342

DESPATCH.

EAST AFR. PROT.

No 13519

C.O. 13519 Regd 25 APR 08

Vol 2

PRINTED FOR USE OF ... OFFICE

No.
... Conf 24

1908

... 25

Previous Paper.

... 8865
... 20013

(Subject.)

Kenya Railway

Sends Capt. Stevensons Report with minutes by manager of Uganda Rly & Dr. of Agriculture. Report deals with (1) (a) prospects of line from Nairobi to Fort Hall (b) extension to ... (c) forest extension (d) line from Athi river or from Nairobi (2) prospects of direct line from Kikuyu to Kenia forests. (3) (a) other branches to forest ... (b) suitability of Nairobi-Fort Hall road for motor traffic

(Minutes.)

Mr Antrobus

I think that no action is required at present on this paper. As the General Manager says in the last para. of his minute of the 19 Dec /07, it will be well to wait until we have the reports on the proposed railways Jinja - Kakoge & Victoria - Albert Nyanza. When their relative advantages can be compared & at all events ... to see which is most likely to advance the interests of the 2 Prot^es. Personally I should say that the present railway is the least likely to do so.

Wait?

H. J. R.
24/4

Next subsequent Paper.

To Gov ... Fort Hall ... 1908

RLA May 23
at once

Are the plates referred to in this page to be reproduced for the Office volume?

ANB

11/6

Mr Bridgman Can you give me any idea of the cost of their reproduction

11/6

Not noticed the only sketches which seems in the [illegible] but any be [illegible] — attached to the [illegible] papers.

ANB

Mr Wood Please [illegible] 12/6

17/6

I can only [illegible] below Do you remember [illegible] sketches? 1816

Mr. Ellis,

I have just recovered these two maps from the S.R., where they had been overlooked, and am consequently only now [illegible] to answer your question of 11 June.

The cost of reproducing these two in black and white would be about £4.

Are they to be done?

E. D. R.

19.11.08.

Mr Rockett
Yes [illegible] 19/11
done

13519

Governor's Office,

Nairobi,

March 25th 1908.

13519

16 APR 08

EAST AFRICA PROTECTORATE.

Confidential (21)

My Lord,

In confirmation of my telegram of to-day's date I have the honour to transmit herewith in original the report on the Kenya Railway project furnished by Captain Stevenson, R.E. together with copies of minutes by the Manager of the Uganda Railway and the Director of Agriculture.

Stevenson 3rd ... 1907.

Currie ...th 1907.

...onald ...th 1908.

Currie 30th 1908.

2. Your Lordship will observe that Mr. Currie recommended awaiting the receipt of Captain Stevenson's further reports before submitting the present report home but in view of Your Lordship's telegram of to-day I have concluded that its immediate despatch is desired.

3. I enclose copy of a further minute by the Manager of the Uganda Railway and I concur with the views expressed by him as to choice of alternative routes. I must admit, with Mr. Currie, that the connection between the Victoria and the Albert Nyanzas is the extension of first importance, but I trust that it may still be found possible to take into consideration

The Principal Secretary of State for the Colonies,

Downing Street,

LONDON, S.W.

* No. 8865

6.11.15

Nairobi,
March 25th 1908.

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The Right Hon. The Principal Secretary of State
for the Colonies,
Downing Street,
LONDON, S.W.

No. 886.

the Nairobi-Fort Hall branch.

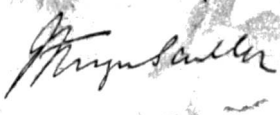
I have the honour to be,

With the highest respect,

My Lord,

Your Lordship's most obedient,

humble servant,



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CONFIDENTIAL.

INCLOSURE No. 1

In Despatch No. Conf. 21 of Mar 20 1908.

13519

5 APR 08

354

PROPOSED RAILWAYS.

Nairobi - Fort Hall - Kenia.

INTRODUCTION.

The subjects dealt with in this report are:-

(1) The prospects of a Railway from Nairobi to Fort Hall and the sources of water power available for working the line by electricity.

(2) The extension of the line to Embu as suggested by the East Africa and Uganda Corporation.

(3) The prospect of branches or an extension to Kenia Forest.

(4) The prospect of a direct line from Kikuyu to Kenia Forest.

(5) The suitability of the Nairobi Fort Hall Road for Motor Traffic.

(6) A line is proposed from Athi River which should meet the wishes of the gentlemen applying for the Kenia Timber Concession.

(7) A third alternative route is discussed which in the opinion of the writer follows the best route from Nairobi to Fort Hall and Kenia.

For purposes of this report the subjects set forth in the introduction have been redivided into four sub-heads.

Firstly

Part of (1) The prospects of a railway from Nairobi to Fort Hall.

(2) The extension to Embu.

(3) The Forest extension.

(6) The line from Athi River.

(7)

3

(7) The alternative line from Nairobi.

(4) The prospects of a direct line from Kikuyu to the Kenia forests.

Secondly.

(1) Communication [illegible] to the Forest.

Thirdly.

(1) The sources of water power available for working the line.

Fourthly.

(5) The suitability of the Nairobi - Fort Hall Road for Motor Traffic.

CHAPTER I.

b-Head I

Before estimating for the various lines named above it is necessary to examine the different proposals as a whole more especially as the lines proposed overlays one another.

A map has been supplied with this report which it is hoped will render the following discussion easy to follow:-

With regard to (1) and (2) the representative of the East Africa and Uganda Corporation accompanied the reconnaissance party.

No Engineer was appointed by the Earl Warwick or Mr. Moreton Frewen but the latter gentleman stated before the departure of the Survey Party from England that the line his Syndicate wished made should go as far round on the East side of the forest as possible and that there was no need to consider any local traffic on the route chosen.

Any line starting from Kikuyu or Nairobi Stations on the Uganda Railway and running towards Fort Hall and Kenia has to cross the drainage from the Kikuyu Escarpment. A line from Kikuyu is accordingly absolutely impracticable as it would have to cross valley after valley (in some places as many as three per mile) varying in depth from 100 to 800 feet with steep sides. These valleys are further too narrow to locate a

curve

curve in, some of them being barely 50 feet wide in the bed.

The line proposed by the East Africa and Uganda Corporation as starting from Nairobi is a practical one as the valleys are less numerous and as a whole are more open and not so deep as on the line from Kikuyu.

The proposal of the Corporation to divert the line beyond Punda Millia to the junction of the Thara (or Mathingeta) with the Tana River cannot be recommended as it would entail an additional fall of 250 feet between Punda Millia and Kania, an increase of grade and a lengthening of line to the extent of 10 miles or more. The country below the junction of the Tana and Thara is reported uninhabited and is unfit for Settlers, being full of Malaria and Tsetse Fly. In conjunction with the representative of the Corporation, a line was found from Punda Millia which crossed the Tana above the falls.

Fort Hall is not easily reached by rail, situated as it is on a spur with valleys from 300 to 500 feet deep on each side. The line proposed passes within five miles direct of Fort Hall and a road 8 miles long with a maximum gradient of 1 in 15 can easily be constructed. This would cost unmetalled £.600, if metalled £.3,800.

A branch railway 5 miles long could be run to the foot of Fort Hall, but there is not sufficient traffic in sight to warrant this expenditure and the extension of the railway across the Tana will reduce the commercial activity of Fort Hall by at least 60% below its present standard.

Fort Hall is merely a collecting centre and the bulk of the produce comes from across the Tana by porters. Any produce from the district lying North and West of

Fort

Fort Hall will stand the extra porterage to Fort Hall road station, or a Motor Service could be instituted.

There is no doubt that the railway if built, should be extended across the Tana to at least the Tiba River so as to tap the rich and cultivated foot slopes of Kenia. Owing to the climatic conditions of Mount Kenia this area has never suffered from a famine within the memory of man. At least 80% of the area between the Fort Hall, Embu Road and the forest is uncultivated and if arrangements were made to throw open to settler some portion of the foot slopes, and if a market were thrown open to them a fair amount of traffic would be assured for the Railway apart from the proposed timber trade.

In the events of the Kenia Forests not being worked the carrying of the line beyond the Tiba River to Embu as suggested by the East Africa and Uganda Corporation would not pay for the traffic likely to be obtained.

Project 3. If the forest is to be worked for timber the line should be further extended from the Tiba River to the poin where the Ruppingazi River leaves the forest. Any furthe extension to the East and North is hampered by the difficu climb out of the Ruppingazi Valley and by the crossing of the Zuchi River, both of which rivers have cut their way deeply into the country. It is possible that when the forest has been fully surveyed an easier crossing of the Zuchi River will be found higher up which is capable of being extended a short way further North.

The reconnaissance party was not permitted to go beyond the South-East corner of the forest, i.e. the Zuchi River as the country was not then considered settle It is understood that the opening of the districts further North is under consideration, and if this opening doe take

take place consequently with the commencement of the construction of the railways a sufficiency of labour would be at once assured for construction without interfering with any of the other industries and works in progress in this Protectorate.

roject 6. There is a second possible route from the Uganda Railway to Kenia Forest. This starts from Athi River Station and runs down the Athi River to past Doinyo Sapuk, crosses the Athi and Thika Rivers and joins the proposed line from Nairobi at mile 59, thence following the same alignment to the forest.

roject 7. The third alternative route follows the line proposed by the East Africa and Uganda Corporation for 20 miles. It then crosses over to Doinyo Sapuk and follows the line described in project 6 to the forest.

It will be seen that there are three alternative routes by which Fort Hall and Kenia Forest can be reached by rail. All these routes follow the same alignment after the first 50 to 56 miles, i.e. beyond Punda Millia Station. For purposes of comparison and estimate these routes will be described by letters.

Route A - from Nairobi as suggested by the East Africa and Uganda Corporation.

Route B - from Athi River.

Route C - from Nairobi as recommended by writer.

The timber extension is described as Route D.

The comparative costs of these three routes from Uganda Railway to Kenia Forest are as follows:-

	£. s.	£. cost per mile.
A + D =	545954	4475
B + D =	453006	3989
C + D =	484686	4022

The

The lengths to Nairobi and Athi River Stations from Mombasa are :-

Route.	To Nairobi miles.	To Athi River miles.
A + D	128	138
" B	130½	136½
C & D	83	115

In the comparison of the two routes A and B the Athi River route has the following advantages:-

Reduction in Capital Cost.

Shorter route to the sea by 25 miles.

Cheaper maintenance owing to fewer viaducts and bridges and less curvature.

Less rise and fall of gradient.

9 miles less line to construct.

The following are the disadvantages:-

The line runs through a country for 20 miles from which no traffic can be expected.

It misses the first thirty miles along the Fort Hall road which must eventually become a closely settled country and so loses a considerable prospective traffic.

It entails the construction of a locomotive shed at Athi River. All through traffic to Nairobi will have to reverse at Athi River Station owing to the fact that all trucks must run in the same direction on account of the pattern of buffers used on Uganda Railway rolling stock.

It has the disadvantage from a management point of view of having a function away from headquarter.

The distance to Nairobi and to the Lakes is increased by 8 miles.

Some

Some of these disadvantages can be overcome to a certain extent by starting Feeder Motor Service from Nairobi to the Thika River via Kiambu.

To render this possible it will be necessary to properly metal the roads. This subject is discussed in the report under a separate head viz: the Report on the Nairobi Fort Hall Road.

Route C as compared with A has the great advantage of a reduced capital cost.

It will be 1½ miles shorter.

It will be cheaper to work and maintain, having less rise and fall of gradient and less curvature.

Route C shares equally with A the advantage of running into a Town and the existing headquarters of the Railway.

As regards the districts traversed where the two routes A and C are separate, there is apparently not much to choose between them although the district round Thika Station is a more desirable district for white settlers to live in, the country between Doinyo Sapuk and Punda Millia is very suitable for tropical agriculture on a large scale. There is moreover a possibility of growing wheat to the S.S.W of Doinyo Sapuk.

Route B as compared with Route C has practically the same relative advantages and disadvantages as compared with Route A but in a lesser degree.

The interest on £.31,500 (the capital saved) would however be easily repaid by Route C in a short time, whilst the difference of £.93,000 between the capital costs of Routes A and B would by its interest charges be a very heavy extra load for line A to carry.

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CHAPTER 11.

E S T I M A T E S .

Estimate A. Estimates are submitted for three alternative lines and for the timber extension.

A line from Nairobi to Tiba River on the slopes of Kenia.

This line has a total length of 99 miles with minimum curves of 10 degrees (573 feet radius) and a maximum grade of 1½% (1 in 66⅔).

The grade has been compensated for curvature at the rate of .05% per degree of curve i.e. on a 10° curve the grade is reduced to 1% (1 in 100).

The cost of line is estimated at £.443,826 or £.4,482 per mile.

Estimate B. A line from Athi River Station to Tiba River, grades and curvature as in Estimate A, length 92 miles.

Estimated total cost £.350,880 or £.3,814 per mile.

Estimate C. A line from Nairobi to Tiba River via Doinyo Sapuk grades and curvature as in Estimate A, length 97½ miles.

Estimate total cost £.382,558 being at the rate of £.3,930 per mile

Estimate D. An extension of line from Tiba River to a point where the Ruppengazi River leaves the forest. This line has a length of 25 miles. The maximum grade with the traffic from the forest is 3% (1 in 33⅓) and against the traffic 1½% (1 in 66⅔). The minimum curve is 10°.

Estimated cost £.102,188 being at the rate of £.4086 per mile.

ESTIMATE A.

Main Line 99 Miles.	£.	Cost per Mile.	Gauge Metre.
I. Survey	500	5	
II. Land & Compensation	1000	10	
III. Earth & Rockwork	85864	867	
IV. Bridges & Culverts	28465	288	
V. Viaducts	80829	816	Including
VI.. Permanent Way including ballasting	190748	1927	5% for
VII. Telegraphs	7318	73	contingencies.
VIII. Station Buildings & Machinery	9025	91	
IX. Fencing	393	4	
X. Plant	8095	82	
XI. Rolling Stock	Nil	Nil	
XII. General Charges (a)	31709	320	
	£.443,826	4,482.	

(a) The General Charges are calculated as for a line 122 miles long and are divided proportionately between the main line and timber extension.

10

364

ESTIMATE C.

Length 97¼ miles	£	Cost per mile. £	Gauge metre.
1. Survey	500	5	
2. Land & Compensation	1000	10	
3. Earthworks	8566	878	
4. Bridges & Culverts	25962	266	5% included for Contingencies.
5. Viaducts	26031	277	
6. Permanent Way	187792	1925	
7. Telegraphs	7217	75	
8. Station Buildings	9025	93	
9. Fencing	325	4	
10. Plant	8095	83	
11. Rolling stock	Nil	Nil	
12. General Charges (c)	51800	320	
	£382.558	£3925	

(c) General Charges are taken as for Estimate A.

12

(12)

ESTIMATE D.(Timber Extension).

		£	Cost per mile.	Gauge per metre.
Length 2¾ miles.				
1.	Survey	100	4	
2.	Land & Compensation	400	9	
3.	Earth and Rock work	36121	1312	
4.	Bridges and Culverts	11118	526	
5.	Viaducts (b)	5124	223	5% included for Contingencies.
6.	Permanent way	38775	1682	
7.	Telegraphs	975	42	
8.	Station Buildings & Machinery	1914	84	
9.	Fencing	25	1	
10.	Plant	1000	44	
11.	Rolling Stock	5760	253	
12.	General Charges(a)	7363	320	
		£102125	4420	

(a) See Estimate A.

(b) Timber Viaducts.

X3

(13)

Rates and Conditions of the Estimate.

The following are the rates and conditions on which the foregoing estimate are based.

1. Survey - As it is the intention of the Government to carry out a detailed survey before deciding on the construction of the line, only a small sum is allotted to cover any alteration in alignment which may seem advantageous to the engineer charged with the construction. The cost of actually pegging out the line is included in general charges "Engineering"

2. Land and Compensation Estimate A & C. The £1000 allotted under this head is to cover the acquisition of ground for Station Yards - to cover damage to crops during survey and construction, and to compensate certain settlers who will possibly have to rebuild their houses as the line passes directly over them.

In Estimate B. £500 is allowed.

In Estimate D. £100 is sufficient.

Land is estimated to cost from £1 - £5 per acre. Only the land for Station has to be paid for - the Government having the right to take free of cost land required for Railway provided the farm traversed is more than 100 Acres.

There are no small farms on the line.

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.B.C.

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There are no small farms on the line.

III. EARTH AND ROCK WORK.

It is proposed to carry out the earth and rock work with African labour, making use of local European contractors as far as possible. In accordance with the general custom in this protect-orate this labour will have to be supplied by the Government.

If the opening up to the district to the East of Kenya takes place concurrently with the commencement of the Railway an ample supply of labour will be obtainable without interfering with the supply to other departments and to settlers.

The advantage of employing a local contractor is that it relieves Government of the supply of tools and goods, and if the contractors are carefully selected, ensures an effective white supervision by men who know the country and understand the natives.

The quantity of work turn out by the African labour in this country is very small and in order to guard against a trouble which was found indentured Indian Labour during the construction of the Uganda Railway it is necessary that some irreducible minimum of work to be executed be fixed (be it only a low one) which labourer must produce before receiving his full pay. It would naturally follow that a system of piece work must be introduced to remunerate such men to execute work above the average in quantity.

With regard to the feeding of the large number of men who will be employed, it will be necessary to warn the Kikuyu who live immediately on or near the line that a certain extra quantity of food will be required. If notice be given one "rains" before the food is required, the food supply should not be a difficult or expensive matter.

The /s

The rates calculated on are as follows.

Earthwork £2 per thousand cubic feet

Rockwork £2-13-4 do.

being high local contract rates at present in force.

To these have been added an increase of 20 per cent to cover a possible rise in the price of labour owing to an increased demand.

Banks have been taken 12" wide at formation level with side slope 1 in 8. Cuttings 14" wide with side slopes of 1 in 1 for purposes of estimating fonly).

The quantity of combined rock and earthwork is equal to a continuous bank 34 feet wide in Estimate A.

Allowance has been made for drainage ditches along the line where required.

Owing to the presence of black cotton soil on all the routes a [illegible] to a more or less degree, allowance has been made for transporting by rail "red earth" from the nearest site to make the bank. This process has been found necessary on the Uganda Railway since its construction. £500 per mile has been allotted for this service whereever necessary.

IV. BRIDGES AND CULVERTS.

The prices of bridges and culverts are based on the following rates in force on the Uganda Railway.

Concrete £5 per 100 cubic feet

Masonry £3-10-0

30 feet girder bridge in 6'6 foot bank	£60 .0. 0
12 feet do.	£70 -0. 0
9 feet Concrete culvert per ft. run	7. 0. 0
6 feet " " "	5. 0. 0
Single elliptical steel-pipe 6'+3', set in concrete per ft. run	5. 6. 8
Single 18" earthenware pipe set in concrete per ft. run	0. 7. 2
Open culverts rail girders each	10. 0. 0

Girder bridges of over 30' span have been estimated for at the concrete and masonry rates quoted above. Girders have been calculated as costing £20 per ton erected.

Pile bridges of imported timber to cross the swamps at a height of 5 feet will cost £8 per foot run.

V. VIADUCTS.

The principal difficulty at the construction of the Nairobi-Fort Hall Railway line is the crossing of the narrow deep valleys which are met with on the route chosen. In order to get a curve of reasonable radius it is necessary to cross at a height of from 50 to 70 feet above the valley.

Owing to the shallowness of the soil in the country traversed, which rarely exceeds 5 or 6 feet, any bank across these valleys would have to be constructed of rock.

A waterway of twenty to fifty feet is requisite. Steel viaducts have been allowed for. It is possible that when the detailed survey is carried out it may be found that a rock bank with an arched culvert would be more expensive than a steel viaduct, and this would therefore be preferable.

The question of employing local wood as a suitable material for building semi-permanent viaducts has been considered. This is estimated as producing a saving of £30,000.

Estimating the life of such a structure at possibly ten years there being no definite information as to the life of unseasoned local timber in this country and there being no stock of seasoned, it will be necessary to meet a further capital expenditure of about £60,000 to replace these timber viaducts by permanent structures. The use of timber viaducts is therefore not recommended on the line other than the timber extension.

The traffic prospects do not appear to warrant the presumption that the earnings will meet the interest on this additional capital expenditure within so short a period.

To

To cross these valleys on a low level bank would entail the use of too sharp curve, viz: one of 15° to permit the free use of the existing Uganda Railway Rolling Stock. The line would further be lengthened by about 4½ miles.

The cost of steel viaducts based on the cost of those already erected on the Uganda Railway has been taken at £21 per foot run, allowances having been made for the present high prices of constructional steel work.

Local timber viaducts would cost £10 per foot run. In both cases the price is as far an average height of 60 feet.

VI. PERMANENT WAY AND BALLASTING.

In estimate A.B.C. the following is allowed. Rails weighed 50 lbs. per yard laid on steel sleepers 2112 to the mile. This permanent way costs delivered Nairobi, complete £1400 per mile. The following items have been added

	£ per mile
Carriage 60 miles from Nairobi	80
Packing and Boxing	100
Making the cost per mile laid £1580	

Ballasting is estimated for over 60 miles of lime at a rate of £100 per mile. 2 sets switches and crossings are allowed for at £40 per set laid and 1½ miles sidings are included being at the rate of 400 yards per intermediate station and 1000 yards at the River Station.

imate L.

No ballast is allowed for on the timber line.

Cost of carriage from Nairobi £6 per mile.

Half a mile is allowed for sidings.

If a suitable local timber can be found for sleepers a reduction of £400 per mile could be made for the permanent way of the timber extension. Local wooden sleepers have not up to the present been successful. Their use is not recommended for the main line but some of the woods in Kenya Forest may be sufficiently good to make the experiment of laying the timber extension with local sleepers, a success.

The use of as heavy a rail as 60 lbs. is recommended on the grounds that the axle load of the existing Uganda Railway engines, of which there are twenty seven snare is 16 tons. No new rolling stock is therefore allowed for. Apart from the above fact the heading grade of 1½ % and ¾% on the extension is best met by using as heavy engine on a heavy rail so as to reduce the working expenses.

VII. TELEGRAPH.

As regards the telegraph line one wire on steel poles has been allowed for at £10 per mile. A saving of £8 per mile be made if the forest department would permit young juniper trees to be cut and used as poles.

There is however some doubt as to the life of these, the timber being immature.

Wooden poles have been quoted for under estimate C. £10 per office has been allowed for instruments.

VIII. Station Buildings and Machinery.

Under this heading are included watering arrangements, and ash pits at stations.

The following buildings &c. have been estimated for at Kamiti Station. The price of buildings being taken at 4d. per foot cube.

	Rs.
Station Buildings	
800 gall. water tank on stand with valves &c. complete	400
1000 yards 2" delivering pipes	170
Hand pump	50
Ash pit	10
Timber edge to platform	5
Weighing machine	20
Total	945

Estimating on the above scale, the cost of the various Stations is as follows:-

Kamiti	£915
Thika	£610
Punda Milia	£684
Fort Hall Road	£610
Tiba River	£605

The variations in price are due to the different length of piping required for the pumping arrangements.

To the above must be added

Goods Shed Fort Hall Road	£.400
The small goods sheds at various stations	300

At Tiba River six single quarters for Foremen and Train Staff £.600

Engine Shed	640
Steam pump & boiler	140
Piping pits	70
Washing out arrangements for boilers	60
Triangle	380

At Nairobi or Athi River

Single cabin at Junction	150

For the permanent way department huts for gangers are erected every four miles. It is proposed that native huts only should be put up for the platelayers.

26 gangers huts at £.86	£.223
104 Native huts at £.2	208
Making a total estimate A.B.& C.	£.8124
5% for contingencies	721
	£.8,845

Zb990-61
P.9

stimate A.B.C. IX. Fencing. Fencing is only allowed for round station Mile posts and gradient boards are included in this heading.

stimate A.B.C. X. Plant. The plant required for the construction and equipment of the line may be subdivided under four heads

(1) Construction

(2) Engineering

(3) Locomotive

(4) Station Furniture.

Under head (1) are placed survey instruments, tools and machinery required on the works. Allowance has been made for the cost of temporary deviations.

Two ten ton traction engine with six 4 ton trucks for use in distributing material are placed under subhead (3) and tools for Tiba River Engine shed included.

The following are the detail

(1) Construction

Survey Instruments	£.200
Piledrivers, winches, blocks, tackle etc.	1,000
Platelayers Tools	200
Timber, concrete etc for deviations	2,000
Tools for Tasena etc.	1,000
	4,400
(2) Pumping Trollies	60
Tools for engineering workshops	100
	160
(3) Locomotive	
Two 10.ton traction Engines.	
(a) £.1,200 erected	2,400
six 4 ton trackle	300
@ £.50 erected	

28

Tools for engine shed Tiba River including r[illegible]ps, [illegible]acks.	£.150
	2,850
(4) Station Furni[illegible]	300
[illegible] plant	[illegible].710
[illegible] contingencies	[illegible]
	£[illegible]

XII. GENERAL CHARGES.

The general charges are estimated on the bases that construction of the line will be carried out under the direction of the Manager of the Uganda Railway. To assist him an engineering constructing branch will have to be formed and the stores and accounts and medical branches amplified. For purposes of construction the line, i.e. the total 122 miles is divided into two construction divisions, of about equal length. The third division being slightly longer as the work is less.

Work would commence at the same time on division I and II whilst that on III would commence three months later. As it is intended to carry out a detailed paper location before the construction of the line is commenced all bridges, viaducts, &c. can be ordered at an early date, and the divisional construction engineer will be able to proceed at once with the pegging out of the line.

The two traction trains are available for the distribution of material ahead, the line running close to the Nairobi Port Rail route for the first 60 miles.

A free use of deviation will be necessary to avoid the delay caused by the time taken to construct the heavy bridges and viaducts of the first 45 miles of line.

It is estimated that each construct division will be at work for about 21 months and that the Chief Engineer and staff will be required for two years.

The

The construction staff is divided into:

A. [redacted]

1. Superintendence
2. Engineering
3. Stores and Transport
4. Accounts
5. Medical
6. Police.

B. Material

		Salary per annum.
A. (1)	[redacted]	
	Chief Engineer	£.1,000
	Three Clerks	270
	Two Draughtsmen	200
	Travelling Expenses &c	[redacted]
		Total 1,770 p.a.
	For 24 months	£.3,540
(2)	[redacted]	Per division
	1. Executive Engineer	£.700
	2. Assistants	300
	3. [redacted] Overseers	300
	4. Native do.	[redacted]
	5. Accountant (native)	120
	6. [redacted]	240
	7. Draughtsman	120
	8. Tracer	80
	Office and Local Expenses	[redacted]
	Total per annum	[redacted]
	Three divisions per annum	[redacted]
	Three divisions 21 months	£20,650

WORKSHOPS 96

WORKSHOPS.

4. Blacksmiths	£.280
4. Carpenters	200
10. Labourers	40
Total per annum	£.440.
Three divisions per annum	£.1320.
Three divisions 18 months	£.1980

SURVEY PARTY FOR 3 MONTHS ONLY.

30 Chainmen, levelmen &c.	£.108
60 Porters	186
Total per division	294
Three divisions	882

(3) STORES AND TRANSPORT.

1 Assistant, and Storekeeper and Transport Superintendent	£400
2 Clerks	180
2 Road engine drivers	400
4 do. do. conductors	120
100 Labourers (loading purposes)	400
300 Porters	1,440
Total per annum	2,940
Total for 81 months	5,980

(4) ACCOUNTS.

1 Assistant Accountant	500
3 Clerks	270
Travelling and Office Expenses	200
Total per annum	970
Total per two years	1,940

(5) MEDICAL.

1. Medical Officer	£.[illegible]
2. Hospital Assistants	500
10. do. Orderlies	100
Travelling and Office expenses	100
Total for one year	1020
Total for 21 months	1785

(6) POLICE.

1. Inspector	£.150
50 Constables @ £12 per annum	600
Office and travelling expenses	80
Total for 1 year	[illegible]
Total for 21 months	1,452.

TOTAL PERSONAL.

Superintendence	£. 5,640
Engineering	23,542
Stores and Transport	3,980
Accounts	1,940
Medical	1,785
Police	1,452
	£.36,259

2. MATERIAL.

Fuel for traction engines & Cooking	£.850
Oil and stores	100
Tents	1540
Medical Stores	50
Road Engine shed	100
Store yard and sidings	200
Water supply	200
	£.2,820

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Total General Charges £.39,079, divided proportionately between 99 miles of main line and 25 miles of timber extension.

Main Line	£.31,709
Timber Extension	7,369

ESTIMATE B & C. As it is estimated that the line from Athi River will be completed in three months less time than the Nairobi line, the terms of service of the staff have been taken as three months less.

ESTIMATE A A & Sub. XI. No rolling stock has been allowed for on the main line, the Uganda Stock being available. For the timber extension two special eight wheeled coupled tank engines with leading and trailing bogies are allowed for, to work on the 3% grades.

ESTIMATE D. These are estimated at a cost of £.5,560.

CHAPTER III.

FOREST EXTENSION AND BRANCHES.

[illegible] physical features, any line leading from the Tana to the edge of Kenia Forest is bound to have steep gradients. The foot slopes are also deeply furrowed by the numerous streams. Along the South side a line running East and West, near the forest, is practically an impossibility. On the West side a line can be run North and South, as the character of the country is of quite a different nature.

In addition to the extension detailed in estimate C above, two branches can be easily constructed one near to the South West corner of the Forest, up the River Romothambi and one to the North West corner of the Forest, running beside the River Hogati and then running parallel to the forest to the point of exit of the Gwaso Nyuki.

The forest extension already described and estimated for under estimate D was chosen to run as near to the forest as soon as possible, so that timber could be easily carted down the ridges.

It further carries out the wishes of Mr. Moreton Frewen that the route chosen for the timber line should go as far [illegible] the [illegible] of the forest as possible.

The Romothambi Branch would be 17½ miles long with gradients up to 4 per cent (1 in 25) compensated for curvature and a minimum curve of 10°. With a permanent way of 50 lbs. rails laid on local timber sleepers this branch is estimated to cost £ 43,750 exclusive of rolling stock, or about £ 2,500 per mile.

The

30

The following items are not included in the estimate, as they are not required.

Viaducts

Ballast

Telegraphs

Station Buildings (except watering arrangements)

Fencing

Only two bridges are required.

The Western branch starts from mile 81 on the main line and is 62½ miles long.

A small branch leaves it at mile 19½ and runs to the point where the Rogati River leaves the Forest, a distance of 10 miles.

A gradient of 4 per cent, (compensated) will be necessary between mile 8 and mile 20. The remainder of the line should not have a greater gradient than 2 per cent (compensated). By the use of the reversing stations to cross the rivers at miles 25.27 a minimum curve of 10° will be small enough to permit of cheap construction. Timber viaducts will be required to cross the following rivers:-

Sakumi, Segu, Nairobi and Bugnet, the last three being of no great length.

This branch line may eventually become the main line running to Lake Rudolph and the Abyssinian frontier. The already large cost of the heavy gradient would have to be overcome by doubling the locomotives over the section or possibly by electrifying.

There is a fall of nearly 400 feet on the River Rogati within three miles of the line. The water training works would however be expensive as the ground on each side of the falls is broken and falls quickly. A long length of pipe would accordingly be necessary.

The

The Western Branch is estimated to cost, exclusive of rolling stock £ 215,000, i.e. £ 3,450 per mile, laid with local sleepers. Provision has been made for telegraphs with wooden poles. Owing to the length of the line station buildings are required and are allowed for.

This Branch if built would open up the good highland country lying between Kenia and the Aberdare and the land to the North along the Guaso Nguo. The watershed between the Tana and Guaso Nguo is at a height of 7.500 feet.

There does not appear to be sufficient prospects of traffic to warrant the construction of the Western branch for many years to come. A road could easily be made along practically the same route as the proposed railway with a maximum gradient of 1 in 15. It would probably be seven miles shorter. To commence with it would not be necessary to carry it further than to abreast of Geitiati Hill, where it would meet the Nageri Embu track.

Such an unmetalled road should cost about £ 2,000 and it would act as a feeder to the railway.

CHAPTER IV.

TRAFFIC PROSPECTS.

The traffic prospects of the Nairobi Kenia Railway may be subdivided as follows:-

(1) Timber

(2) Tropical and Agricultural produce

(3) Livestock

(4) Coaching.

The various subdivisions are discussed below. The quantity of traffic likely to be available in three years time is estimated for.

A. Before discussing the timber traffic possibilities, it is necessary to examine the proposed working of the Penia forest.

On examination the forest was not found to be so large as estimated in the report of Mr.D.E.Hutchins. The average distance of the outer edge of the forest in the area examined i.e. between the Dumeo (Yuni) on the North west to the Zuchi River on the South East is from 22 to 14 miles distant from the summit of Penia, 18 Miles would be a fair average. The length of forest between the limits stated above is 55 miles i.e. along the Western and Southern sides.

As regards the width of the forest belt at the one place traversed it was found to be about 4½ miles. This distance was obtained by pacing and cannot be considered accurate.

The Northern slopes of Penia were reported by two white eye witnesses to be either bare or "very patchey" as regards timber.

The Eastern side is reported to be well timbered. A conservative estimate of the forest would therefore be.

(55 + 55/2) × 9/2 miles = 371 Square miles

= 237,440 acres.

Until the forest area has been properly surveyed the above figures, should, in the opinion of the writer be taken for purposes of estimating. The estimate is probably well on the safe side.

As regards the marketable value of the timber, the following points are worthy of consideration.

Pacific Coast Deals delivered in shiploads at Lorenco Marques cost £2/6 per 50 cubic feet.

Sailing freights Pacific Coast to Egypt are 16/- per 40 cubic feet.

It will be reasonable to take the sailing rate from the Pacific Coast and to Lorenco Marques as 20/-or say 22/- per 50 cubic feet.

including landing charges.

The value of Pacific Coast woods f.o.b. Pacific Coast would therefore be 30/6.

As regards Kenia Timber sailing freight and landing charges [illegible] timber could probably be obtained for 10/- per 50 cubic feet. In order to compete with the Pacific Coast woods the value of Kenia white wood timber at Mombasa can be taken at 42/6. that is to say 30/6 + the difference between the sea freights.

Out of the above rate of 42/6, the following have to be allowed for.

(1) Loading at Mombasa.

(2) Rail.Kenia.Mombasa.

(3) Lumbering, including interest or capital of lumber Coy.

(4) PROFIT.

(1) Loading at Mombasa may be taken as 1/6 per ton.

(2) Rail.Kenia.Mombasa at 1/2 per ton mile that is to say 1/2 per 50 cubic feet, 440 miles = 18/4.

The value of Timber loaded on trucks outside Kenia forest must therefore not exceed 22/8 per 50 cubic feet, to compete at Cape Ports with other sources of supply.

The present cost of sawn unseasoned timber in Nairobi is 80/ per 50 cubic feet. This includes 30 miles haulage by rail, and the timber is cut close to the Railway.

The price is a doubtless an inflated one, making every allowance for reduction in expense due to dealing in large quantities it does not appear that the rate of 22/8 is sufficient to pay for lumbering and loading, let alone making any profit.

There would of course be a royalty to pay which taken at the low rate of 1 a cubic foot would amount to 4 /2 per 50 cubic feet.

It would appear from the above calculations that the only possible

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possible market for the white and yellow wood timbers(podocarpus) is in the British East African Protectorate itself. There might however possibly be an opening for the export of hard wood timber to Bombay in the form of paving blocks,but there are not figures in this country to enable an estimate to be found. The freight Mombasa,Bombay should not exceed 10/- per 50 cubic feet including loading.

It is probable that the railway rate of 1/2 per ton mile would also be too heavy.

The reduction of the timber rate below 1/2 per ton mile does not seem possible until there is some assurances of a regular traffic up from the coast to save the return of empty trucks which would ensue if a timber export was started under the present trade conditions.

In the event of coal being worked near the coast a farthing rate for timber might there be given, as the trucks could return loaded.

It is a question from an economic point of view whether the export of timber from this country is desirable. Taking Mr.Hutchins figures as to stocking as averaging 2,500 cubic feet per acre it is further pointed out by Mr.Hutchins that the natural regeneration of the trees in the Kenia Forest is not strong. Until a supply of local coal is definitely assured, timber of all kinds stands a valuable asset to the Protectorate for use as fuel.

The present price of imported deals in Nairobi works out at 5/- per cubic foot,and it would therefore be to the advantage to work the forests for use in the protectorate,and not for export. Up to the present no quantity of local timber has been felled and allowed to season thoroughly before sawing.

The behaviour of local seasoned timber is still an unknown quantity,but as similar woods are worked in South Africa it may

be

be taken that rent timbers can be used locally.

The Administration report of the Uganda Railway 1906-07 gives under the head of building materials, 4,200 tons of timber as up traffic, being an increase of 1776 tons over the year 1905-06. This timber may practically be taken as all imported.

In 3 years time the consumption of timber will amount to 9,400 tons and should come from the Kenia forests.

The timber ton mileage on the line will therefore amount to 9,400 × 120 = 1,128,000 ton miles.

(2) As regards Agricultural produce, the Provincial Commissioner in Nairobi has collected information from the merchants in Nairobi and reports that 4,800 tons of produce are at present brought in from North of the River Thika. It will be a reasonable assumption that ~~xxxxxxxxx~~ this quantity will be doubled in 3 years.

For purposes of estimate it is assumed that these 9,600 tons are carried as from Fort Hall Road Station, a distance of 76 miles. This gives a ton Mileage of 9,600 × 76 = 729,600 ton miles.

Up to the present no tropical produce has been produced but the cultivation of coffee and sisal has been commenced, and there are undoubtedly possibilities of cotton being grown on the Tana Plains.

Tropical produce may therefore be estimated at 1,000 tons to be carried as from Punda Millia = 50,000 ton miles.

The "up" traffic in agricultural and tropical produce will therefore amount to 779,600 ton miles. Estimating the down traffic at 1/3 of the above the total goods traffic, exclusive of timber traffic, should amount to 1,038,400 ton miles.

The

The total ton-mileage in eight in three years time therefore amounts to 2,142,400 ton-miles. The net receipts on the Uganda Railway 1906-07 amount to 1/2 per ton mile. If the same figure be taken on the Kenia Line the goods earnings will amount to £ 4,313.

In the above estimate timber is taken as carried at the rates at present in force on the Uganda Railway, as it is not considered as carried for "export".

(3) Under the heading Livestock the following animals may be expected.

1,000 Sheep - 20 trucks

200 Cattle - 18 trucks

38 trucks

The livestock rate is 8d per truck mile,

The average cost of hauling a goods truck one mile is 5d: profit = 3d per mile.

The average haul may be taken as 75 miles.

profit = $\frac{38 \times 75 \times 3d}{240}$ = £ 35

(4) Coaching Traffic.

The following are the numbers of passengers estimated for

1st Class	200
2nd "	200
Intermediate	100
III	10,000
	10,500.

Taking these passengers as carried an average distance of 75 miles, a passenger mileage of 787500 will be reached.

The net receipt per passenger mile may be taken as 1/8d (Uganda Railway Report 1906-07)

Coaching revenue will therefore amount to £ 410.

Allowance must also be made for mails, parcels passengers luggage say £ 250

the

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The total estimated revenue for the branch in 3 years time is therefore -

Goods Traffic	4,513
Livestock	35
Coaching	410
Mails parcels etc.	250
	5,208

This sum amounts to over 1% on £ 484,686, the capital cost of route D, the line recommended for construction.

ch Railway feeder.

The capabilities of the branch as a feeder must not be overlooked.

Of the nineteen thousands tons which are estimated as being carried it will be reasonable to assume that at least two thirds of this quantity will be carried along the main line up or down. The average "leads" on the Uganda Railway is 300 miles per ton. As Nairobi is practically in the centre of the Railway a lead of 150 miles may be estimated for 12,000 tons. Taking a profit of ½ per ton mile the increase of revenue on the main line will amount to £3,750. This amounts to 2% of the profits of the year 1906-07.

CHAPTER V.

Electrification of the Nairobi - Fort Hall Kenya Railway.

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~~ription of line.~~

The length of line is 122 miles.

Gradients.

The gradients are for

For the first 99 miles.

1. 5% (compensated) in both directions.

For the last 23 miles

3% (compensated) with the traffic from Kenya Forest towards the Coast.

1. 5% (Compensated) against the traffic.

The line from the Forest, i.e. with the load falls 1700 feet between miles 122 and 72. From thence it rises 1000 feet to mile 78 and after rising [illegible] falling nine times from 50 to 100 feet, eventually rises 400 feet to Nairobi.

Water Power.

Water Power is available at miles 65 and 72 both close to the line and also at mile 78 within one mile of the line.

Power Station, Mile 65.

The power at this station is obtainable from the joint waters of the Thika and Chania Rivers. The fall available is 300 feet (at low water levels). The amount of water in the two rivers measured shortly before the little rains in what is reported as being a dry year was as follows:-

Thika 6840 cubic feet per min.

Chania 19000 " " "

The fluctuations in level of these two streams depends upon whether the rain fall is heaviest on the East or West slopes of Kinangop. The Chania River rising on the West of this mountain and the Thika on the East.

The

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The quantities given above were obtained by measuring a cross section of each river and then by taking the mean velocity of half submerged weighted sticks floating down at various points across the Section.

The [illegible] which the sticks were timed was 30 feet and the section measured was in the middle of the 30 feet. Care was taken to chose a stratch of the river in which the velocity of the water was fairly constant.

Although the season is reported as short of rain it will be safer to take 75% only of the above quantities as the minimum amount of water available. This quantity, assuming a minimum efficiency of 66% in the turbines and dynamos gives an available Horse Power of $\frac{25840 \times .75 \times 26}{33000}$ X 100 X 62.25

= 2190 H.P.

Power Station, Mile 72.

The power available at this mileage is obtainable from the Mengua River at the point where it falls into the Tana. The fall available at low level water is 260 feet, and calculating the horse power with the same factors as to quantity of water available and as to efficiency this fall will produce 2720 H.P.

Power Station, Mile 78.

If the two above stations are not [illegible] sufficient to cope with a very increased traffic or some special power scheme outside the railway demand, power is obtainable at mile 78 from the Tana River. The fall available is one of [illegible] feet at low water level, but a little blasting in the river bed would easily increase the maximum fall to 45 feet. The minimum power available calculated as

as for the Waka scheme is 1070 H.P.

Owing to the low fall existing at the point chosen and to the greater length of canal in comparison to the two previous schemes, capital cost per horse power would probably be three times as great as that of either of the other two stations.

In all the above cases it is proposed to cut a canal through the volcanic trap rock which is found at each site. The soil of the country is pervious and there is practically no clay available for puddling.

Fortunately in each case the level of the country along each bank of the river is practically as high, or in some cases higher than the height of the requisite dam. So that little built up work is required.

In estimating the cost of the above stations the following rates have been taken:-

Rockwark	£/	per 1000 cubic feet
Concrete	£6	- 100 cubic feet

Power and houses of masonry.

The prices of the electrical equipment in the power houses and on the line are taken on the assumption that single phase alternating current at a periodicity of 40 per second would be used.

Although the capital cost of single phase equipment is high it is considered that abroad in a country where skilled supervision is an expensive item, that the simplicity of a single overhead trolly wire will repay the extra capital cost.

The following conditions are also assumed:-

(1) That the locomotives consist of two bogies of three axles, each axle being fitted with a motor giving 50 H.P. at the tread of the wheel.

Weight of loco probably 36 tons.

(2)

(2) That the locomotives be arranged [illegible] control.

(3) That the locomotives will pull a load of 102[illegible] tons on a grad[illegible] of [illegible]%.

That two such trains may be at each end of the line at the same time.

[illegible] we get a maximum demand at [illegible] miles from the power Station of 1200 H.P.

Allowing a loss of 12[illegible] in energy the H.P. [illegible] Station is say 1350 H.P., but as it may be necessary to double engine one or more of the trains, the power station should be capable of supplying another 600 H.P. and 12% for loss making a total demand of 2020 H.P.

The H.P available at either of the two larger power stations described at the commencement of this report is large enough. As the [illegible] scheme has a large reserve of power it is recommended that this power house ~~be~~ to be the first erected.

The following estimate is based on figures supplied by the Verlikon Company of Zurich as regards the electrical equipment.

[illegible] RIVER STATION

Canal Work	[illegible]000
Steel Pipe	£1000
Buildings	£2000
5 Generators (one spare)	[illegible]00. 5[illegible]
[illegible] Exciters	600
5 Step up Transformers	[illegible]000
Switch Board &c.	1400
Turbines, Valves &c.	7000
Erection (Supervision)	600
Freight by sea and land	1000 1600 Tons 50/-s
	26,300
and 10% for Contingencies	2,630
Total £	28,930

Thika Power Station (spare)

Canal Work	£1200
Pipe	£1000
Buildings	£2000
Electric Equipment as above but only [illegible]	£18970
	23,170
+ 10%	2,317
	£25,487.

The over head equipment proposed consists of two light steel A brackets carrying a beam across the line. One of the A brackets is raised to carry the transmission line. The brackets are 165 feet apart, steel pull-off poles being supplied at curves where necessary. The contact wire is supported by catinary suspension, section of contact wire 8 square millimetres and (cost taken at 1/4 per lb.)

Total cost of transmission and Contact line per mile £1214.

For purposes of repairs it is proposed that the steps down transformers should be mounted on trucks and sidings with locked points put in about every fifteen miles at the exact points where experience shows they are required to give the best [illegible]

The voltage of the [illegible] line [illegible] 4500 and of the contact line 6000.

The current being generated at 6000 can be fed direct to the line on the sections near the power station.

Cost of transformers

9 Transformers or Wagons at £2000 £18,000

Rolling Stock

6 Locomotives at £4300 £25,800

Totals

Meragua Power Station	£28900
Overhead Equipment	£147908

418

Transformers	£18,000
Locomotives	£25,800
	£220,608

being at a cost of £[illegible] per mile.

The interest and sinking fund charges on £220,608 at 5% = £11,030

This sum is far beyond the prospective carrying capacity of the line for many years to come.

CHAPTER VI.

The Suitability of Fort Hall Road for Motor Traffic.

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The Fort Hall Road is 66 miles long, its maximum gradient as it at present exists is 1 in 14 but only in one or two places. There is a grade of 1 in 16 in Fort Hall itself. Steps are now being taken to reduce the maximum gradient throughout to 1 in 16.

The alignment throughout is good, there being no dangerous curves for motor traffic although some of the bridge approaches required caution.

The surface of the road consists of the soil in situ with the exception of those places where the road traverses black cotton soil it has been ballasted with a ferruginous soil known as murrum. Murrum is of fairly frequent occurrence and makes a good surface for light traffic. A volcanic trap rock is found practically everywhere at depths varying from on the surface to three feet down.

The road is impossible for motor traffic during about three months during the year, that is to say [illegible] during the big rains and one month during the little rains.

Messrs. Swift and Rutherford of Punda Millia have an 8½ ton tractor which pulls three trailers weighing 35 hundred-weight each, and carrying in all 8 tons, which travels along the road occasionally in the dry weather without much apparent damage, but if the road be damp, the surface "balls" and adheres to the wheels, tearing up the road.

In really wet weather the tractor cannot be used as not only does the surface break up but the road is too soft over the cotton soil stretches, to carry the weight.

The bridges which were originally made of wood are being replaced by steel girders and stone abutments. They were designed to carry up to 20 ton rolling load on a 20 feet span.

The road as it stands is not fit for continuous motor traffic throughout the year. In order to render it suitable it will be necessary to ballast the road and allowing for ballast 9 feet wide and 1 thick, this will cost £357 per mile. The following are the particulars on which the above estimate is based.

Cost of ballast.

2 rupees per 100 cubic feet. Labour say 3 rupees a 100 cubic feet for spreading and consolidating. Allow four culverts per mile 12 inches to 18 inches earthenware pipe set in concrete where necessary - £132. Ditches two feet deep, three feet wide along say 30 miles of road .....=£126.

Nairobi-Fort Hall Road.

for ballasting &c.

Ballasting and consolidating £17,618

Culverts 1,584

Extra ditches £ 126

£19,070

Plus 5% Contingencies 954

£20,050

= £357 per mile.

Working cost of Traction Train.

If 2 light traction engines and eight trucks be obtained, and each engine be run one trip to Port Hall and back per week with three trucks, goods can be carried at a reasonable rate and interest paid on the road improvement.

The following are the particulars:-

26 H.P. Nominal Traction Engine

2 at [illegible] ton 15 cwt. at £1000 £2000

[illegible] ton waggons at £35 280

Total £2280

Add for freight and erection 200

£2480

5% for interest and 10% for depreciation

on £2,480 = £369 per annum
= £7 per week

The following crews will be required

2 drivers at £200 each per annum £400

[illegible] at [illegible] per annum [illegible]

[illegible]

= £8.13 per week.

The useful load of each engine is 12 tons. Allow 8 tons only each [illegible] load carried for the double trip for two engines [illegible] tons over 76 miles. The fuel consumption can be taken at 24 lbs. [illegible] per ton [illegible]

Wood fuel costs [illegible] per 100 cubic feet and one cubic foot weighs 40 lbs.

	Tons.	cwt.
Weight of engine	9	15
do. trucks (3)	7	10
do. paying load	8	0
	25	5

$\frac{21 \times 2 \times 25\frac{1}{4} \times 56 \times [illegible]}{40 \times 100}$ = price of fuel consumed a double journey.

Fuel per engine = £2-16 per week £ S

Total for 2 engines per week 5.12.0

Add for oil and small stores 1. 0.0

6.12.0

The total expenses per week are therefore-

Interest and depreciation on rolling stock	£7.0
Engine crews	8.13
Fuel and oil	6.12
	£22.5
Add for clerking, office expenses repairs to stock etc say	6.0
Total per week	£28.5.

per mile
e charged

Before fixing a rate per ton mile to charge, it is necessary to compare existing means of transport.

Goods are at present carried either by oxwagon at 1/- per ton mile or else by porters at 1/4 per load of 60lbs, for the distance of 56 miles.

To carry 32 tons 56 miles by oxwagon costs £.89.12

It is only fair to assume that competition will bring down this rate say 1/3. The transport of 32 tons would then cost £.59.14 = 6d per ton mile.

To carry 32 tons 56 miles by porter, costs

32 [illegible] = £.79.12.0. = 10½ per ton mile.

This rate is not likely to be reduced.

The interest on £.20,030 at 3 is 600 = £.11.10 per week.

The total weekly cost of carrying 32 tons 56 miles by motor traction, including the interest as above is £.39.15 per week. £.44.16 can be earned at 6d per ton mile.

It would however be better policy to charge 7d per ton mile. This would ensure a profit of £.1.1.10 per week provided full loads of 16 tons each way were available.

From information supplied by Mr. Hobley, Provincial Commissioner in Nairobi, over 4,000 tons are estimated to be brought in from the North of the Thika River every year, the larger portion being from Fort Hall and beyond. There is apparently no reason to expect any difficulty in getting full loads

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loads into Nairobi, though there may be some difficulty in getting loads out.

No allowance in the above calculations has been made for road repairs, it being considered that this charge should be made against the public works Department as the road is for the use of all.

The existing road is getting damaged by the narrow tyres of ox wagons used by the Indian Traders, and this damage is accentuated by the fact that the oxen follow very closely in tracks. It is therefore advisable that an order be published limiting the weight per inch of width of tyre of vehicles.

The reconnaissance of the Nairobi Kenia Railway has been carried out by the following staff:-

Captain A.C.Stevenson,R.E.

Lieutenant H.F.L.Hall,R.E.

During a portion of the reconnaissance,the party was accompanied by Mr.A.E.Fawcus the representative of the East Africa and Uganda Corporation.

The routes actually traversed are as follows:-

From Nairobi following the line proposed by the East Africa and Uganda Corporation to Embu,from thence to the Zuchi River and along the foot slopes of Kenia to the River Romo Chambi.

The country between the Tiba River and the Kipingazi was also carefully examined.

Lieutenant Hall was then detached from the main party to make a plane table triangulation on which the compass traverses already made could be based.

Advantage was taken of points erected by the Director of Surveys East Africa Protectorate for his triangulation and as time progressed the values of these points were supplied by him.

Captain Stevenson accompanied by Mr.Fawcus examined the country on both sides of the Tana down to its junction with the Mathingeta and after visiting Fort Hall line up to Punda Millia it was found necessary to trace the line with a clinometer owing to the uncertain results obtained from trusting to Aneroid Readings.

From Punda Millia the route proposed by the East Africa and Uganda Corporation was examined in detail back to Nairobi, Mr.Fawcus then left the party.

After spending a few days in Nairobi mapping and refitting the party. Captain Stevenson and Lieutenant Hall marched up parallel with the Uganda Railway to Limoru Station and from,thence proceeded across country towards Kenia,keeping an altitude of over 7,500 feet.

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It was soon found that the country was impracticable and when the Kiga - Fort Hall Road was reached the party descended to Fort Hall. A tour was then made across the Tana extending as far North as the Gagama River and as far East as the Romothambi, owing to the intersected nature of the country a close inspection of the ~~ground~~ was necessary. During this trip the forest was traversed near the Romothambi River.

On returning to Fort Hall the party again started off North, but this time on the right bank of the Tana and passing through Nyeri eventually reached the North West corner of Kenia Forest, at the point where the Guaso Nyuku crosses the Equator. From here Southward the country was examined for the possibilities of a line running North and South. A certain amount of delay was caused by rain and the necessity of bridging two rivers in flood. The two officers returned to Fort Hall via Swahili Village so as to further examine the country between the Romothambi and Rogati Rivers.

On the return of the party from Fort Hall to Nairobi the road was examined with a view to its suitability for motor traffic.

On arrival at Nairobi, Captain Stevenson took in hand the writing of this report while Lieutenant Hall examined the country between Nairobi and Doniyo Sapuk going as far out as Punda Milia and returning to the Athi River Station.

The country examined by the reconnaissance party has an area of about 30,000 square miles.

This necessitated marching upwards of 900 miles, and has taken 3½ months in the field.

Three plates accompany this report.

Plate I is a map of the country between the Uganda Railway and Kenia to a scale of 1/125,000. On it have been drawn the routes described in this report.

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The existing intelligence map 1/250,000 was not found sufficiently accurate for use, Fort Hall being found to be nearly 9 miles further north than shewn.

Plate II is a section shewing the country traversed by Routes A. & B. It is drawn to a scale of 1 inch to 4 miles horizontal and 1 inch to 400 feet vertical.

As regards route C. the section can be obtained by drawing a line from Ruiro River on Route A to the Athi River on Route B.

The lengths cannot be taken as accurate, being based on aneroid readings.

Plate III. gives in plan and section the possible sources of water power on Route A.

Every assistance was given to the party by the officials of the Protectorate and the Uganda Railway officers.

From the latter, information with regard to local rates and prices was obtained.

Sd/ A.G.Stevenson.

Jinja,

December 3rd 1907.

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MEMORANDUM.

I have very little to add to this excellent report which appears to me to deal fully and accurately with all points of importance.

I consider the estimates are reasonable and as regards "General Charges", page 25, I endorse what Captain Stevenson has said.

It would save considerable expense if, in the event of the line being undertaken, it was placed as a construction branch under me; by this means no separate source or accounts Departments would be required only the necessary extra staff to work under the existing Chief Storekeeper and Chief Accountant.

The provision under the Engineering may at first sight appear high, that is three division for 128 miles, and five white men per division. I consider however that this is quite the minimum that will be found necessary to efficiently handle African labour. We know by experience that constant personal attention is absolutely essential to get any work at all out of these men.

I do not share Captain Stevenson's fears that the export of timber from Kenya would be liable to endanger the amount of timber and fuel available in the country because I have no doubt whatever but that if export was begun on a large scale the Forest Department would see to it that reafforestation was also begun on a corresponding scale. These figures go to show however that to export this timber at a profit is not financially feasible. The rate of half penny per ton per mile is the lowest we can possibly offer to carry it for that

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from the forest to the sea.

It is of course impossible to give even approximate figures of what the general traffic on the line is likely to be. Captain Stevenson has however shown that it is very improbable that it will earn much for the first few years.

Electrification is out of the question until the traffic has developed sufficiently to justify the extra capital outlay.

I think that this report shows that it will be as well to wait until Captain Stevenson has reported on the Jinja - Kakoge and Entebbe Lake Albert projects. The relative advantages of them all can then be compared and we shall be in a position to say which route is most likely to advance the general interests of East Africa and Uganda.

Sd/- J.A.F. CURRIE

Nairobi,
December 19th, 1907.

[illegible]

I have the honour to submit the following report on the land along and for some distance on either side of the alternative suggested Railway routes from the junction of the M'Kikuyu and Rewera rivers to Messrs. Swift and Rutherford's farm (Punda Millia) as outlined by Captain Stevenson in blue pencil on the accompanying map.

I. The area within a zone of ten miles on the western side of the suggested upper or western route is very healthy and the land is exceedingly fertile. It is suitable for intensive culture and will maintain a dense population, more especially if irrigation is resorted to.

II. Much of the land in this zone could be brought under the influence of irrigation at a very small outlay and as the settlers are now asking for authority to take water from the various streams and rivers which run through this area of land we may expect within a reasonable period a large and regular production of farm products.

III. Most of these products would be forwarded by rail if the line were constructed.

IV. Immediately to the West of the suggested upper route the soil is somewhat shallow and overlies a murrum formation and would appear to be better adapted for pastoral than agricultural farms and therefore provide but little towards Railway traffic.

5.

V. The land on either side of the suggested lower route from the Fewera through Schwatzal's and Major Binger's farms is extremely poor in quality. Proceeding northwards along the route to the Thika river, the soil improves in fertility and agricultural farming is possible. The area may however be considered a pastoral proposition. Across the Thika and on to Punda Millia the soil is deep and fertile and it is probable large areas on either side of the suggested lower line and between these two points will be brought under cultivation.

VI. Notwithstanding the difference between the capital cost of the two routes viz:- £9K,000 I strongly favour the upper route. The district immediately to the west is a desirable district for white settlers and as already stated a large area can be brought under irrigation and intensive farming pursued, and given a few years for development I am of opinion that the interest on the above sum would not be too high an extra charge for the line to carry.

Sd/- A.C.MACDONALD
Director of Agriculture.

Nairobi,
January 17th 1908.

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Minute.

I regret having overlooked your minute I thought the papers only came to me to note.

From Captain Stevenson's report I do not consider that it is financially feasible to export Kenya timber in bulk. If however it is feasible to do so this Railway will bebuilt for that purpose and I favour the Athi river route (Route B.)

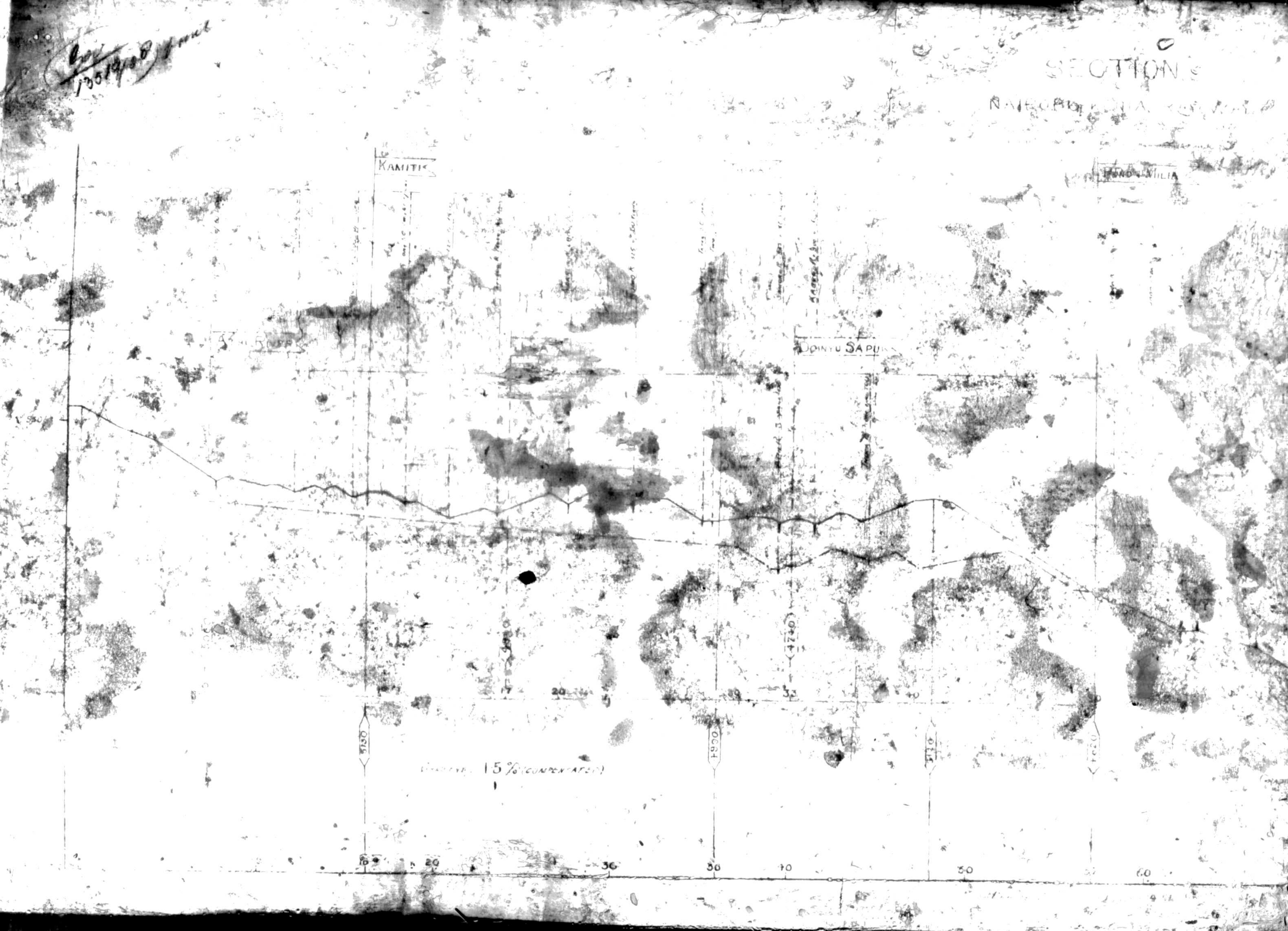
If the Railway is built as a feeder only I favour the route recommended by Captain Stevenson (Route D.)

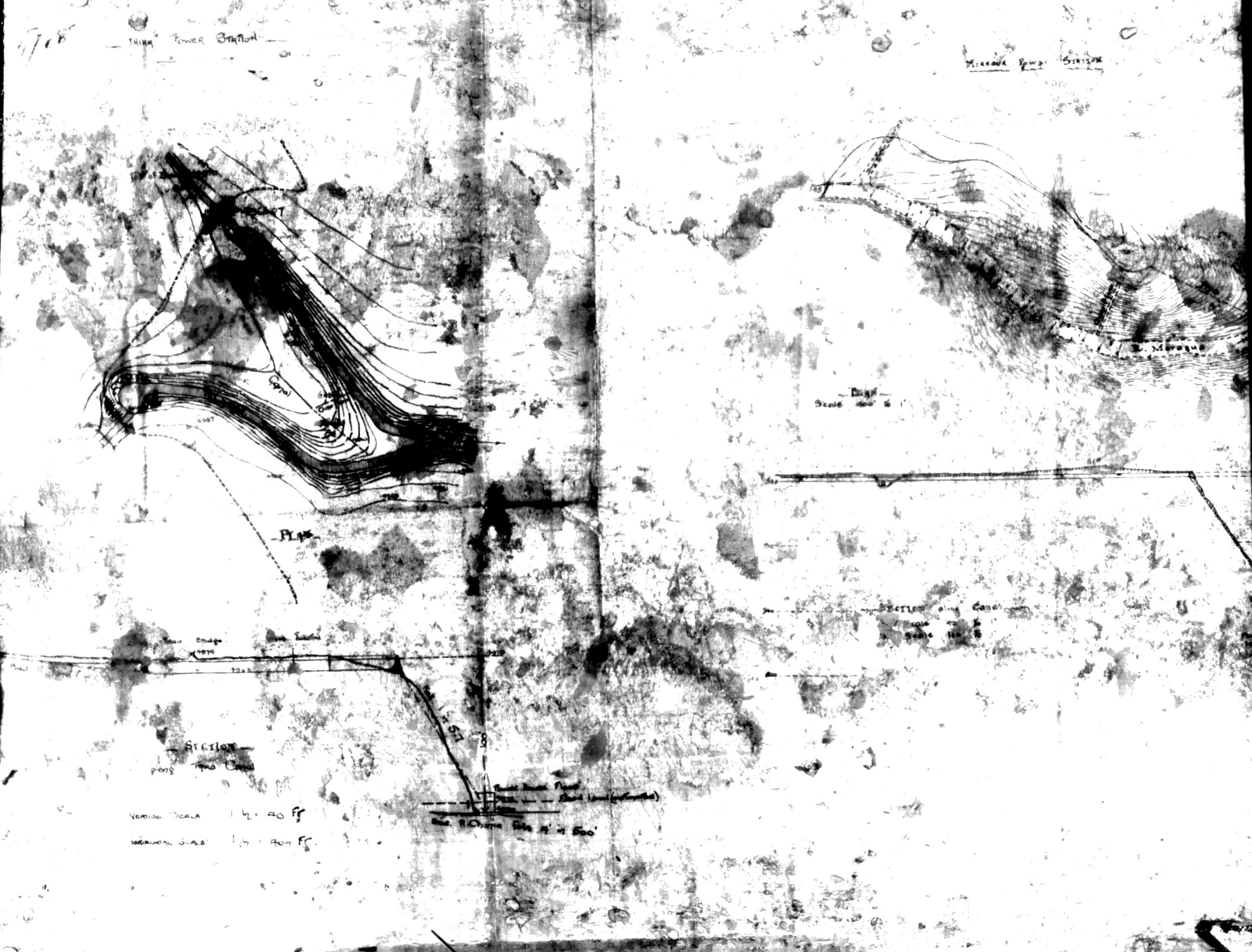
I fancy however that the [illegible] Butiaba lines are more likely to advance the future of Africa than this line.

Sd/- I.A.E.CURRIE

Nairobi,

March 20th 1908.


SECTIONS
KAMITI
DOINYO SAPUK
5130
4900
4740
1 5% (COMPENSATED)
10
20
30
50
40
60



Thika Power Station
Plan
Section
Vertical Scale 1 in 40 Ft
Horizontal Scale 1 in 400 Ft
Power Station