Drakensberg Busingatha Cableway

UPDATED TECHNICAL DESCRIPTION AND PREFEASIBILITY STUDY

Prepared by

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1. *INTRODUCTION*

KUKA Ropeways ("KUKA") is a South African company that has focused on developing affordable and sustainable rope based transport infrastructure and systems in Africa for the transport of ore from mines in remote and mountainous areas and the transport of people in similar terrain since 2003.

KUKA has entered into a cooperation agreement with Leitner *registered company name* ("Leitner") and by extension their subsidiary company Agudio registered name ("Agudio"), whereby Leitner and KUKA have combined their efforts in developing aerial ropeways in the Southern African region. The technical partnership with Leitner provides KUKA's clients with access to over 150 years of ropeway system development expertise and experience, combined with KUKA's experience in adapting system configurations to uniquely African conditions and requirements.

Leitner is arguably the world's leading manufacturers of ropeway systems. As per the company's traditions, they bring skiers and snowboarders to the peaks comfortably, safely and quickly. LEITNER ropeways products are also increasingly being used for alternative purposes. They carry people to tourist sights and help to solve traffic problems in urban areas. In doing so the ropeways offer increasing amounts of comfort and thrilling experiences.

To this end, with the support of Leitner, KUKA recently completed a system design for a cableway up the Sentinel for PKX Mountain Cableway / National Empowerment Fund and has over the past few years provided detail system designs for material transporting ropeways for Xstrata (2 ropeways in the Steelpoort area), for Namdeb (at Oranjemund in Namibia), and for BHP Billiton (in Gabon) amongst others. A number of additional projects across the African continent are currently at various stages of development. KUKA has also been contracted to construct and operate a 16km long aerial ropeway transporting chrome ore for GlencoreXstrata from their Thorncliffe Mine to the Lion Ferrochrome Smelter near Steelpoort, Limpopo Province. Construction is scheduled to start within the next three months.

The technology used in material transporting aerial ropeways is similar and actually derived from the latest technology used in people transporting cableways.

Aerial ropeway based transporting of people up the Drakensberg can either be done by a cable car system, consisting of two large cable cars per drive system (similar to the installation at Table Mountain, Cape Town), or a gondola system consisting of a series of small gondolas.

The last cable car installations made by Agudio/Leitner are:

- "Marmolada" (Italy) – Three installations with 70pax cabins
- "Pattemouche – Anfiteratro" (Italy) – 60+1 cabins
- "Corvatsch" (Switzerland) – 100+1 cabins

The last gondola installation made by Leitner is:

- "Kronplatz" (Italy) – GD10 cabins (series of cabins with capacity of 10 persons per cabin)

A brochure regarding the latest Leitner gondola technology is attached as Annexure 1.

Based on the updated information received from Graham Muller Associates we were able to update the prefeasibility study in a very short time and intend with this document to present a cost estimate based on scenarios whereby all equipment and structures will be manufactured in Europe. It is anticipated that up to a 10% saving could be realised by manufacturing most of the steel structures for the stations and towers and some of the equipment in South Africa, which will be investigated during a baseline system design phase.

This study was based on a peak demand capacity of between 400 and 500 persons per hour in each direction for the main cableway from Busingatha to Mount Amery. For the three different drive section system, two 60+1 person cable cars are necessary to have a peak demand capacity of 500 persons per hour in each direction for the main cableway from Busingatha to Mount Amery (Scenario 1).

The single drive section option will result in a 6.8km single span system, which will be the longest single span aerial tramway in the world. Although costs are provided for such a system in this report, the technical feasibility of such a system will only be determined during a technical evaluation study, which will cost R200 000. This amount excludes an Aerial LiDAR Survey, necessary to compile the ground profile in DWG format, if not already available with contour lines at least every 2m, which should cost in the region of R200 000 as well. The single drive system will have a peak demand capacity of around 400 persons per hour in each direction, based on 2 x 100 person cabins (Scenario 2).

A third option is an 8 person gondola cableway system running on three different drive sections (Scenario 3).

The estimated capital costs to 60% accuracy are:

- Scenario 1 with two cabins per section (60 persons / 4800kg) is **R574 million**;
- Scenario 2 with two cabins on one section (100 persons / 8000kg) is **R492 million**;
- Scenario 3 (8 person gondolas) is **R375 million**.
- The cost to execute a Preliminary Project, which will verify the costs of scenario 2 to an accuracy of at least 85% if the technical evaluation study found scenario 2 viable, is R850 000. If Scenario 2 is not found viable the preliminary project will be done on either scenario 1 or 3, depending on the preference of the client.

To extend the ropeway from the top of Mount Amery to the top of Mont Aux Sources utilising 8 person gondolas is **R222.5 million**.

All costs in this document exclude any value added tax.

2. *GENERAL DESCRIPTION OF THE COMPONENTS*

2.1. DRIVE STATION

The drive station consists mainly of a concrete made building, including the track ropes anchoring drums, the track ropes saddles supports, the embarkation quays, the machinery room, the control room and in general the access.

The station electromechanical equipment consists of:

- Main winch (see the next paragraph)
- Deflecting sheaves complete with fixed shaft, bearings and supporting frames deflecting sheaves for haul rope (one of these mounted on a counterweights sliding on vertical guides).
- 1 set of safety and control devices as per relevant norms and codes

- 2 steel carrying rope shoes with support structure;
- 4 set of clamps for truck ropes fixation on the drums;
- 4 automatic gates complete with all around hand rails;
- 4 cabin guides;
- 2 buffers;

2.1.1 Main Winch

For a cable car system the two groups (motor + gear speed reducer) together are able to operate the installation at maximum speed (12 m/s).

For a gondola system the maximum speed is around 6 m/s.

The main winch: pre-assembling in Agudio factory.

2.2. RETURN STATION

The return station consists mainly of a concrete made building, including the truck ropes anchoring drums, the truck ropes saddles supports, the embarkation quays and in general the access.

The station electromechanical equipment consists of:

- 2 steel carrying rope shoes
- 4 set of clamps for track ropes fixation on the drums.
- 4 automatic gates complete with all around hand rails.
- 4 cabin guides.
- 1 hand operated winch for rescue cabin handling.
- 2 buffers

Bolzano Soprabolzano Cable Car Bottom Station

Murtel Corvatsch Cable Car Bottom Station

Kronplats Gondola System Top Station

Intermediate Gondola System Station

2.3. **LINE**

The truck line is equipped with:

- 2 + 2 carrying steel ropes closed
- 1 haul rope (or 2 half haul ropes)
- Suspended haul rope supports
- Steel structure lattice type towers complete with carrying rope shoes, haul rope rollers, ladders and maintenance walkways.

2.4. MAIN VEHICLES

For a normal cableway system, one or two main vehicles are foreseen for each drive section, each one consisting of:

- 1 sixteen wheels carriage complete with safety truck rope brake, hanger articulation shaft, one haul rope anchoring unit (drum or/and electronically controlled safety shoes).
- 1 steel hanger
- 1 100+1 (or 50+1) passengers cabin aluminium alloy made, complete with two automatic doors.

Corvatch (Switzerland) – The main vehicle 100+1 people

Marmolada (Italy) – The main vehicle 70+1 people

Pragelato (Italy) – The main vehicle 60+1 people

The pictures above show the cabins of some of the Leitner installations, the final design of the cabin, however, can be studied according to Client requirements (the picture shows an example).

For a gondola system, a series of vehicles are foreseen for each drive section, each one consisting of:

- One or two wheel carriage complete with safety truck rope brake, hanger articulation shaft, one haul rope anchoring unit (drum or/and electronically controlled safety shoes).
- 1 steel hanger
- 4 to 10 passenger cabins, aluminium alloy made, complete with one or two automatic doors.

2.5. **ELECTRICAL EQUIPMENT**

The electrical equipment consists of:

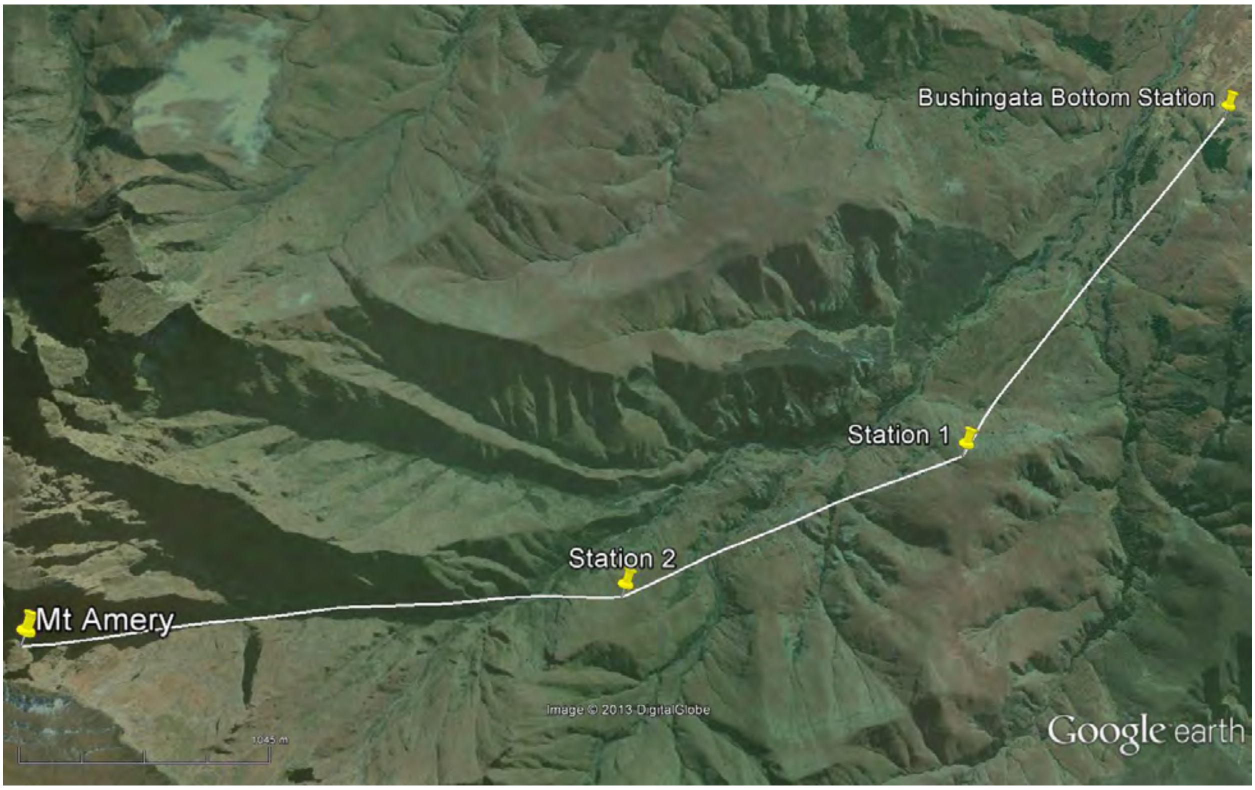
- Main a.c. converters.
- PLC controls.
- Electric motors.
- Safety intercommunication system.
- Main control desk
- Two control desks, one per vehicle
- Wiring.

3. *GENERAL DESIGN ASSUMPTIONS*

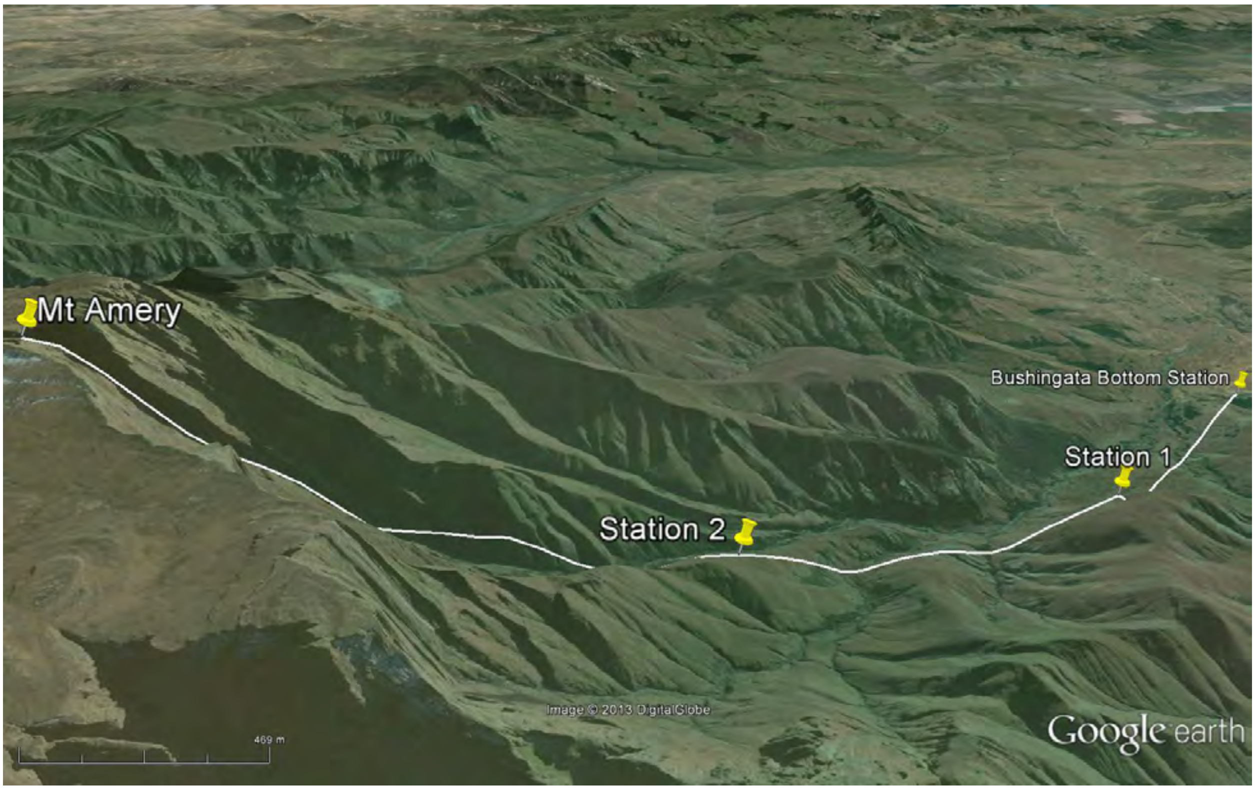
3.1. **ROUTE**

3.1.1. Three Section Route

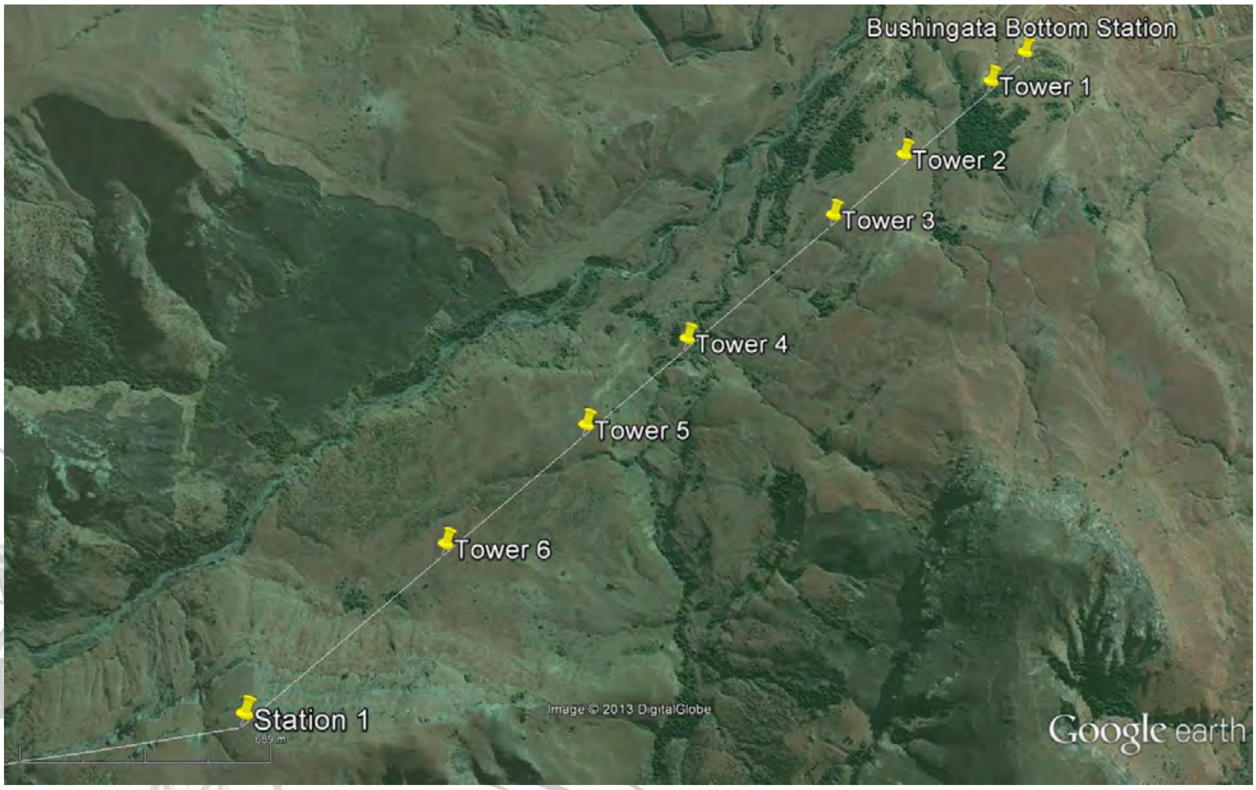
The proposed route provided to KUKA consists of three sections of distances of 2580m, 2030m and 2675m, with two intermediate stations where people get off and on the vehicles – indicated by white lines on the next Google map:

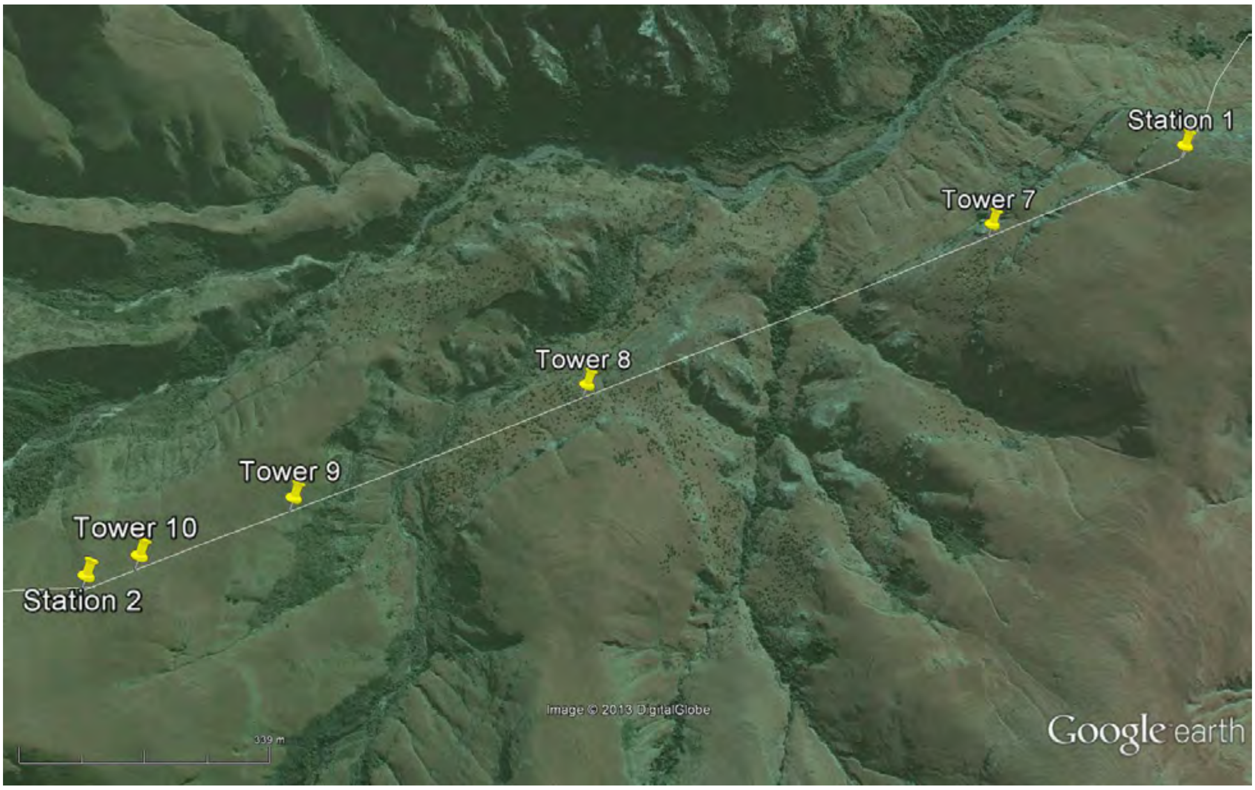


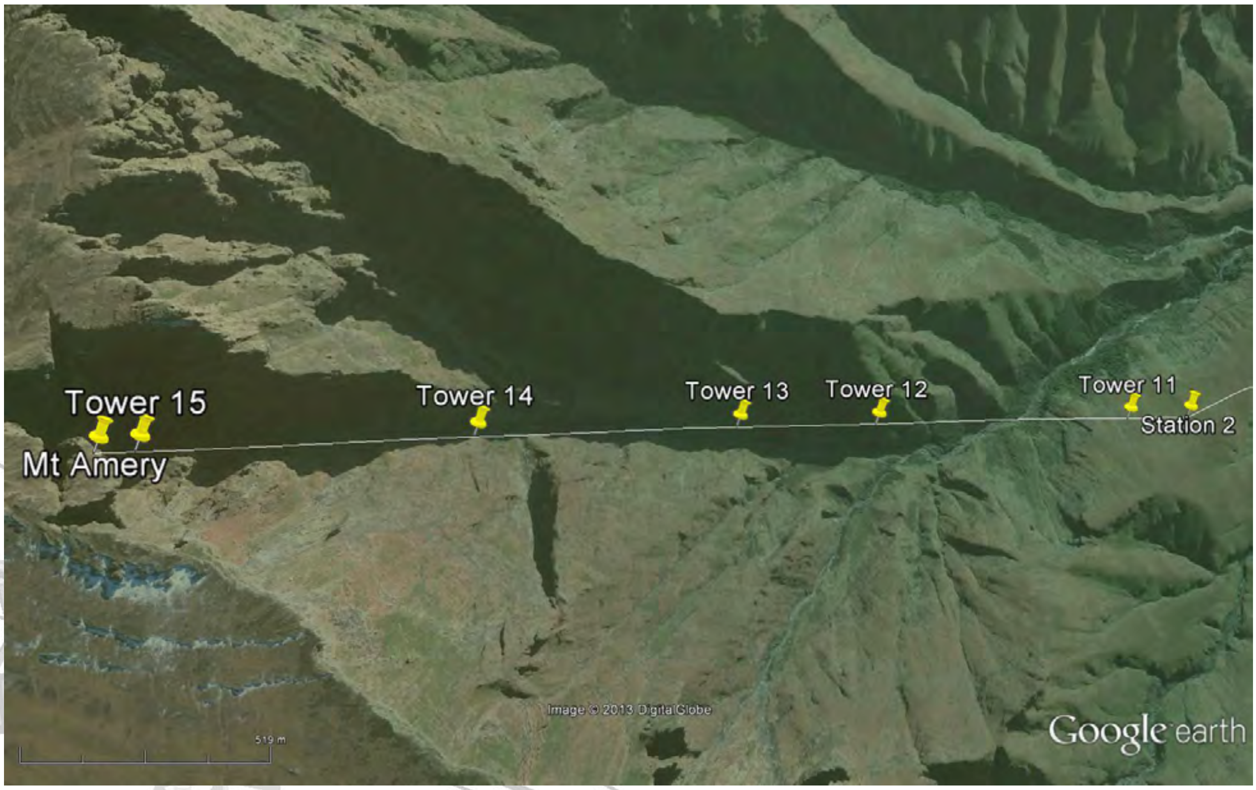
The following Google map shows the profile of the route.



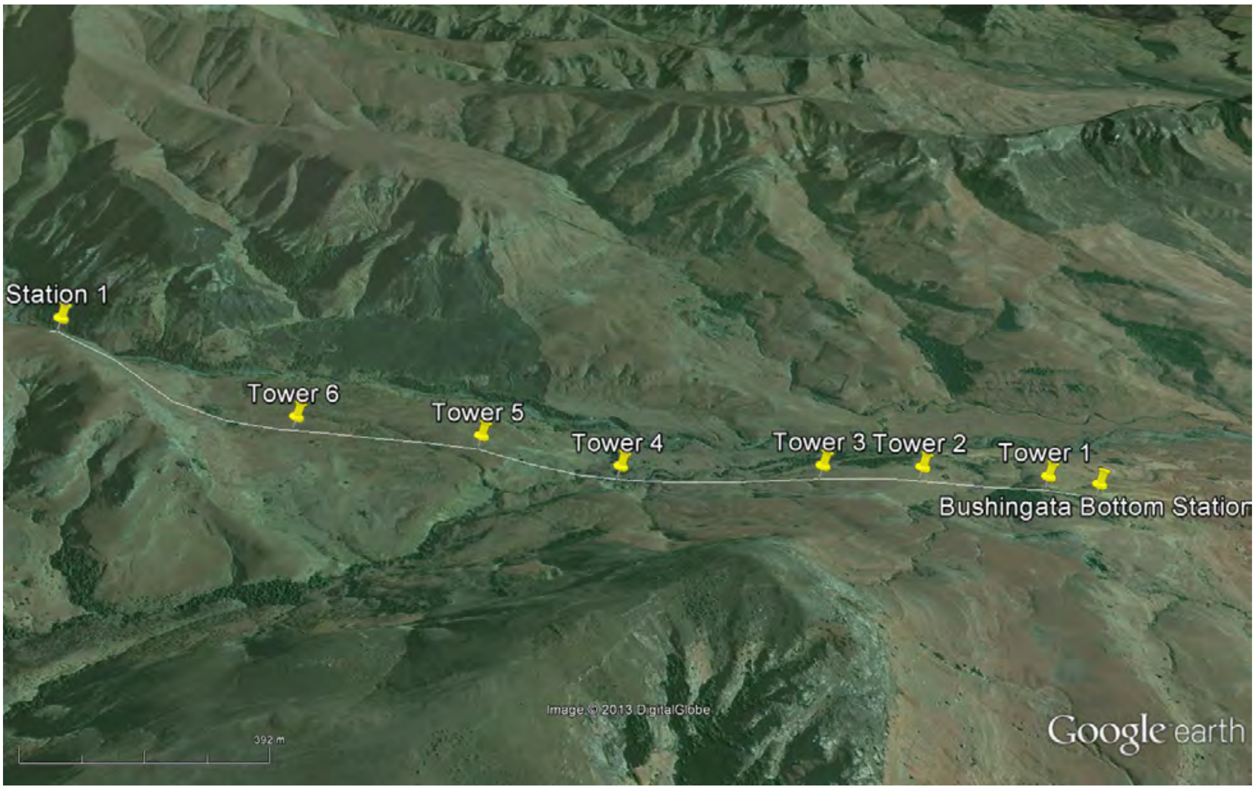
The following three maps show the routes of the three different sections and tower placements.

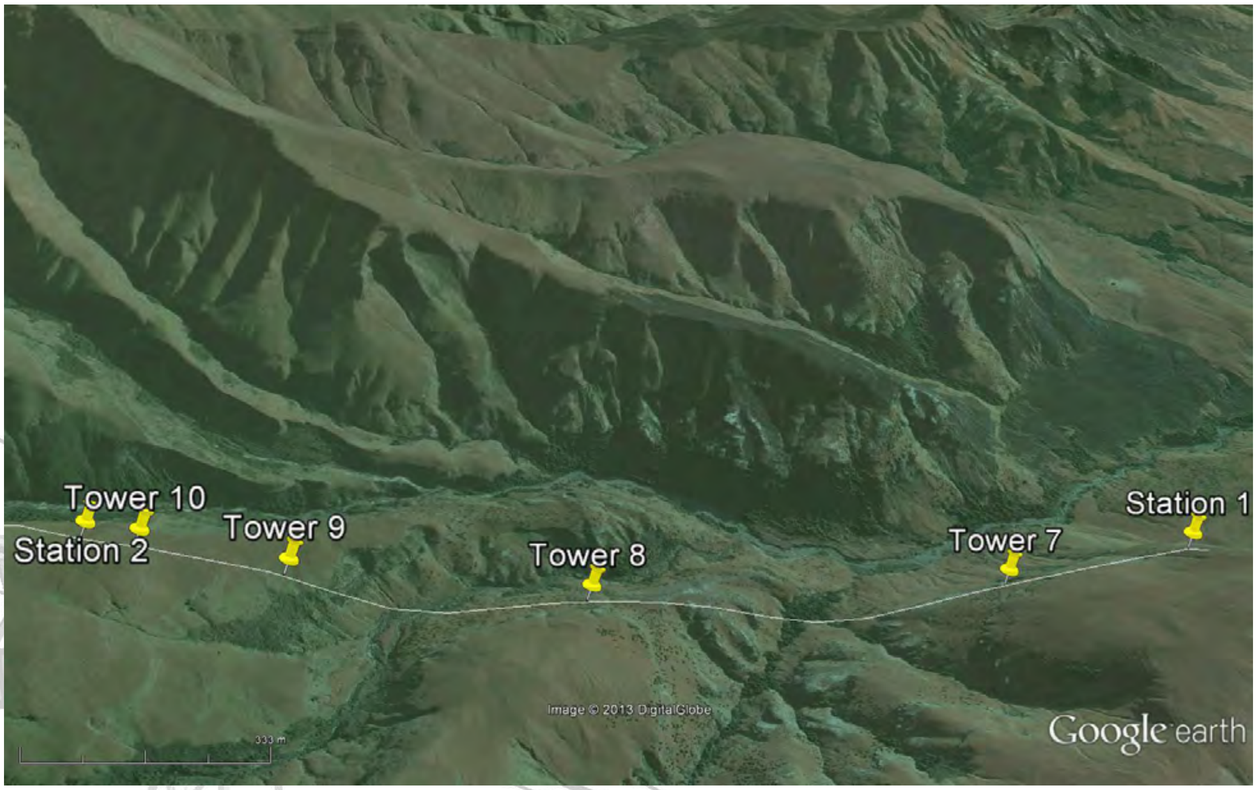


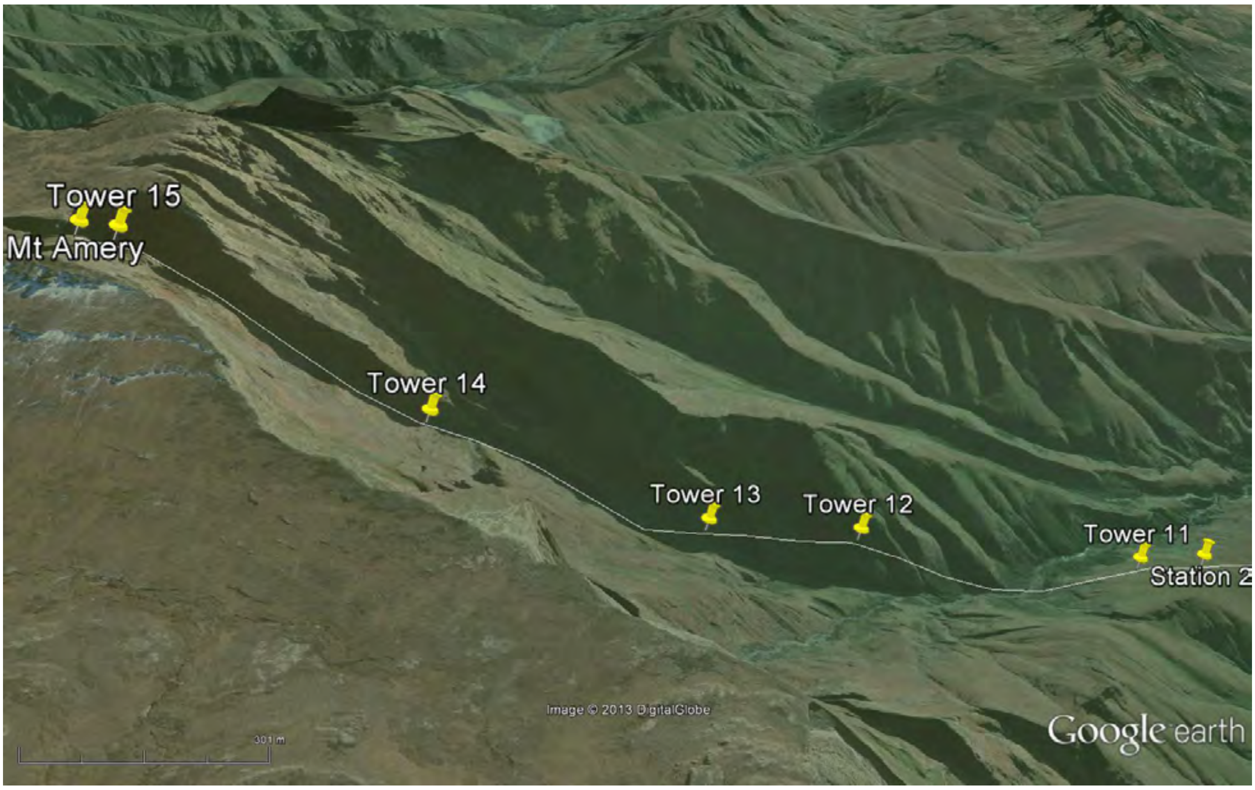

Station 1
Tower 7
Tower 8
Tower 9
Tower 10
Station 2
Image © 2013 DigitalGlobe
Google earth


Tower 15
Mt Amery
Tower 14
Tower 13
Tower 12
Tower 11
Station 2
Image © 2013 DigitalGlobe
Google earth

The following three maps indicate the profile and possible tower positions for the three sections:





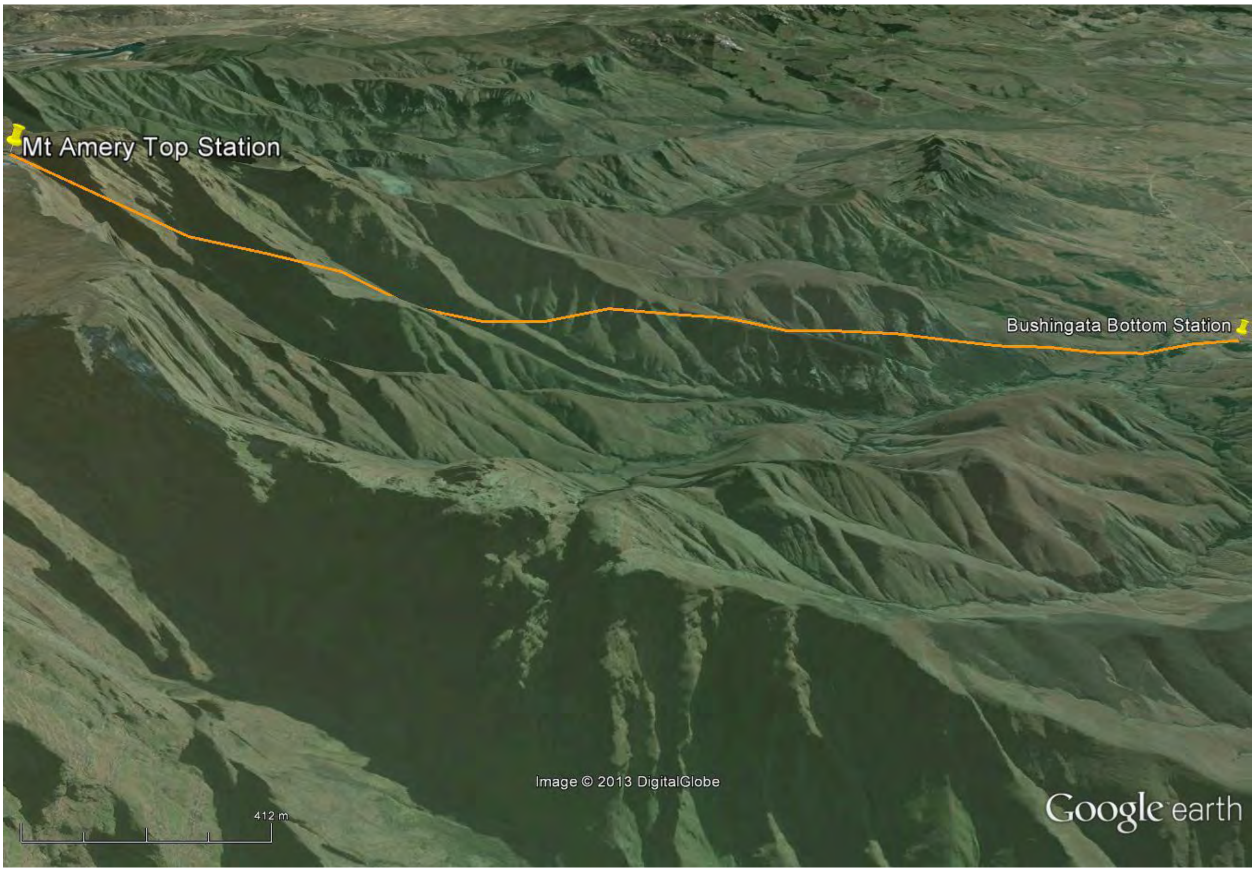


The probable positions and indicative heights of the towers are given in the following table:

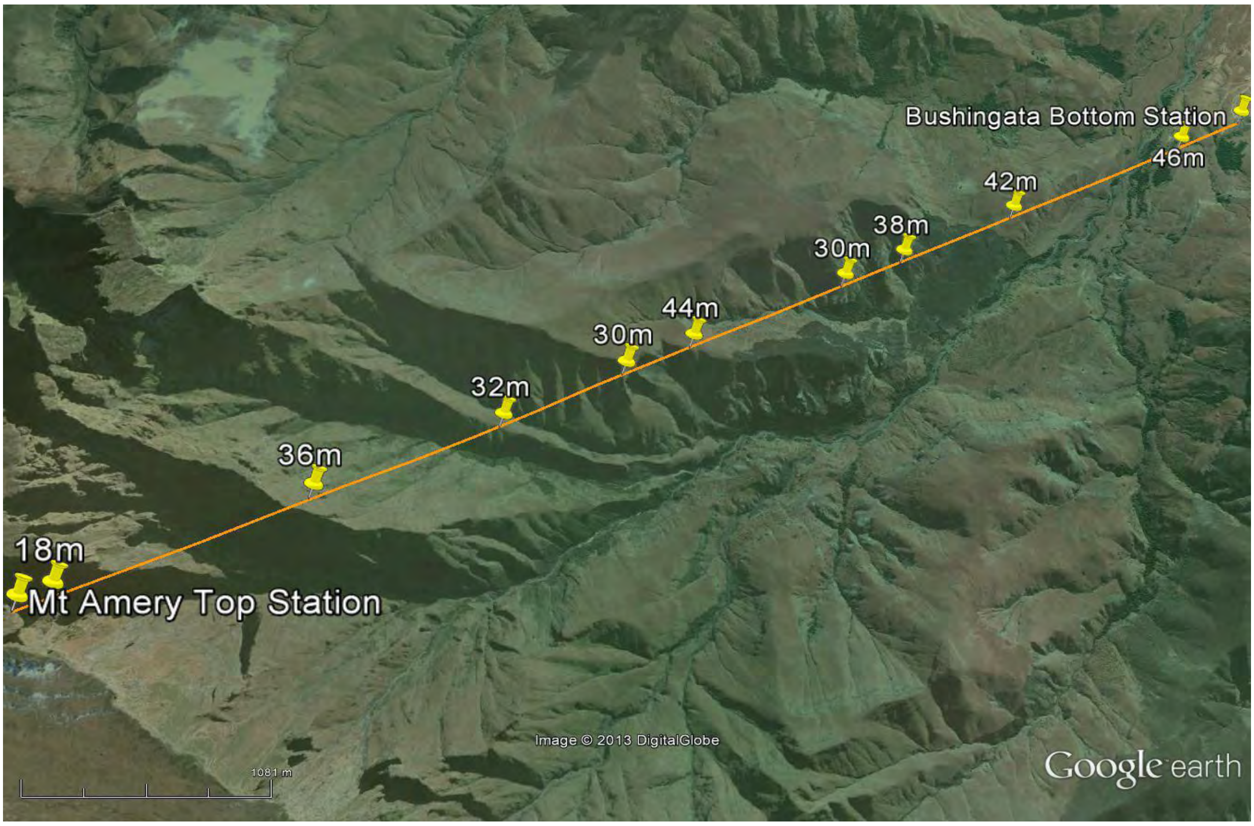
Structure	**Latitude Coordinates**	**Longitude Coordinates**	**Height (m)**
Bottom Station	28°44'52.22"S	28°59'38.31"E	6
Tower 1	28°44'55.39"S	28°59'35.28"E	10
Tower 2	28°45'3.09"S	28°59'27.87"E	18
Tower 3	28°45'9.24"S	28°59'22.01"E	14
Tower 4	28°45'21.86"S	28°59'9.85"E	24
Tower 5	28°45'30.66"S	28°59'1.46"E	22
Tower 6	28°45'42.39"S	28°58'50.19"E	26
Station 1	28°45'56.29"S	28°58'36.83"E	6
Tower 7	28°46'0.41"S	28°58'24.93"E	22
Tower 8	28°46'10.10"S	28°57'57.12"E	18
Tower 9	28°46'16.61"S	28°57'38.45"E	18
Tower 10	28°46'19.48"S	28°57'30.21"E	10
Station 2	28°46'20.48"S	28°57'27.26"E	6
Tower 11	28°46'20.64"S	28°57'21.08"E	12
Tower 12	28°46'21.09"S	28°56'53.38"E	14
Tower 13	28°46'21.25"S	28°56'38.85"E	30
Tower 14	28°46'21.68"S	28°56'13.92"E	30
Tower 15	28°46'22.07"S	28°55'51.62"E	10
Top Station	28°46'22.18"S	28°55'48.76"E	6
Mont-Aux Sources	28°46'24.35"S	28°52'25.93"E	

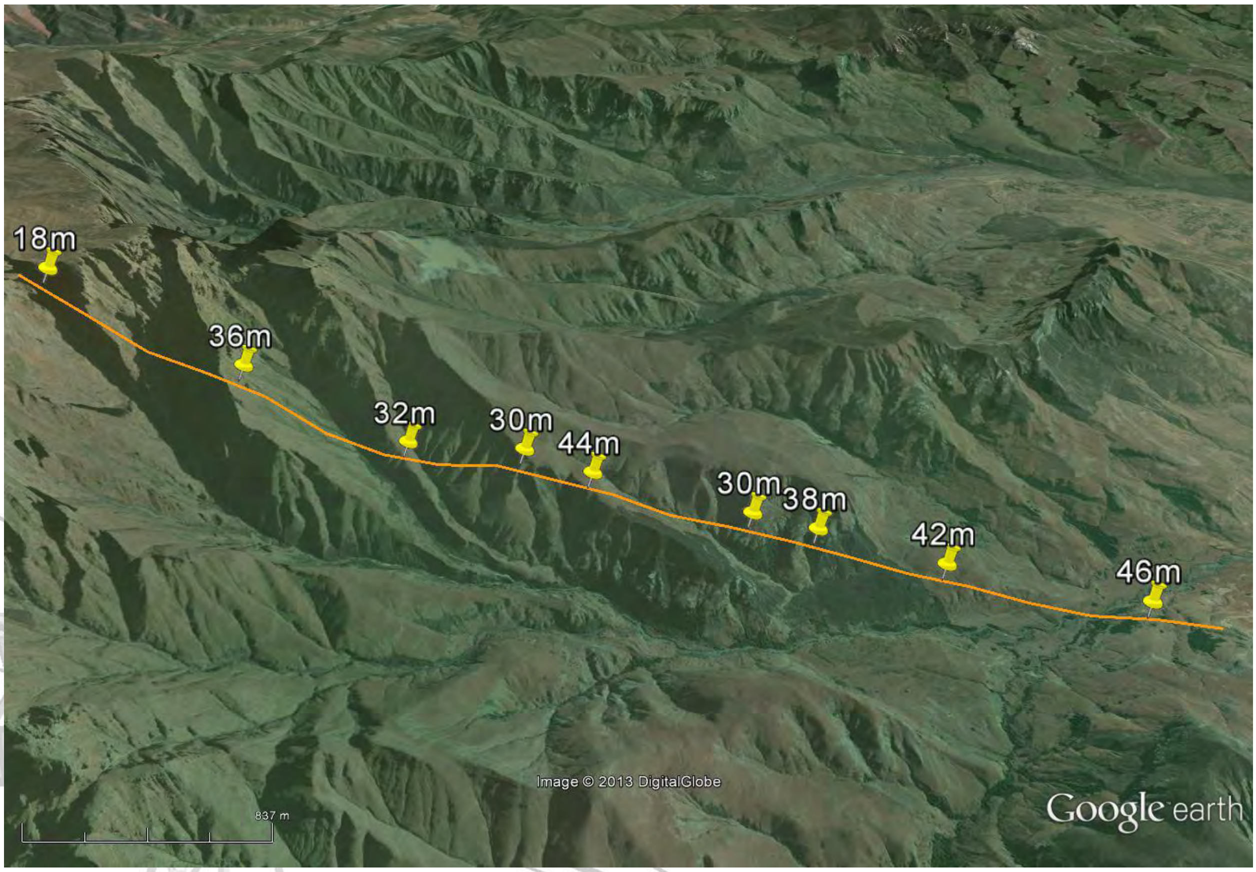
3.1.2. Straight Line Single Section Route

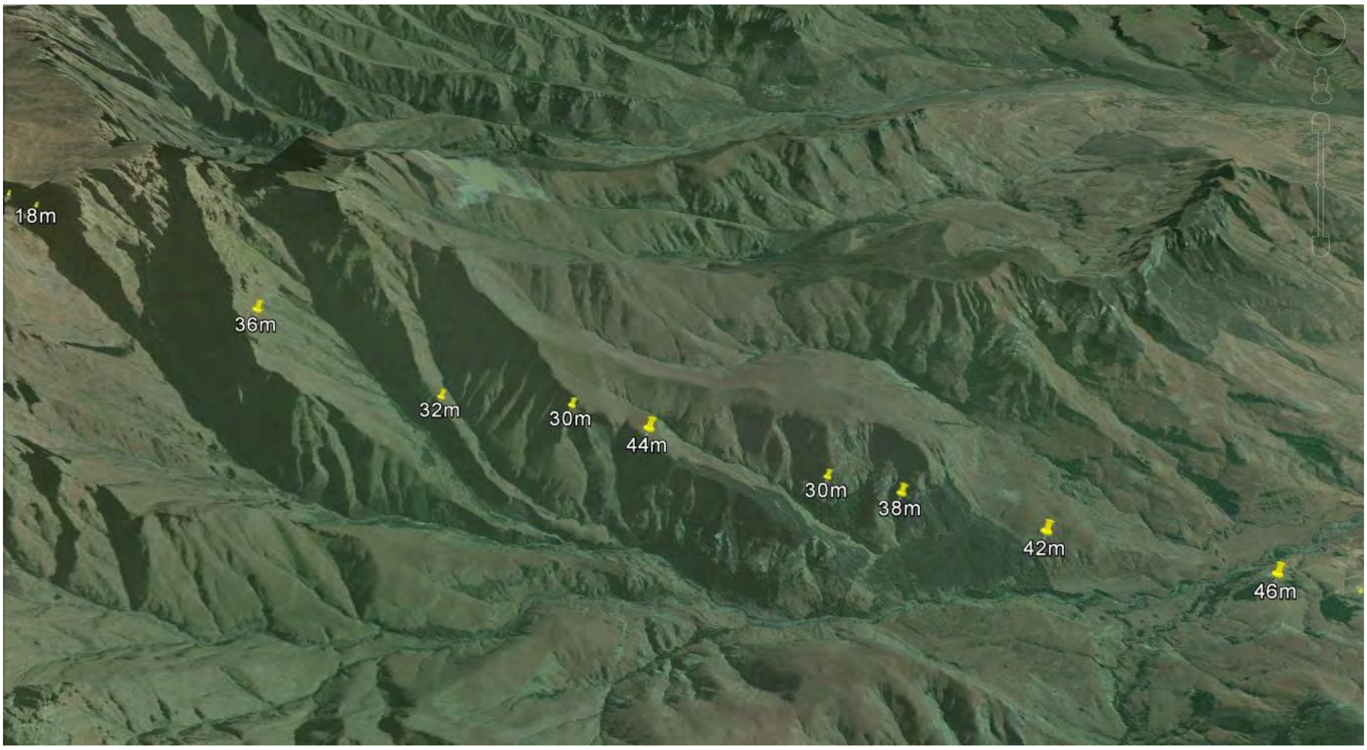
The straight line route has a distance of 6815m. The technical feasibility of this option needs to be verified during a technical evaluation study. The route is indicated by the orange line on the following Google map:

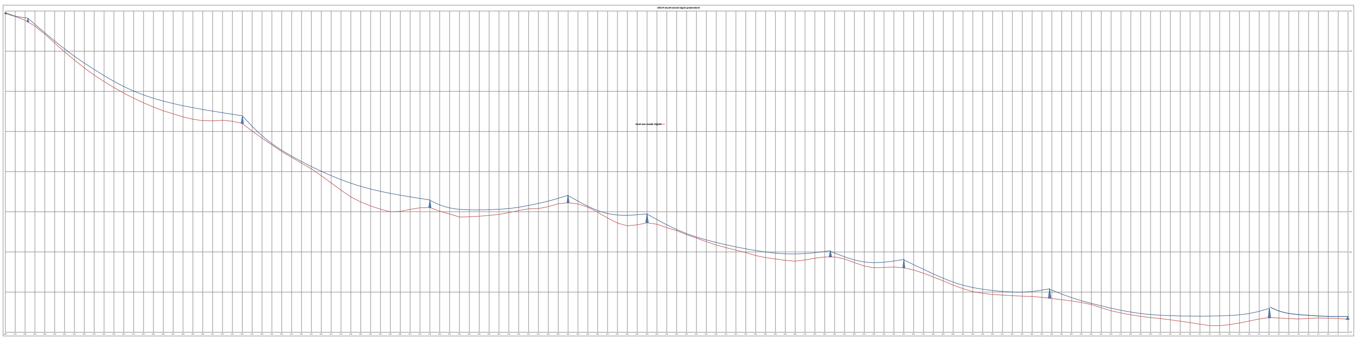


The following Google maps and graph show different dimensions of a possible 9 tower configuration on this straight line route:


Bushingata Bottom Station
46m
42m
38m
30m
44m
30m
32m
36m
18m
Mt Amery Top Station
Image © 2013 DigitalGlobe
1081 m
Google earth


18m
36m
32m
30m
44m
30m
38m
42m
46m
Image © 2013 DigitalGlobe
837 m
Google earth





The probable positions and indicative heights of the towers are given in the following table:

Structure	Latitude Coordinates	Longitude Coordinates	Height (m)
Bottom Station	28°44'52.22"S	28°59'38.31"E	8
Tower 1	28°44'57.52"S	28°59'25.13"E	46
Tower 2	28°45'12.28"S	28°58'47.37"E	42
Tower 3	28°45'22.04"S	28°58'22.71"E	38
Tower 4	28°45'26.96"S	28°58'10.08"E	30
Tower 5	28°45'39.14"S	28°57'38.84"E	44
Tower 6	28°45'44.44"S	28°57'25.56"E	30
Tower 7	28°45'53.75"S	28°57'1.81"E	32
Tower 8	28°46'6.11"S	28°56'29.73"E	36

Tower 9	28°46'20.41"S	28°55'53.48"E	18
Top Station	28°46'22.18"S	28°55'48.76"E	8

3.1.3. Gondola System Route to Mont-Aux-Sources

The green line in the following Google map indicates a possible route for a gondola system from Mount Amery to the southern slope of Mont-Aux-Sources at a total distance of 5500m:

3.2. CABLEWAY SCENARIOS

3.2.1. Busingatha to Mount Amery

3.2.1.1. Option 1: Three Section Jig-back Cable Car System

This option consists of three separate ropeway systems, each with one or two main cabins running up and down that specific section. The data for this system will be as follows:

- Two 60+1 person cable cars per section
  - Total no of main cabins: 6

- Capacity per main cabin: 60 persons (4800kg)
- Capacity: 500 persons per hour
- Fastest time to get from bottom to top: 25 minutes (3 x 7 + 4 minutes)
- Gross Main Power: 2 x 2 x 300kW and 1 x 2 x 750kW

3.2.1.2. Option 2: Single Section Jig-back Cable Car System

This option consists of one straight line ropeway systems, with two main cabins running up and down that route. The data for this system will be as follows:

- Two 100+1 person cable cars per section
  - Total no of main cabins: 2
  - Capacity per main cabin: 100 persons (8000kg)
  - Capacity: 430 persons per hour
  - Fastest time to get from bottom to top: 14 minutes
  - Gross Main Power: 1 x 2 x 1000kW

3.2.1.3. Option 3: Gondola System

This option consists of three separate ropeway systems, each with a number of 8 person gondola cabins running up and down that specific section. The data for this system will be as follows:

- 8 person gondola system
  - Total no of gondolas for section 1: 18
  - Total no of gondolas for section 1: 14
  - Total no of gondolas for section 1: 18
  - Capacity per gondola: 8 persons (640kg)
  - Capacity: 500 persons per hour
  - Time to get from bottom to top: 26 minutes (3 x 8 + 2 minutes)
  - Gross Main Power: 2 x 2 x 200kW and 1 x 2 x 500kW

3.2.2. Mount Amery to Mont Aux Sources

This option consists of one ropeway system of 5500m in length with a number of 8 person gondola cabins running up and down that specific section. The data for this system will be as follows:

- 8 person gondola system

- Total no of gondolas: 20
- Capacity per gondola: 8 persons (640kg)
- Capacity: 300 persons per hour
- Time to get from bottom to top: 16 minutes
- Gross Main Power: 2 x 100kW

The gondola option is a very versatile solution in terms of capacity as the capacity can be increased or decreased by adding or removing gondolas. The size of the gondolas as well as the type and quality of gondolas can also be designed according to the client’s needs and budget.

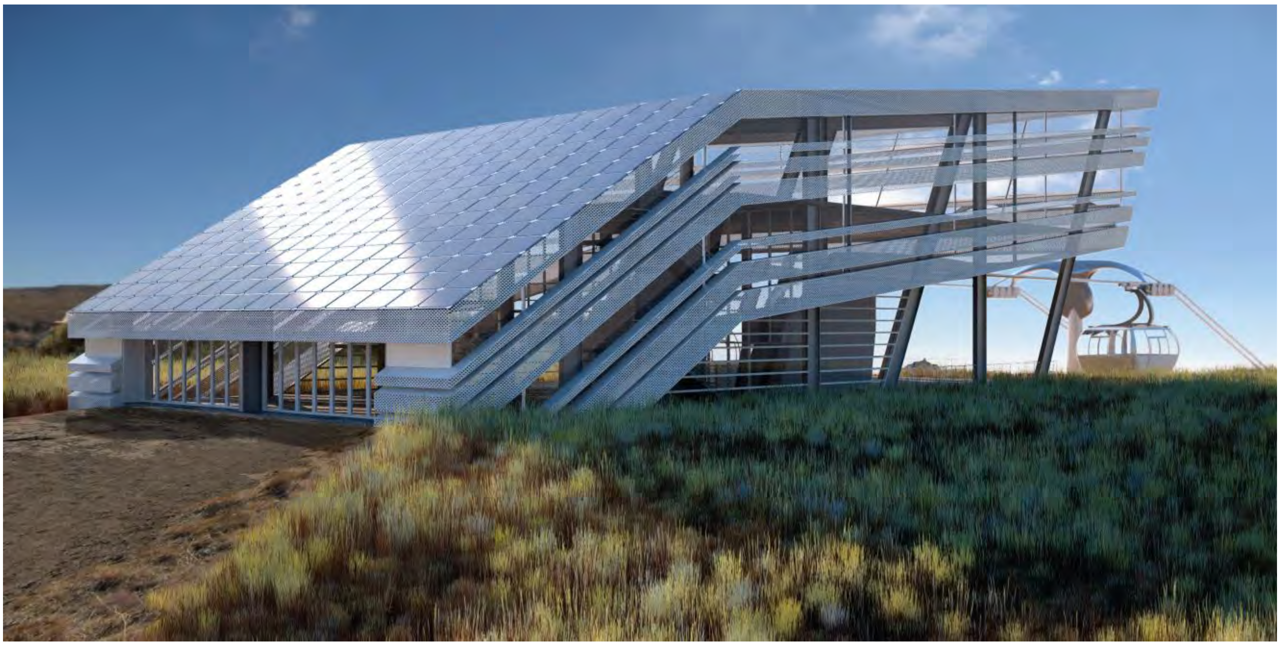
3.3. ALTERNATIVE ENERGY SOURCES

Although the ropeway systems are energy efficient transport systems, the client should consider generating energy for the ropeway system as well as for ancillary usage with wind turbines and/or solar panels.

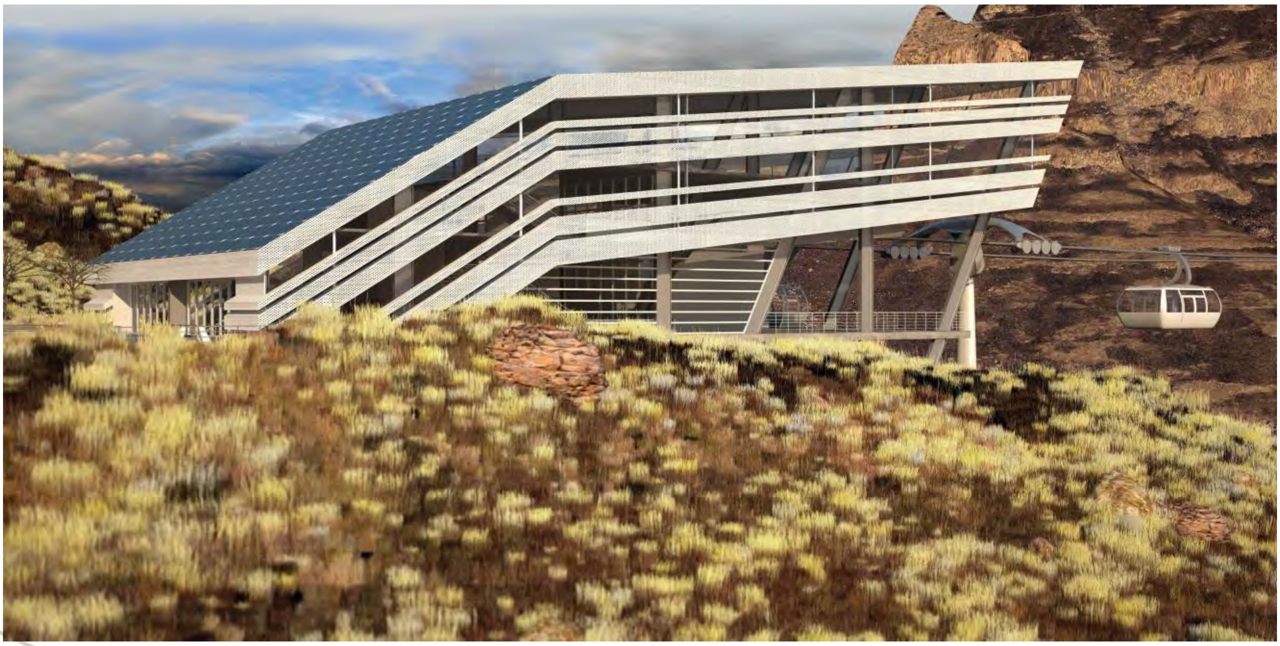
3.4. STATION SIZES

The size of land required for the top and bottom stations is a function of the extra facilities envisaged at the stations. The minimum size of enclosed station buildings is around 10m x 20m and anything between 6m and 10m high, depending on the position of the station in comparison to the line. A top station on the edge of a cliff should not be much higher than 6m. However, if the look-out area is situated on top of the cabin receiving area, the height of the station increases by approximately 3m. The need for extra shops and restaurants increase the area requirement.

The following design was done by Ruben Reddy Architects, KUKA’s architect partners in the PKX cableway project up the Sentinel from the Free State side:

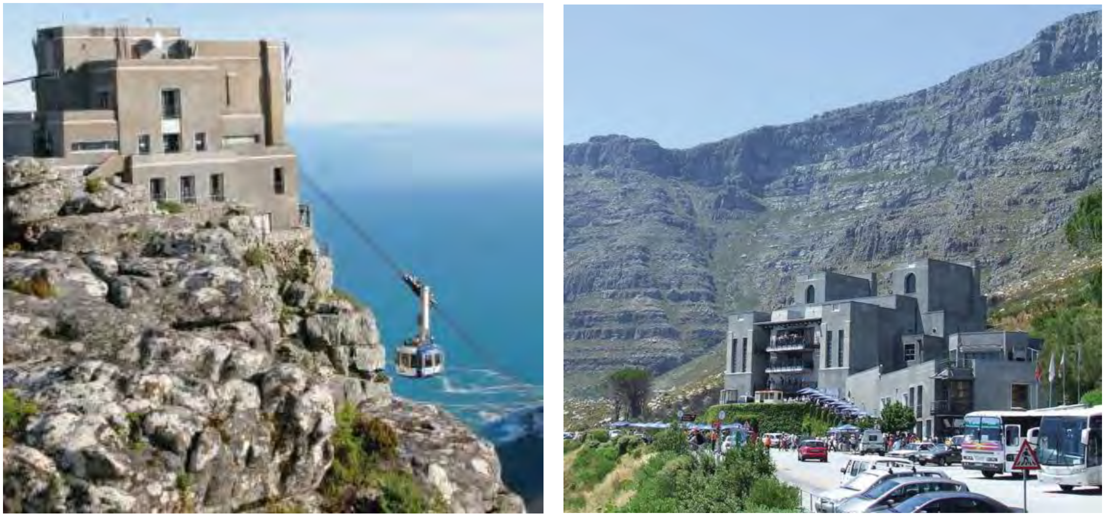


Sentinel Top Station



Sentinel Bottom Station (Similar, but larger)

The next photos are from the Cape Town Cableway:



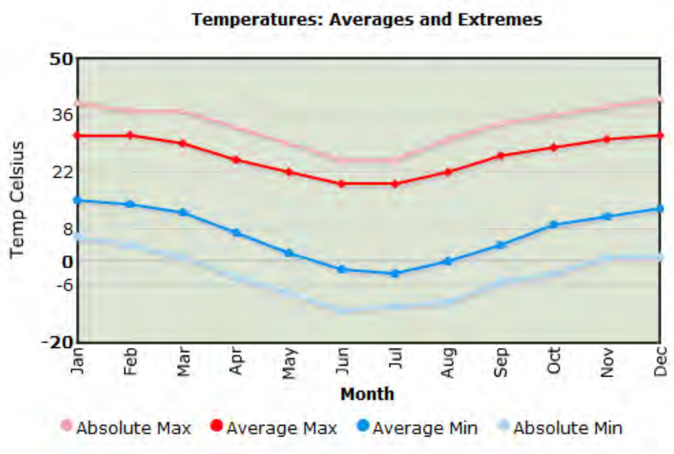
Cape Town Cableway Top and Bottom Stations

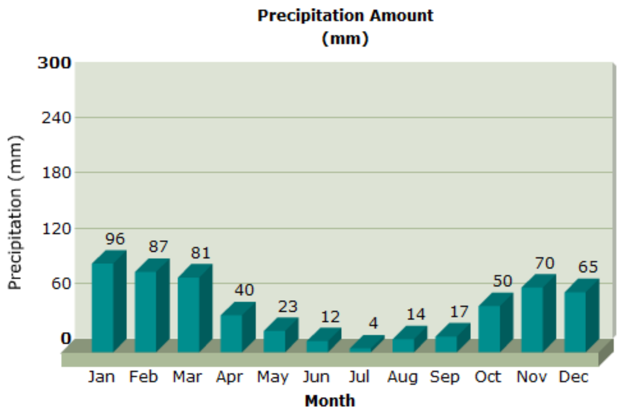
The following combined photo shows a station in construction and an approximately 20m high tower:

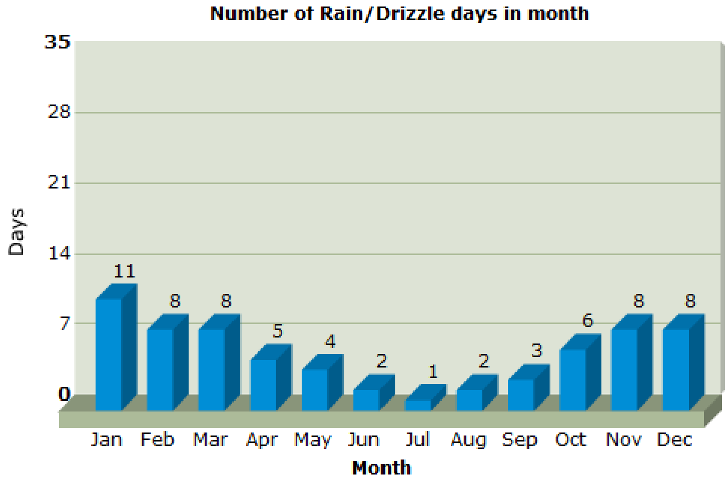
3.5. WEATHER CONDITIONS

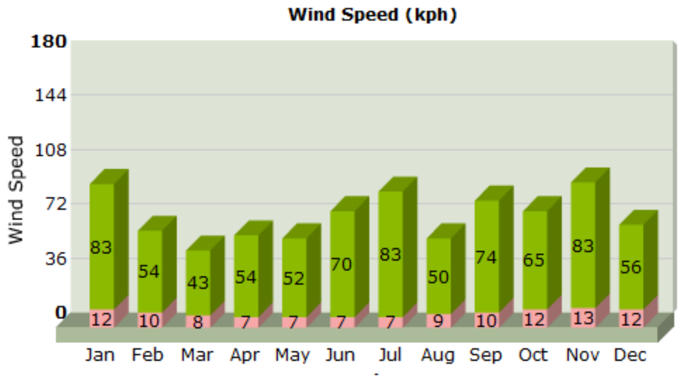
Cableways can be designed according to specific weather conditions, which include anticipated maximum wind speeds. Although the norm is to design the systems to be operational in wind speeds up to between 40km/hr and 60km/hr, systems have been designed in the world that can operate in much higher wind speed conditions, at extra cost. Notwithstanding the maximum wind speed at which the system is designed to operate, the system structures are designed to withstand winds up to 160km/hr.

The following graphs supply typical data regarding weather conditions in the Drakensberg area:









The maximum wind speed per month is indicated in green and the average wind speed per month is indicated in pink. These wind speeds are normal for aerial ropeway systems being built in mountainous areas and do not pose a risk to the feasibility of the project.

4. *CONSTRUCTION ASSUMPTIONS*

4.1. ITEMS BREAKDOWN FOR 3-SECTION JIG-BACK CABLE CAR SYSTEM

STEEL	
Stations (ton):	461
Towers (ton):	275
Ropes (ton):	347
CONCRETE	
Stations (m^3):	248
Anchors (m^3):	1600
Towers (m^3):	285
EQUIPMENT	
Stations (ton):	23
Towers (ton):	7.5
Vehicles (ton):	42

4.2. ITEMS BREAKDOWN FOR SINGLE SECTION JIG-BACK CABLE CAR SYSTEM

STEEL	
Stations (ton):	363
Towers (ton):	350
Ropes (ton):	413
CONCRETE	
Stations (m^3):	196
Anchors (m^3):	1800
Towers (m^3):	315
EQUIPMENT	
Stations (ton):	13
Towers (ton):	6.5
Vehicles (ton):	22

4.3. IMPORTED VS LOCAL CONTENT

The costs in this study are based on all components being imported from Europe and all civil works and assembly of steel structures being done by local companies. It is anticipated that up to a 10% saving could be realised by manufacturing most of the steel structures for the stations and towers and some of the equipment in South Africa, which will be investigated during a baseline system design phase.

4.4. HELICOPTER AIDED CONSTRUCTION

Due to the impassability of the terrain up the mountain, the costs in this study were based upon helicopter aided construction of all towers and all stations, except the bottom station at Busingatha. It might be possible to construct most of the towers of the first section without the help of a helicopter but it is foreseen that from station 1 upwards construction will only be possible with the help of a helicopter delivering all items and personnel to the site. Stringing of the ropes will also be done with the aid of a helicopter.

5. *COSTS*

5.1. CAPITAL COSTS

5.1.1. Busingatha to Mount Amery

5.1.1.1. Option 1: Three-section Jig-back Cable Car System

ITEM	TOTAL
Distance (m)	7285
Leitner Supply	EUR 29 785 000
Leitner Supply	R 402 097 500
Transport	R 8 813 657
Civils & Foundations	R 24 327 050
Helicopter Transport	R 11 613 225
Rope Stringing [m]	R 12 020 250
Power Supplies & Reticulation	R 32 678 250
Construction labour	R 13 569 600
Professional	R 6 251 001
Preliminary & General	R 5 209 168
Safety	R 2 083 667
Site Establishment	R 3 125 501
TOTAL	**R 521 788 869**
Contingency	R 52 178 887
GRAND TOTAL	**R 573 967 756**

5.1.1.2. Option 2: Single Section Jig-back Cable Car System

ITEM	TOTAL
Distance	7285
Leitner Supply	EUR 25 815 000
Leitner Supply	R 348 502 500
Transport	R 10 562 402
Civils & Foundations	R 22 152 350
Helicopter Transport	R 7 932 075
Rope Stringing [m]	R 11 244 750
Power Supplies & Reticulation	R 17 645 375
Construction labour	R 15 642 000
Professional	R 5 158 330
Preliminary & General	R 4 298 608
Safety	R 1 719 443
Site Establishment	R 2 579 165
TOTAL	**R 447 436 998**
Contingency	R 44 743 700
GRAND TOTAL	**R 492 180 698**

5.1.1.3. Option 3: Gondola System

ITEM	TOTAL
Distance	7285
Leitner Supply	EUR 17 454 010
Leitner Supply	R 235 629 135
Transport	R 7 932 291
Civils & Foundations	R 20 677 993
Helicopter Transport	R 9 871 241
Rope Stringing [m]	R 10 818 225
Power Supplies & Reticulation	R 29 410 425
Construction labour	R 11 534 160
Professional	R 5 625 901
Preliminary & General	R 4 427 793
Safety	R 2 083 667
Site Establishment	R 3 125 501
TOTAL	**R 341 136 331**
Contingency	R 34 113 633
GRAND TOTAL	**R 375 249 965**

5.1.2. Mount Amery to Mont Aux Sources Gondola System

ITEM	TOTAL
Distance	5500
Leitner Supply	EUR 10 530 000
Leitner Supply	R 142 155 000
Transport	R 4 117 151
Civils & Foundations	R 8 717 500
Helicopter Transport	R 8 637 725
Rope Stringing [m]	R 9 075 000
Power Supplies & Reticulation	R 13 025 375
Construction labour	R 8 184 000
Professional	R 3 157 231
Preliminary & General	R 2 631 026
Safety	R 1 052 410
Site Establishment	R 1 578 616
TOTAL	**R 202 331 034**
Contingency	R 20 233 103
GRAND TOTAL	**R 222 564 138**

5.2. OPERATING COSTS

The monthly operating costs are summarized in the following tables:

5.2.1. Busingatha to Mount Amery

5.2.1.1. Option 1: Three-section Jig-back Cable Car System

Operating costs:	Total (R/m):
Maintenance labour*	R 117 325
Maintenance material*	R 355 530
Operations personnel**	R 96 000
Management	R 70 000
General Operational Expenses	R 40 000
Energy supply (181.4MWh/m)***	R 127 007
Miscellaneous	R 21 140
Total:	**R 827 002**
Contingency (10%)	R 82 700
Total Operating:	**R 909 702**

5.2.1.2. Option 2: Single Section Jig-back Cable Car System

Operating costs:	Total (R/m):
Maintenance labour*	R 121 990
Maintenance material*	R 304 975
Operations personnel**	R 48 000
Management	R 70 000
General Operational Expenses	R 40 000
Energy supply (120.6MWh/m)***	R 84 412
Miscellaneous	R 21 140
Total:	**R 690 517**
Contingency (10%)	R 69 052
Total Operating:	**R 759 569**

5.2.1.3. Option 3: Gondola System

Operating costs:	Total (R/m):
Maintenance labour*	R 76 705
Maintenance material*	R 232 439
Operations personnel**	R 96 000
Management	R 70 000
General Operational Expenses	R 40 000
Energy supply (125.2MWh/m)***	R 87 635
Miscellaneous	R 21 140
Total:	**R 623 919**
Contingency (10%)	R 62 392
Total Operating:	**R 686 311**

5.2.2. Mount Amery to Mont Aux Sources Gondola System

Operating costs:	Total (R/m):
Maintenance labour*	R 45 294
Maintenance material*	R 137 254
Operations personnel**	R 48 000
Management	R 35 000
General Operational Expenses	R 20 000
Energy supply (23.2MWh/m)***	R 16 257
Miscellaneous	R 21 140
Total:	**R 322 945**
Contingency (10%)	R 32 294
Total Operating:	**R 355 239**

* The operating costs are a function of operating hours. The costs calculated for this study were based on 8 hours operation per day, 365 days per annum.

**The operational costs were based on one operator per station, 2 x 8 hour shifts per day, 365 days per annum.

*** Energy supply is based on the system operational on average for 8 hours per day, 365 days per annum. The costs were based on a tariff of R0.70 per kWh.

Although costs are provided for such a single section system in this report, the technical feasibility of such a system will only be determined during a technical verification study, which will cost R200 000. This amount excludes an Aerial LiDAR Survey, crucial for the study, which should cost in the region of R200 000.

The costs and tariffs in this document exclude any value added tax.

6. *DEATAIL FEASIBILITY STUDY*

KUKA proposes the detail feasibility study to be split into two phases:

6.1. FHASE 1 – VERIFICATION OF THE TECHNICAL FEASIBILITY OF A SINGLE SECTION SYSTEM

This verification phase will comprise of:

- Leitner to execute preliminary line profile with main characteristics of the installation
- Leitner to do preliminary price estimation for study and electromechanical equipment (civil works and erection works not included)
- Leitner to provide other preliminary information to allow KUKA to verify the problems concerning the construction and erection works in terms of the accessibility conditions of the station areas and the line (maximum dimensions and weights to transport to the erection site, etc..).
- KUKA to determine preliminary price estimation for civil works and erection works

Delivery is 3 weeks after receiving the following input data:

- Ground profile in DWG format with departure and arrival points of the cableway

- Cabin capacity
- Information of the possibility to have the drive at the Top Station

The cost for the Technical Verification Study is R200 000.

The cost for the Aerial LiDAR Survey is approximately R200 000. An Aerial LiDAR Survey is not necessary for phase 1 if ground profile data for that area is available in DWG format with contour lines at least every 2m.

Payment terms for the Technical Verification Study is 100% on order.

Payment terms for the Aerial LiDAR Survey is normally 50% on order and 50% before submission of electronic results in DWG format.

6.2. PHASE 2 – PRELIMINARY PROJECT

The preliminary project will comprise of:

- General technical report
- Drawings
  a) Final Line profile
  b) General planimetry
  c) Drive station - General Layout
  d) Return Station - General Layout
  e) Winch - General Layout
  f) Line tower and line shoe - General Layout
  g) Main vehicle - General layout

For the preliminary project the ground profile is necessary in DWG format with contour lines at least every 0.5m, which can only be obtained with an Aerial LiDAR Survey.

Delivery is 5 weeks from obtaining the Aerial LiDAR Survey data in DWG format, or if already available, from date of order.

Payments terms for the preliminary project is:

- 30% on order;
- 70% on completion of the project before delivery of the final report.