unique part of the Oil Shale Industry in the Blue Mountains Area, and played a significant role in shaping the early European settlement of the Blue Mountains area as a means of industry (Criteria a, f). As the first aerial cableway used in mining in NSW, and probably Australia, they exemplify the enthusiasm for overseas technological innovations and mark the beginning of the end of the dependence on pack animals and bullock carts (Criteria a, f). They are representative of the many ambitious and frequently short-term mining endeavours in the Blue Mountains area, and across New South Wales, which formed a significant part of the colonial economy in the late 19th century (Criteria a, g).

The relics have a special association with their maker, Adolf Bleichert, who pioneered technical advances in the construction of aerial ropeways in the late 19th century and supplied his patented ropeways to mining operations throughout the old and new world (Criterion b). They also provide tangible evidence of the works of the lesser known migrant engineer Oscar Schulze who was responsible for both importing the ropeway and installing them, not once, but twice (Criterion b).

The Ropeway was a major engineering feat, spanning 3.2 km over impassable inclines and ravines (Criterion c). The surviving relics have the potential to yield information about local adaption of world-class engineering infrastructure, and the causes of the catastrophic failure of the ropeway (Criterion e). The challenging conditions of its installation and subsequent abandonment have served to protect the surviving relics from widespread salvage or destruction. As a consequence many elements of the ropeway are intact and survive in situ—a rarity for 19th-century industrial heritage (Criterion f).

The Ropeway has a strong association with a group local bushwalkers who have been discovering, researching and recording the relics for several decades (Criterion d). Descendants of Bleichert hold the site in high esteem and visited the site. The Ropeway has the potential to be of significance to descendants of mine workers or operators.

6 RECOMMENDATIONS

1. Nominate the Bleichert Ropeway for the State Heritage Register.
2. Develop an Interpretation strategy for the Bleichert Ropeway that will enable community engagement without undue risk to the surviving Ropeway elements.
3. Consider the development of a broader cultural heritage management plan for the surviving Ropeway elements.
4. Consider the development of a mobile application to enable to local community to record new items, or maintain information about the condition of known items.
5. Publish an article in a peer-reviewed academic outlet, and make the survey data available on the FAIMS Repository, in consultation with National Parks, ensuring that sensitive data (such as the location of individual items) is protected.
6. Consider excavation of the Tension Station north of Causeway Creek to investigate in situ weight systems and other surviving artefacts.
7. Continue survey of the sites of Towers 8, 9, 10, 11 and 12 on the northern side of the walking track, to complete the path of the ropeway.

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