	<b>WESTERN REGION</b>		
	<b>Preliminary Design Document</b>		
	<b>Cover Sheet</b>		
<b>Job Name:</b>	Kommagas Buffelsrivier Integration	<b>Job Rev.</b>	0
<b>Job ID:</b>	3353A		
<b>TEF Doc. No:</b>	TEF 2010/077	<b>Doc. Rev.</b>	0

<b>Business Process:</b>	Strengthening
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<b>Interdependent Jobs:</b>		
<b>Job ID</b>	<b>Description</b>	<b>Status</b>

<b>Compiled By</b>		<b>Checked By</b>	
<b>Name:</b>		<b>Name:</b>	Zoleka Sisilana
<b>Tel:</b>		<b>Tel:</b>	021 980 3681
<b>Date:</b>		<b>Date:</b>	
		<b>Project Engineer</b>	

<b>Supported By</b>		<b>Approved By</b>	
<b>Name:</b>	Hasheem Hendricks	<b>Name:</b>	Vikesh Bhikha
<b>Tel:</b>	021 980 3542	<b>Tel:</b>	021 915 2839
<b>Date:</b>		<b>Date:</b>	
<b>Project Engineering Specialist - Rural MV Retic &amp; Electrification</b>		<b>Project Engineering Manager MV Systems</b>	

## WESTERN REGION - Key Role Players -

	Name	Telephone
<b>Project Initiator:</b>	Suné Coetzee	021 980 3569
<b>Project Engineer:</b>	Zoleka Sisilana	021 980 3681
<b>Project Co-ordinator:</b>	Shantal Gordon	027 213 3944
<b>Programme Manager:</b>	Robert Adonis	021 980 3832
<b>Electricity Delivery:</b>	Vacant Leon Drotsché	
<b>Field Services:</b>	Kolodi Makola Nolan Ockhuis Manie Kotzé Zaid Ouardien Mario Eygelaar	
<b>Plant:</b>	Thabo Mogalanyane Hennie Mostert Attie Coetzee	
<b>Project Engineering:</b>	Vikesh Bhikha Hasheem Hendricks	
<b>Land Development:</b>	Barbara van Geems Graham Hector Martin Keulder	
<b>MEW</b>	Michelle Weideman	
<b>Network Operations:</b>	Tony Taute Naniki Lukhele	
<b>Network Planning:</b>	Riaan Smit	
<b>Technology &amp; Quality:</b>	Leon Christiaans Stefan Terblanché	

# INDEX

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# Section 1

## Required Scope

## 1. Required Scope

Build a Fox line from Kommagas 22kV supply line to the pump station - 14.5km. T-off from Kommagas 22kV supply with recloser on Kommagas and Buffelsrivier leg. (Utilising D-DT-1825).

Install pump station transformer out of line.

Buy over Munic line – Quote received.

Build a Fox line from start of Munic line to metering point. (Approx 2.7km)


Convert Buffelsrivier 11kV into 22kV; including the transformer to the pumps

Roughly 27 points with installed capacity of 850kVA. This solution is also more cost effective than to refurbish the Municipal network for Eskom's use.

Remove Buffelsrivier 11kV recloser and 11kV metering unit (re-use by TSC).

# **Section 2**

## **MV Retic Conceptual Design**

	<b>WESTERN REGION</b>		
	<b>Rural MV Reticulation</b>		
	<b>Conceptual Design</b>		
<b>Job Name:</b>	Kommagas Buffelsrivier Integration	<b>Job. Rev.</b>	0
<b>Job ID:</b>	3353A	<b>Doc. Rev.</b>	0

## 1. Background

Currently Kommagas have no Voltage Regulators or Shunt Capacitors. The total backbone length is  $\pm 7.5$ km, with FOX conductor. The feeder does not experience any voltage or thermal problems. Buffelsrivier is currently supplied via Spektakel, a 33/11kV substation of Nama Khoi municipality.

This substation is not in a good condition, as no maintenance is being done in and around this substation. This means that Eskom does not have any control of the quality being fed into the 11kV network. This 33/11kV transformer will not be easily replaceable if damage/fault occurs on the transformer, because this is not a standard transformer size in the area.

## 2. CRA Project Scope

- Build a Fox line from TR41 to Coordinate S: 29°42'10.53" E: 017°31'51.72"
- Convert Buffelsrivier 11kV into 22kV, including the transformer to the pumps Roughly 26 points with installed capacity of 850kVA.
- This solution is also more cost effective than to refurbish the Municipal network for Eskom's use.
- Remove Buffelsrivier 11kV recloser and 11kV metering unit.

### 2.1. Project Scope as per Survey and scoping/site meeting

- Build a Fox line from Kommagas 22kV supply line to the pump station - 14.5km. T-off from Kommagas 22kV supply with recloser on Kommagas and Buffelsrivier leg. (Utilising D-DT-1825). Will be preferred option to be presented at TEC.
- Install pump station transformer out of line.
- Buy over Munic line – Quote received. Martin will confirm with Manie and Sune.
- Build a Fox line from start of Munic line to metering point. (Approx 2.7km)
- Convert Buffelsrivier 11kV into 22kV; including the transformer to the pumps Roughly 27 points with installed capacity of 850kVA. This solution is also more cost effective than to refurbish the Municipal network for Eskom's use.
- Remove Buffelsrivier 11kV recloser and 11kV metering unit (re-use by TSC).

## 3. Conductor and Insulators

- The line will use Fox conductor templated at 70°C.
- The insulators will be silicone rubber long rods 22kV 40kN 31mm/kV for Strains and Intermediates will use the line posts silicone 22kV 10kN 31mm/kV.
- For road crossing with intermediates line post silicone 22kV 10kN 31mm/kV will be used and with strains long rods with pistol grips will be used.

#### **4. Strains and Intermediate structures**

- All intermediates, strains, T-off and terminal structures will be done with 11m 160mm and 180mm top diameter wood poles respectively.
- All inline strains will have 1 stay with stay in each direction
- Terminal and T-off structures will be stayed by 1 stay.
- All angle strain structures will be stayed by using a minimum of two stays, of which the stays will be inline with the line.
- Conductor to be tensioned to the RSAT 5.1 sag and tension tables.
- All steel frames (A-Frames) must be Heavy duty Galvanized to SANS 1461

#### **5. Load Break Switch**

- Load break switches to be installed at the position advised by the TSC
- Install the Load break switch as per DWC 6470-20-02-00 drawing.
- The Load break switch will be mounted on in inline A-frame strain structure.

#### **6. Recloser**

- Two reclosers will be installed at both legs one at the existing Kommagas Kommagas and the other at the new Kommagas Buffelsrivier.(see more info at the constructability notes)
- Recloser to be installed as per drawing DDT 1825.

#### **7. Constructability of the line**

- Two Reclosers will be installed in both the legs (one existing and the other new) as the new line will T-off at the existing Kommagas Kommagas feeder. This is done in the interim as there is no feeder bay to cater for this new line yet. Planner to plan for the new feeder at the Substation. The reclosers will have no bypass.
- The existing terminal on the Spektakel side will be converted to an angle strain to pick up the new line from Kommagas side.
- The Recloser and Metering at Spektakel will be removed and be reused by the TSC; their structures will be used in the T-off to BR 12 transformer point.
- Replace the about 27 11kV transformers with 22kV ones on the Spektakel Buffelsrivier feeder.
- The transformer structures and earthing doesn't need changing as it was done on the project by the TSC in the last 2 years.
- Phase rotation will be done on the day of replacing the transformers and the TSC has a proposal for doing transformer changing: - to have many teams in order for a team of three people to do one transformer at a time with a 12hour outage.
- The Munic transformer will be done out of line.
- The two T-offs to (BR 12 and 97K5298) on Spektakel Buffelsrivier will remain with their fuses.



# Section 3

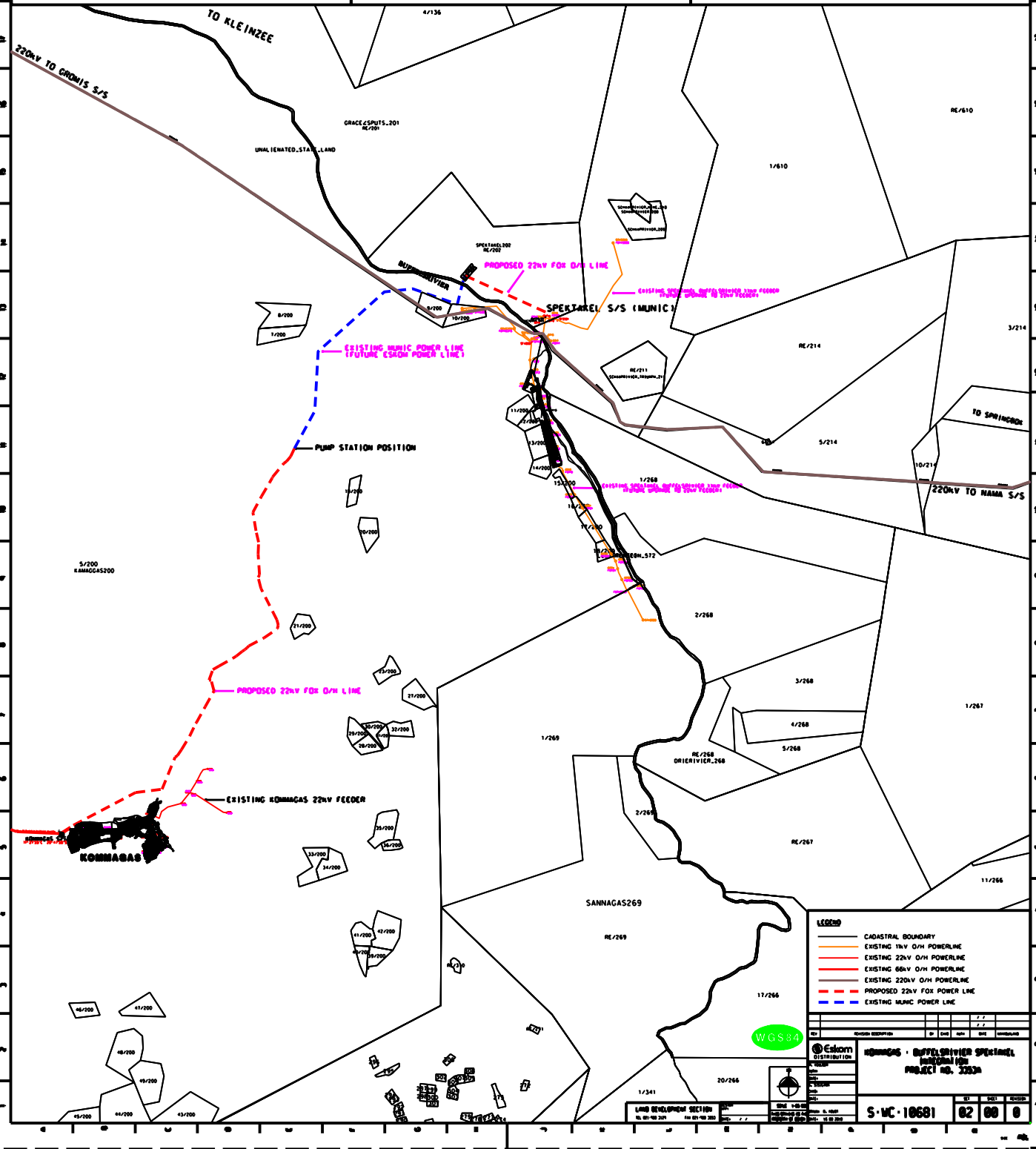
## Route Map

THIS EHS IS ONLY A PROPOSED DIAGRAM AND SHOULD NOT BE USED. DEPT TO FINALISE EHS & FUSE POSITION BEFORE COMMISSIONING.

BUFFELSRIVIER SPEKTAKEL SHEET 1 OF 1

LOCALITY PLAN 2917 CD & 2917 DC SCALE 1:50 000

LOCALITY PLAN 2917 DA SCALE 1:50 000



**LEGEND**

- CADASTRAL BOUNDARY
- EXISTING 11kV O/H POWERLINE
- EXISTING 22kV O/H POWERLINE
- EXISTING 66kV O/H POWERLINE
- EXISTING 220kV O/H POWERLINE
- - - PROPOSED 22kV O/H POWER LINE
- - - PROPOSED 22kV FOR O/H LINE
- - - EXISTING MUNIC POWER LINE

WGS 34		Eskom Distribution	
Kommagas - Buffelsrivier Spektakel		PROJECT NO. 3353A	
S.W.C. 10681		02 00 0	

# **Section 4**

## **Bill of Materials**

**Kommagas Buffelsrivier Integration  
-3353A**

A..16.4km Fox A-Frame Line

QTY	DESCRIPTION	BMS CODE	UNIT COST (R)	% of TOT/	
136	INT CAPE A-FRAME FOX PORC 10KN 31MM/KV	RWSZIBZZR PF ZZ	1281.61	174298.96	23.42
15	STRAIN (0) CAPE A-FRAME FOX ELBROC	RWSZIEZZZ EF ZZ	1252.42	18786.30	2.52
1	1784 (TRIPS) 22KV COASTAL FOX ROAD CROSSIN	74002WCH#R##	2619.84	2619.84	0.35
30	STRAIN (0-60) CAPE A-FRAME FOX ELBROC	RWSZIEZZZ EF ZZ	1252.42	37572.60	5.05
3	STRAIN(60-90) CAPE A-FRAME FOX ELBROC	RWSZIGZZZ EF ZZ	2684.65	8053.95	1.08
1	TERMINAL CAPE A-FRAME FOX ELBROC 40KN	RWSZIHZZZ EF ZZ	1014.27	1014.27	0.14
2	T-OFF T-FRAME FOX ELBROC FLAT DELTA	RWSZJGZZZ EF FL	R 2,146.13	4292.26	0.58
136	Wood Pole 11m 160mm Top D0051	RWSEZZZZT ZZZZ	699.16	95085.76	12.78
47	Wood Pole 11m 180mm Top D0051	RWSMZZZZT ZZZZ	836.94	39336.18	5.29
5	Wood Pole 12m 160mm Top D0051	RWSGZZZZT ZZZZ	556.6	2783.00	0.37
2	Wood Pole 14m 180mm Top D0051	RWSNZZZZT ZZZZ	1090.24	2180.48	0.29
48	TAP CONNECTOR T-OFF ANGLE TAP FOX/FOX	RWGTCONAT FX/FX	18.67	896.16	0.12
187	PLATE,BLANK ALU POLE MK 25X150 D3049	0172393	5.67	1060.29	0.14
100	MV STAY C/W DOUBLE WRAP 380SQ	RWSZZZGZ ZZZZ	387.55	38755.00	5.21
49287	ELEMENT MVF - CONDUCTOR - 35MM ACSR FOX	RWCMVF ZZZZ	4.29	211441.23	28.41
1870	Cement Portland General Purpose 50kg Bag	0114720	49.66	92864.20	12.48
187	Sand Import in m <sup>3</sup>	0401060	70.00	13090.00	1.76
40	MV ROCK ANCHOR C/W DBL WRAP G/GRIP	RWSZZZIZ ZZZZ	352.53	14101.20	1.89
<b>STOP</b>					100.00
		<b>Material Cost Only (unescalated) Total (excl. VAT)</b>	<b>744130</b>		
		<b>Material Cost/km</b>	<b>45319</b>		

Project Name: Kommagas Buffelsrivier Integration  
 Project No.: 3353A  
 Region: Western Region  
 Project Engineer: Zoleka Sisilana

Rev date

23 May 2006

RATE/POINT: R 476.00

Line BOQ

REV 10

CODE	DESCRIPTION	UNIT	QTY.	LABOUR & PLANT							MATERIAL		
				Burden %	RATE (R)	POINTS/UNIT	HOURS	TOTAL HOURS	TOTAL (R)	POINTS TOTAL	SUPPLY Y/N	RATE (R)	TOTAL (R)
<b>L004000</b>	<b>Setting Out Of Pegs</b>												
L004010	Setting Out Of Pegs	each	290.0	0.00	23.80	0.05	0.20	58.00	6902.00	14.50		0.00	0.00
<b>L005000</b>	<b>Dig/Drill Holes</b>												
L005060	Dig/Drill Holes Depth: 1.8 to 2.0m Rock	each	18.0	0.00	428.40	0.90	3.60	64.80	7711.20	16.20		0.00	0.00
L005080	Dig/Drill Holes Depth: 2.0 to 2.5m Rock	each	2.0	0.00	476.00	1.00	4.00	8.00	952.00	2.00		0.00	0.00
L005100	Stay Hole - MV	each	100.0	0.00	285.60	0.60	2.40	240.00	28560.00	60.00		0.00	0.00
<b>L007000</b>	<b>Excavations</b>												
L007020	Excavations intermediate	m <sup>3</sup>	15.0	0.00	1190.00	2.50	10.00	150.00	17850.00	37.50		0.00	0.00
<b>L009000</b>	<b>Backfill and Compact</b>												
L009010	Backfill and Compact Normal	m <sup>3</sup>		0.00	85.68	0.18	0.72	0.00	0.00	0.00		0.00	0.00
L009020	Back/Compact Sand/Cement Mixture	m <sup>3</sup>	187.0	0.00	119.00	0.25	1.00	187.00	22253.00	46.75		0.00	0.00
<b>L021000</b>	<b>Layout of poles/struts up to 15m</b>												
L021030	Layout Pole - 7-14m Wood	each	190.0	0.00	238.00	0.50	2.00	380.00	45220.00	95.00		0.00	0.00
<b>L022000</b>	<b>Assemble Structures</b>												
L022020	Assemble Structures - MV X-arms (Steel)	each	190	0.00	71.40	0.15	0.60	114.00	13566.00	28.50		0.00	0.00
L022030	Assemble Structures - MV Insulators	each	1122	0.00	38.08	0.08	0.32	359.04	42725.76	89.76		0.00	0.00
L022050	Bonding and Fitting BIL	m	1	0.00	5.95	0.01	0.05	0.05	5.95	0.01		0.00	0.00
<b>L023000</b>	<b>Erect poles/struts</b>												
L023090	Erect Poles/Struts - 11-14m Wood	each	190.0	0.00	428.40	0.90	3.60	684.00	81396.00	171.00		0.00	0.00
<b>L024000</b>	<b>Install stays &amp; Backfill</b>												
L024010	Install Conventional Stays & Backfill - MV	each	100.00	0.00	178.50	0.38	1.50	150.00	17850.00	37.50		0.00	0.00
<b>L025000</b>	<b>Stays: Make-off</b>								0.00				
L025010	Stays: Make-off - Conventional/Mule Stays	each	100	0.00	178.50	0.38	1.50	150.00	17850.00	37.50		0.00	0.00
<b>L027000</b>	<b>Stringing MV &amp; LV</b>												
L027010	Run Out/Hang Conductor MV Bare-Fox	ph/m	49287	0.00	3.57	0.01	0.03	1478.61	175954.59	369.65		0.00	0.00
L027020	Tension/Regulate & Bind In-Fox	ph/m	49287	0.00	3.57	0.01	0.03	1478.61	175954.59	369.65		0.00	0.00
<b>L030000</b>	<b>Finishing of MV &amp; LV Structures</b>												
L030010	Finishing of MV Structures - Intermediate	stru	136	0.00	119.00	0.25	1.00	136.00	16184.00	34.00		0.00	0.00
L030020	Finishing of MV Structures - Strain/Terminal/T-Off	stru	54	0.00	142.80	0.30	1.20	64.80	7711.20	16.20		0.00	0.00
L030085	Labeling - Attached	each	187	0.00	29.75	0.06	0.25	46.75	5563.25	11.69		0.00	0.00

Project No.: 3353A  
 Region: Western Region  
 Project Engineer: Zoleka Sisilana

RATE/POINT: R 476.00

Line BOQ

REV 10

CODE	DESCRIPTION	UNIT	QTY.	LABOUR & PLANT							MATERIAL		
				Burden %	RATE (R)	POINTS/UNIT	HOURS	TOTAL HOURS	TOTAL (R)	POINTS TOTAL	SUPPLY Y/N	RATE (R)	TOTAL (R)
<b>L033000</b>	<b>Dismantling</b>												
L033020	Loosening/slacking of conductor (3 phase)	stru	4	0.00	57.12	0.12	0.48	1.92	228.48	0.48		0.00	0.00
L033030	Rolling up/Cut-up/Removal - Conductor	ph/m	40	0.00	4.76	0.01	0.04	1.60	190.40	0.40		0.00	0.00
L034010	Bringing Down of Stays - Cut-off	each	2	0.00	119.00	0.25	1.00	2.00	238.00	0.50		0.00	0.00
L034020	Bringing Down of Stays - Total Removal	each	6	0.00	285.60	0.60	2.40	14.40	1713.60	3.60		0.00	0.00
<b>L035000</b>	<b>Disassemble Structures</b>												
L035020	Disassemble Structures - Steel Frames	each	4	0.00	71.40	0.15	0.60	2.40	285.60	0.60		0.00	0.00
L035030	Disassemble Structures - MV Insulators	each	24	0.00	23.80	0.05	0.20	4.80	571.20	1.20		0.00	0.00
<b>L036000</b>	<b>Removal</b>												
L036010	Removal of Structures - Wood Poles	each	4	0.00	95.20	0.20	0.80	3.20	380.80	0.80		0.00	0.00
	<b>sub-total: production</b>							5859.98	697337.62	1465.00			0.00
	<b>Sub-total: contractor activities</b>							0.00	0.00	0.00			0.00
BBB6	Outages	man-hrs	100.0		119.00	0.25	1.00	100.00	11900.00	25.0		0.00	0.00
BBB7	Off-loading of material	man-hrs	40.0		119.00	0.25	0.75	30.00	4760.00	10.0		0.00	0.00
BBB9	Other	man-hrs	80.0		119.00	0.25	0.42	33.36	9520.00	20.0		0.00	0.00
	<b>sub-total: standing time</b>							163.36	26180.00	55.00			0.00
<b>TOTALS:</b>								6023.34	723517.62	1520.00			0.00

NO. OF PEOPLE	10
PROJECT DURATION (FOR ONE PERSON) =	752.92
PROJECT DURATION (WHOLE TEAM) =	75.29

TOTAL: LABOUR, PLANT & MATERIAL: R	R 723,517.62
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Prepared by : MEW TCO	DATE	Agreed by : PROJECT CO-ORDINATOR PROJECT CO-ORDINATOR CPD	DATE
Approved by : MEW MANAGER	DATE	Accepted by: PROJECT MANAGER CPD	DATE

**Nabo F4 Line Refurbishment (877HH)  
11kV 16km Oak Line**

**27 transformers and Surge arrestors**

QTY	DESCRIPTION	BMS CODE	UNIT COST (R)	% of TOTAL	
6	1866 22KV COASTAL FOX 3PH 50KVA 3.5M	1866WCF3D3#	23990.24	143941.44	50.98
14	1866 22KV COASTAL FOX 3PH 25KVA 3.5M	1866WCF3C3#	1740.32	24364.48	8.63
1	1860 22KV COASTAL FOX 2PH 32KVA	1860WCF2B##	16385.28	16385.28	5.80
5	1860 22KV COASTAL FOX 1PH 16KVA	1860WCFAA##	12318.14	61590.70	21.82
1	1860 22KV COASTAL FOX 3PH 100KVA	1860WCF3E##	36045.45	36045.45	12.77
<b>STOP</b>					<b>100.00</b>
		<b>Material Cost Only (unescalated)</b>			
		<b>Total (excl. VAT)</b>	282327		

**Kommagas Buffelsrivier Integration  
-3353A**

**B.2xRecloser structure - H-pole with 16KVA transformer**

QTY	DESCRIPTION	SAP	UNIT COST (R)	Total Cost
	ISOL 3PH 22kV 400A 8kA H-POLE	0186428	25730.00	0.00
4	SET SCREW,HX GALV M16x40 NUT+WASH D3082	0080725	1.83	7.32
4	ROD,THREADED GALV M20X350 WASH+NUTSD3015	0163790	19.31	77.24
2	Wood Pole 9m 160mm Top	0164561	299.55	599.10
4	Wood Pole 12m 180mm Top	0164572	793.75	3175.00
72	COND. ACSR FOX 8.37D UNGRS	0171330	4.29	308.88
60	Jumper covering LDPE Pipe Type4 Cls 10 20ID	0163530		
12	Jumper Covering BPTM	8000021	50.00	600.00
12	Clamp PG 2B AL-AL 4-15 Dia M+T	0165495	14.02	168.24
30	TAP CONN,TOFF 9.0-15.0 I/C D3153	0175985	35.25	1057.50
4	TIE,TOP GRVE B/FOX/35 COAST D3081	0179976	25.36	101.44
4	Insul Line Post Silicone 22kV 10kN 31mm/kV D3017	0216686	190.00	760.00
4	Pin Insul M20x250	0168499	22.95	91.80
8	Bird Diverters HDPE 250MM - Steel X-arm	8000017	50.00	400.00
2	Platform Equipment H-Pole 2600mm Channel	0175465	770.00	1540.00
				0.00
0.1	WIRE STRAND-ST 3x3.35 1100MPA	0163344	80.56	8.06
0.22	STAPLE-GALV WIRE 40MM LG X 4MM	0163938	54.88	12.07
50	CLIP-BONDING ST GALV 22D HOLE	0164312	1.85	92.50
12	SHACKLE-D H/BACK PIN 70kN	0163400	54.58	654.96
12	CLAMP ,THIMBLE CLEV A-ALLOY 40kN D3007	0010896	14.98	179.76
12	NUT-EYE 70kN M20X2-5-6H BOLT	0163909	12.14	145.68
12	INSUL-L/ROD 22kV 40kN 450C	0167574	142.25	1707.00
10	ROD-THREADED GALV M20X600 WA	0163865	59.30	593.00
4	XARM-WOOD 4.5X160-179 TOP DI	0164556	246.06	984.24
12	DEAD END,HELICALLY FORMED FOX/35	0010866	23.66	283.92
16	SET SCREW,HX GALV M20X65 NUT+WASH D3082	0163639	10.92	174.72
12	ROD,THREADED GALV M20X350 WASH+NUTSD3015	0163790	38.62	463.44
16	BRACKET,L FUSE-CUT/OUT22KV ST XARM D3086	0164283	55.56	888.96
12	Disconnecter 1PH 22kV 400A CSTL D-DT-3087	0207970	1401.31	16815.72
4	FUSE-CUT/OUT BASE 22kV COASTAL D3086	0174683	1433.40	5733.60
4	XARM-ST CHANNEL 2400 LG D3000	0189877	600.00	2400.00
2	XARM,ST STRAIN FOX 100x65x1700 LG D3071	0179726	528.12	1056.24
4	Fuse Link 15A Type K Outdoor Cut Out D3199	0117257	12.37	49.48
32	Lug BI/MET 9.0-15.0 M12 0 DEG I/C D3166	0180019	41.77	1336.64
2	Recloser 11/22kV 400A 8kA with IRTU D3180	0185155	66599.00	133198.00
2	TRF 16kVA 11kV/240V 1PH Coastal D3021	0175077	5127.96	10255.92
8	Rod Threaded Galv M20x350mm Wash + Nuts	0163790	15.19	121.52
6	Plate Stay for 2000xM20 Stay Rod	0163419	38.62	231.72





Project Name: Kommagas Buffelsrivier Integration  
 Project No.: 3353A  
 Region: Western region  
 Project Leader: Zoleka Sisilana

MEW wbs nr :  
 Cost Centre No.:

Expected start date: Rev date 23 May 2006  
 Actual start date:  
 Expected completion date:  
 Actual completion date:

**RATE/POINT: R 476.00 2x Recloser**

REV 10

CODE	DESCRIPTION	UNIT	QTY.	LABOUR & PLANT							MATERIAL		
				Burden %	RATE (R)	POINTS/UNIT	HOURS	TOTAL HOURS	TOTAL (R)	POINTS TOTAL	JPPL Y/N	RATE (R)	TOTAL (R)
L004010	Setting Out Of Pegs	each	6.0	0.00	23.80	0.05	0.20	1.20	142.80	0.30		0.00	0.00
L005030	Dig/Drill Holes Depth: 1.3 to 1.5m Pick	each	1.0	0.00	178.50	0.38	1.50	1.50	178.50	0.38		0.00	0.00
L005050	Dig/Drill Holes Depth: 1.8 to 2.0m Pick	each	2.0	0.00	285.60	0.60	2.40	4.80	571.20	1.20		0.00	0.00
L005100	Stay Hole - MV	each	1.0	0.00	285.60	0.60	2.40	2.40	285.60	0.60		0.00	0.00
L008010	Install Earthing	m	72.0	0.00	14.28	0.03	0.12	8.64	1028.16	2.16		0.00	0.00
L009010	Backfill and Compact Normal	m³	4.0	0.00	85.68	0.18	0.72	2.88	342.72	0.72		0.00	0.00
L021030	Layout Pole - 7-14m Wood	each	3.0	0.00	238.00	0.50	2.00	6.00	714.00	1.50		0.00	0.00
L022020	Assemble Structures - MV X-arms (Steel)	each	3	0.00	71.40	0.15	0.60	1.80	214.20	0.45		0.00	0.00
L022030	Assemble Structures - MV Insulators	each	9	0.00	38.08	0.08	0.32	2.88	342.72	0.72		0.00	0.00
L023080	Erect Poles/Struts - 9m Wood	each	2.0	0.00	333.20	0.70	2.80	5.60	666.40	1.40		0.00	0.00
L023090	Erect Poles/Struts - 11-14m Wood	each	4.0	0.00	428.40	0.90	3.60	14.40	1713.60	3.60		0.00	0.00
L024010	Install Conventional Stays & Backfill - MV	each	1.00	0.00	178.50	0.38	1.50	1.50	178.50	0.38		0.00	0.00
L025010	Stays: Make-off - Conventional/Mule Stays	each	1	0.00	178.50	0.38	1.50	1.50	178.50	0.38		0.00	0.00
L027010	Run Out/Hang Conductor MV Bare	ph/m	108	0.00	3.57	0.01	0.03	3.24	385.56	0.81		0.00	0.00
L027020	Tension/Regulate & Bind In	ph/m	108	0.00	3.57	0.01	0.03	3.24	385.56	0.81		0.00	0.00
L028020	Install Bird Flight Diverters (MV & LV)	each	6	0.00	47.60	0.10	0.40	2.40	285.60	0.60		0.00	0.00
L029110	Install Transformer - Single Pole - 5-100kVA	each	2	0.00	1904.00	4.00	16.00	32.00	3808.00	8.00		0.00	0.00
L029160	Install Equipment - Links	set	6	0.00	685.44	1.44	5.76	34.56	4112.64	8.64		0.00	0.00
L029170	Install Equipment - Surge Arrestors	set	3	0.00	685.44	1.44	5.76	17.28	2056.32	4.32		0.00	0.00
L030020	Finishing of MV Structures - Strain/Terminal/T-Off	stru	4	0.00	142.80	0.30	1.20	4.80	571.20	1.20		0.00	0.00
L030060	Finishing Structures - Anti-climbing	each	6	0.00	119.00	0.25	1.00	6.00	714.00	1.50		0.00	0.00
L030085	Labeling - Attached	each	2	0.00	29.75	0.06	0.25	0.50	59.50	0.13		0.00	0.00
	<b>sub-total: production</b>							159.12	18935.28	39.78			0.00
BBB6	Outages	man-hrs	50.0		119.00	0.25	1.00	50.00	5950.00	12.5		0.00	0.00
	<b>sub-total: standing time</b>							50.00	5950.00	12.50			0.00
<b>TOTALS:</b>								209.12	24885.28	52.28			0.00

P&G's @ 7%											1741.97
Burden @ 5%											1244.26

NO. OF PEOPLE	10
PROJECT DURATION (FOR ONE PERSON) =	26.14
PROJECT DURATION (WHOLE TEAM) =	2.61

**TOTAL: LABOUR, PLANT & MATERIAL: R 27,871.51**

Prepared by :	MEW TCO	DATE	Agreed by :	DATE
Approved by :	MEW MANAGER	DATE	PROJECT CO-ORDINSTOIPROJECT CO-ORDINSTOR CPD Accepted by:	DATE
			PROJECT MAMAGER CPD	

**Kommagas Buffelsrivier Integration  
3353A**

Load break Switch for the Isolating point

QTY	DESCRIPTION	BMS CODE	UNIT COST (R)
1	Wood Pole 11m 200mm Top	0164568	652.56
6	Shackle-D H/BACK PIN 70kN	0163400	19.23
50	ELEMENT MVF - CONDUCTOR - 35MM ACSR FOX	RWCMVF ZZZZ	4.29
6	Clamp-Thimble Clev A-Alloy 40kN	0010896	15.00
2	TIE, TOP GRVE B/FOX/35 COAST D3081	0179976	25.36
25	TAP CONN, TOFF 9.0-15.0 I/C D3153	0175985	35.25
6	CLAMP-COMP D/END ASSY Fox	0168189	173.18
3	Joint-Non-Ten AL 9.0-15.0 D I/C	0179944	11.31
6	Insul-L/Rod 22kV 40kN	0167574	134.96
1	Xarm-A-Frame 1.24x1m HG STD	0168243	380.54
6	Guy-Grip D/End ST Cond 7/4.0	0010850	19.31
2	Pole Top-Make Off 7/4.0 2290LG	0010882	42.90
2	Insul-Strain Stay 97kN BIL150/60	0189400	107.12
22	Wire Strand-ST 7x4.00 1100MPA	0000209	6.83
2	Thimble-ST TO FIT 14mm DIA.WIR	0163399	1.88
2	Stayrod 2000XM20 Non-Adjust	0163402	53.66
2	Plate-Stay For 2000xM20 Stay	0163419	68.24
1	SW-DISC 400A 24KV ON/L SPM VERT CSTL	0186429	25730.00
2	MV STAY C/W DOUBLE WRAP 380SQ	RWSZZZGZ ZZZZ	387.55
1	T-OFF T-FRAME FOX ELBROC FLAT DELTA	RWSZJGZZ EF FL	R 2,146.13
2	Screw-Set: 40MM LG-16MM DIA	0080725	1.83
4	Rod-Treaded Galv M20x350	0163790	19.31
12	Pipe LDPE TYPE 1 CLS 3 16ID 20OD D3127	0197853	15.80
1	Insul Post Top 4kN 31mm/kV Porc	0167580	142.25
1	Long Pin-Insul M20x250	0168499	22.95
1	Sign Danger 150x150x0.5 Elec Shock	0172423	8.87
1	Information Sign	9905BUY OUT	74.62
<b>STOP</b>			
		<b>Material Cost Only</b> (unescalated) <b>Total (excl. VAT)</b>	<b>34252</b>

RETIC & ELEC POWER OFFICE DATABASE REV 10

Project Name: Kommagas Buffelsrivier Integration  
 Project No.: 3353A  
 Region: Western region  
 Project Leader: Zoleka Sisilana

MEW wbs nr :  
 Cost Centre No.:

Expected start date: Rev date 23 May 2006  
 Actual start date:  
 Expected completion date:  
 Actual completion date:

**Load Break Switch**

RATE/POINT: R 476.00

REV 10

CODE	DESCRIPTION	UNIT	QTY.	LABOUR & PLANT							MATERIAL		
				Burden %	RATE (R)	POINTS/UNIT	HOURS	TOTAL HOURS	TOTAL (R)	POINTS TOTAL	SUPPLY Y/N	RATE (R)	TOTAL (R)
L005060	Dig/Drill Holes Depth: 1.8 to 2.0m Rock	each	1.0	0.00	428.40	0.90	3.60	<b>3.60</b>	<b>428.40</b>	<b>0.90</b>		0.00	<b>0.00</b>
L007020	Excavations intermediate	m³	1.0	0.00	1190.00	2.50	10.00	<b>10.00</b>	<b>1190.00</b>	<b>2.50</b>		0.00	<b>0.00</b>
L009010	Backfill and Compact Normal	m³	4.0	0.00	85.68	0.18	0.72	<b>2.88</b>	<b>342.72</b>	<b>0.72</b>		0.00	<b>0.00</b>
L021030	Layout Pole - 7-14m Wood	each	1.0	0.00	238.00	0.50	2.00	<b>2.00</b>	<b>238.00</b>	<b>0.50</b>		0.00	<b>0.00</b>
L022020	Assemble Structures - MV X-arms (Steel)	each	1	0.00	71.40	0.15	0.60	<b>0.60</b>	<b>71.40</b>	<b>0.15</b>		0.00	<b>0.00</b>
L022030	Assemble Structures - MV Insulators	each	6	0.00	38.08	0.08	0.32	<b>1.92</b>	<b>228.48</b>	<b>0.48</b>		0.00	<b>0.00</b>
L023090	Erect Poles/Struts - 11-14m Wood	each	1.0	0.00	428.40	0.90	3.60	<b>3.60</b>	<b>428.40</b>	<b>0.90</b>		0.00	<b>0.00</b>
L024010	Install Conventional Stays & Backfill - MV	each	1.00	0.00	178.50	0.38	1.50	<b>1.50</b>	<b>178.50</b>	<b>0.38</b>		0.00	<b>0.00</b>
L027010	Run Out/Hang Conductor MV Bare	ph/m	30	0.00	3.57	0.01	0.03	<b>0.90</b>	<b>107.10</b>	<b>0.23</b>		0.00	<b>0.00</b>
L027020	Tension/Regulate & Bind In	ph/m	30	0.00	3.57	0.01	0.03	<b>0.90</b>	<b>107.10</b>	<b>0.23</b>		0.00	<b>0.00</b>
L029150	Install Equipment - Gang Links	set	1	0.00	2142.00	4.50	18.00	<b>18.00</b>	<b>2142.00</b>	<b>4.50</b>		0.00	<b>0.00</b>
L030020	Finishing of MV Structures - Strain/Terminal/T-Off	stru	1	0.00	142.80	0.30	1.20	<b>1.20</b>	<b>142.80</b>	<b>0.30</b>		0.00	<b>0.00</b>
	Time Lost Due To Travelling	mhr		0.00	119.00	0.25	1.00	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>		0.00	<b>0.00</b>
BBB6	Outages	man-hrs	40.0		119.00	0.25	1.00	<b>40.00</b>	<b>4760.00</b>	<b>10.0</b>		0.00	<b>0.00</b>
	<b>sub-total: standing time</b>							<b>40.00</b>	<b>4760.00</b>	<b>10.00</b>			<b>0.00</b>
<b>TOTALS:</b>								<b>93.90</b>	<b>11174.10</b>	<b>23.48</b>			<b>0.00</b>

NO. OF PEOPLE	<b>10</b>
PROJECT DURATION (FOR ONE PERSON) =	<b>11.74</b>
PROJECT DURATION (WHOLE TEAM) =	<b>1.17</b>

TOTAL: LABOUR, PLANT & MATERIAL:	R	<b>11174.10</b>
----------------------------------	---	-----------------

Prepared by :	MEW TCO	DATE	Agreed by :	DATE
Approved by :	MEW MANAGER	DATE	PROJECT CO-ORDINATOR Accepted by:	DATE
			PROJECT MAMAGER CPD	DATE

**Kommagas Buffelsrivier Integration  
-3353A**

**Bill of Structures**

QTY	DESCRIPTION	SAP NO.	UNIT COST (R)
81	Only Fuse Link 15A Type K Outdoor Cut Out	0117257	6.68
3	Complete Cut-out outdoor at Trfr Hare	RWATO3FCT ZH ZZ	2696.59
2	Diverter Bird HDPE for Steel X-Arm 250mm	8000017	50.00
9	Link Solid For Fuse Cut out	0165066	64.79
		<b>Material Cost Only</b> (unescalated)	
		<b>Total (excl. VAT)</b>	8757

Project Name: Kommagas Buffelsrivier Integration  
 Project No.: 3353A  
 Region: Western region  
 Project Leader: Zoleka Sisilana

MEW wbs nr :  
 Cost Centre No.:

Expected start date:  
 Actual start date:  
 Expected completion date:  
 Actual completion date:

Rev date 23 May 2006

RATE/POINT: R 476.00

Fusing

REV 10

CODE	DESCRIPTION	UNIT	QTY.	LABOUR & PLANT							MATERIAL		
				Burden %	RATE (R)	POINT UNIT	HOURS	TOTAL HOURS	TOTAL (R)	POINTS TOTAL	UPPL Y/N	RATE (R)	TOTAL (R)
L028020	Install Bird Flight Diverters (MV & LV)	each	2	0.00	47.60	0.10	0.40	0.80	95.20	0.20		0.00	0.00
L029160	Install Equipment - Links	set	30	0.00	685.44	1.44	5.76	172.80	20563.20	43.20		0.00	0.00
BBB6	Outages	man-hrs	150.0		119.00	0.25	1.00	150.00	17850.00	37.5		0.00	0.00
BBB9	Other	man-hrs	50.0		119.00	0.25	0.42	20.85	5950.00	12.5		0.00	0.00
	<b>sub-total: standing time</b>							170.85	23800.00	50.00			0.00
<b>TOTALS:</b>								344.45	44458.40	93.40			0.00

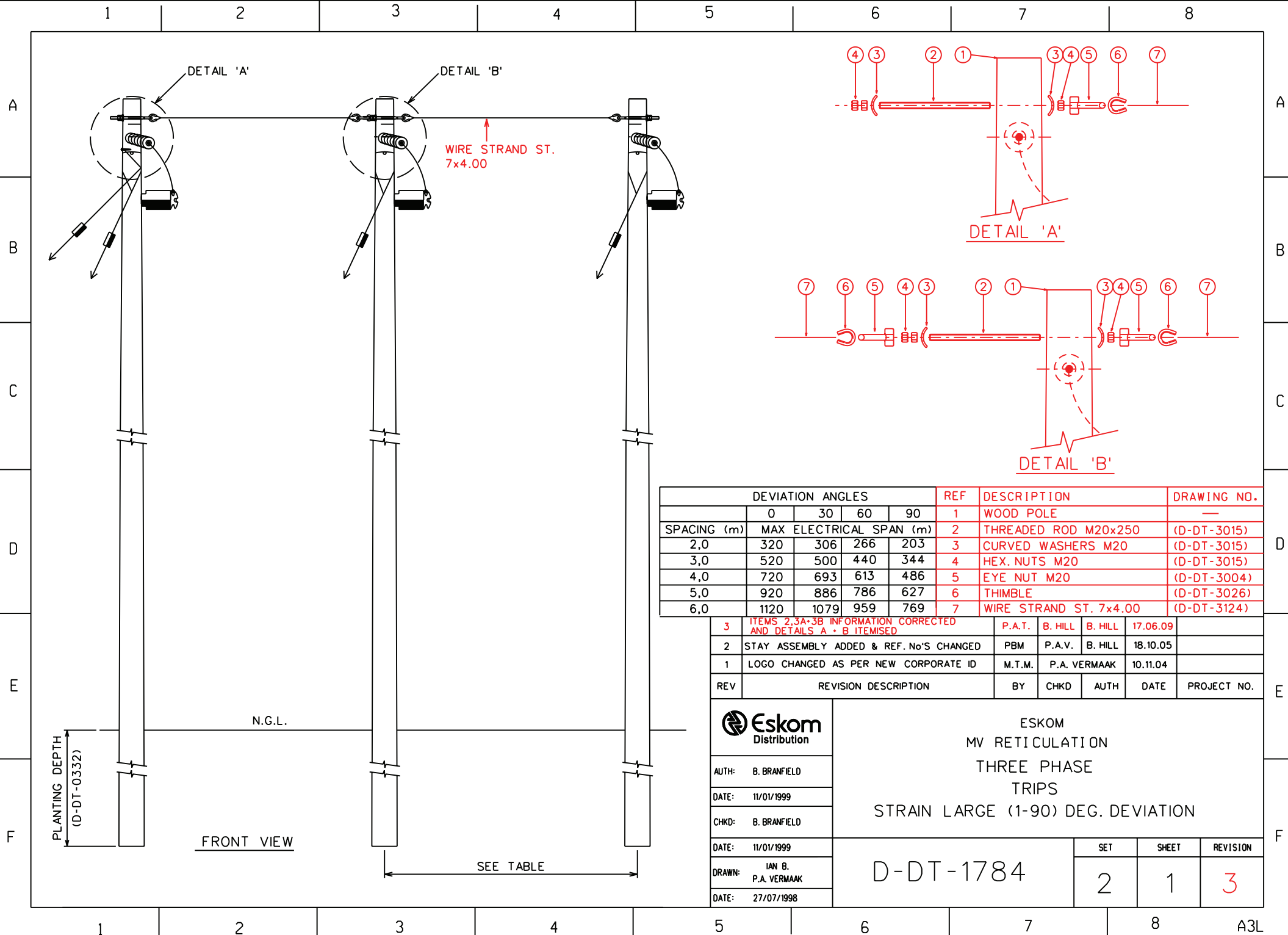
NO. OF PEOPLE	10
PROJECT DURATION (FOR ONE PERSON) =	43.06
PROJECT DURATION (WHOLE TEAM) =	4.31

TOTAL: LABOUR, PLANT & MATERIAL:	R	44458.40
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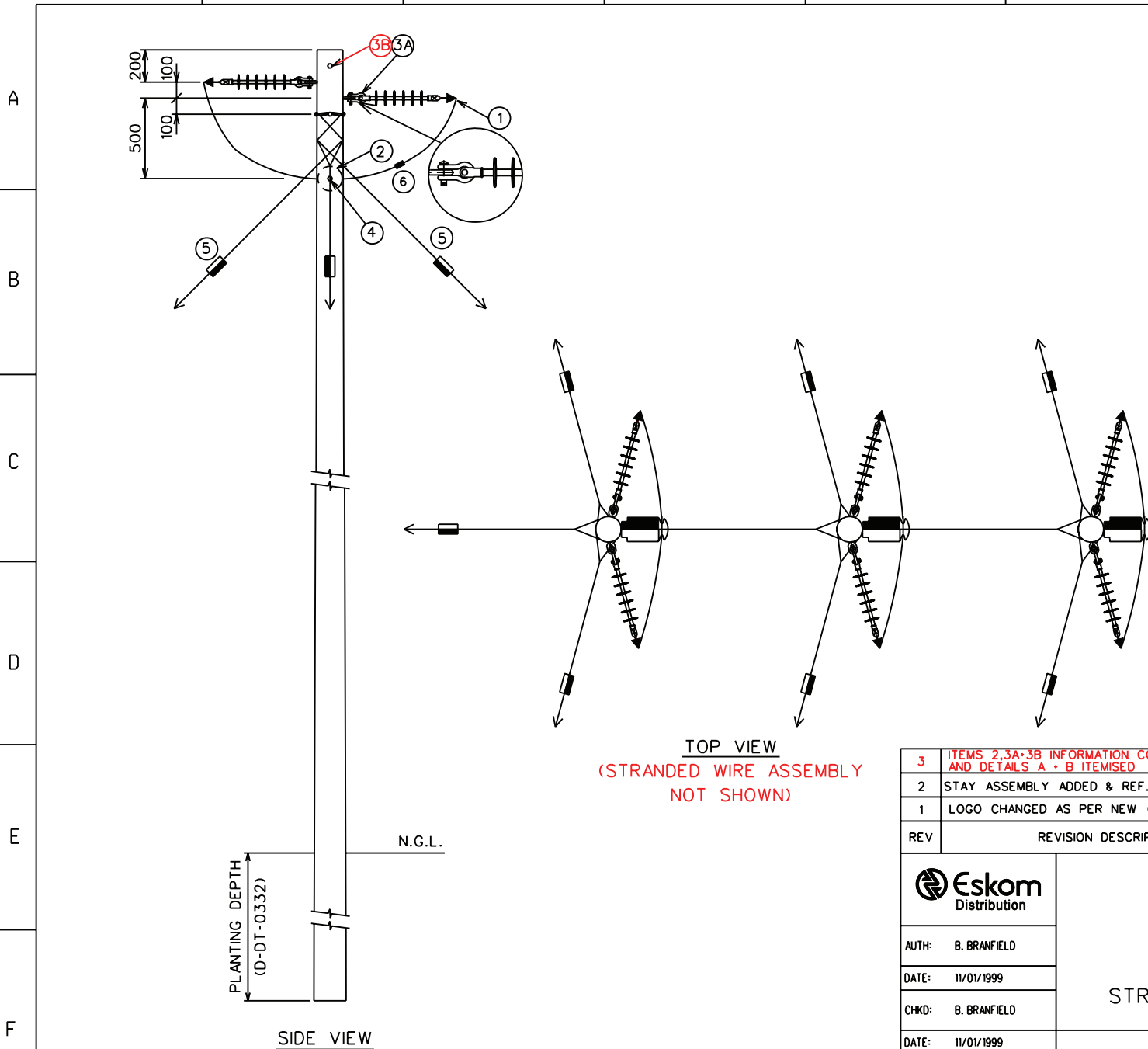
Prepared by : MEW TCO	DATE	Agreed by : PROJECT CO-ORDINATOR CPD	DATE
Approved by : MEW MANAGER	DATE	Accepted by: PROJECT MANAGER CPD	DATE

# Section 5

## Structures



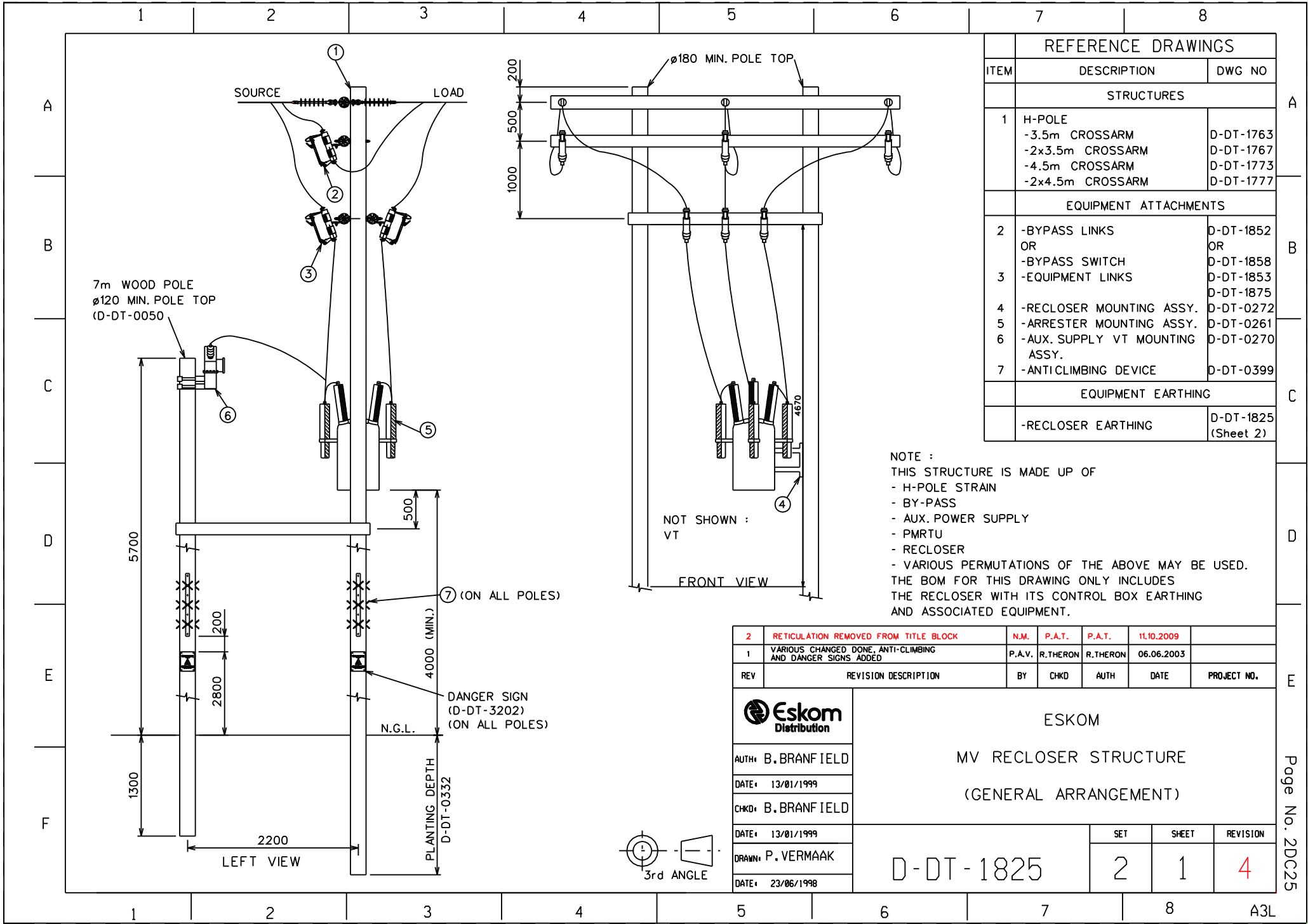




REFERENCE DRAWINGS		
ITEM	DESCRIPTION	DWG NO
CONDUCTOR / INSULATOR ATTACHMENTS		
1	STRAIN -PREFORM/HELICAL DEAD-END -PISTOL GRIPS	D-DT-0250 D-DT-0251
2	POSTS -SIDE GROOVE TIES	D-DT-0259
INSULATOR / STRUCTURE ATTACHMENTS		
3A	STRAIN -EYEBOLT	D-DT-0373
3B	STRAIN -THREADED ROD	D-DT-0373
4	POSTS -LONG SPINDLE	D-DT-0391
BONDING AND EARTHING		
INULATION CO-ORDINATE		D-DT-0310
STAYS		
5	STAY ATTACHMENTS STAY ASSEMBLY	D-DT-0312 D-DT-0341
PHASING		
PHASE CONFIGURATION		D-DT-0311
JOINTS		
6	NON-TENSION JOINTS	CHOICE

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
3	ITEMS 2, 3A, 3B INFORMATION CORRECTED AND DETAILS A + B ITEMISED	P.A.T.	B. HILL	B. HILL	17.06.09	
2	STAY ASSEMBLY ADDED & REF. No'S CHANGED	PBM	P.A.V.	B. HILL	18.10.05	
1	LOGO CHANGED AS PER NEW CORPORATE ID	M.T.M.	P.A. VERMAAK		10.11.04	

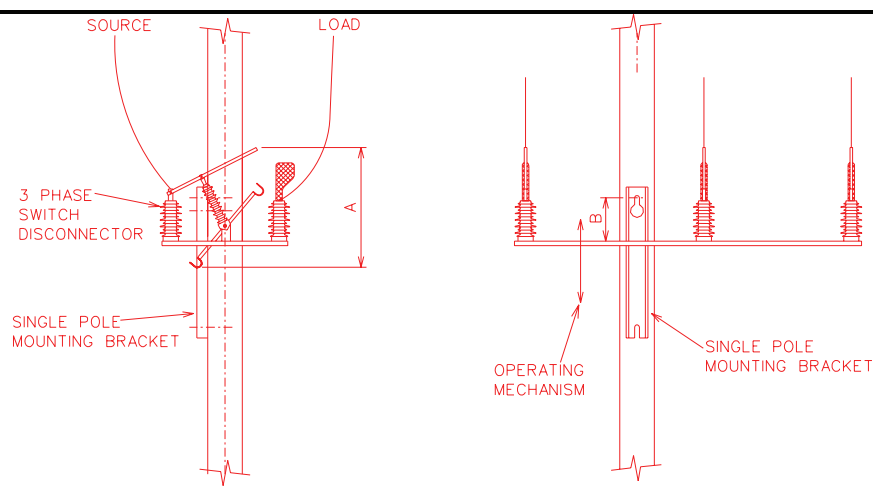
	<b>ESKOM</b> MV RETICULATION THREE PHASE TRIPS STRAIN LARGE (1-90) DEG. DEVIATION			
	AUTH: B. BRANFIELD			
	DATE: 11/01/1999			
	CHKD: B. BRANFIELD			
DATE: 11/01/1999				
DRAWN: IAN B. P.A. VERMAAK	D-DT-1784			
DATE: 27/07/1998		SET	SHEET	REVISION
		2	2	3



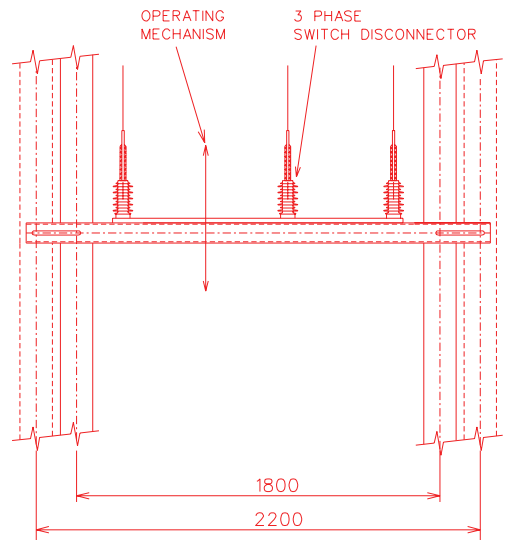
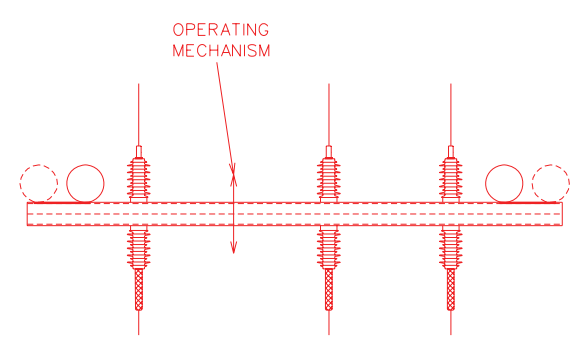
REFERENCE DRAWINGS		
ITEM	DESCRIPTION	DWG NO
STRUCTURES		
1	H-POLE	D-DT-1763
	-3.5m CROSSARM	D-DT-1767
	-4.5m CROSSARM	D-DT-1773
	-2x4.5m CROSSARM	D-DT-1777
EQUIPMENT ATTACHMENTS		
2	-BYPASS LINKS	D-DT-1852
	OR -BYPASS SWITCH	D-DT-1858
3	-EQUIPMENT LINKS	D-DT-1853
		D-DT-1875
4	-RECLOSER MOUNTING ASSY.	D-DT-0272
5	-ARRESTER MOUNTING ASSY.	D-DT-0261
6	-AUX. SUPPLY VT MOUNTING ASSY.	D-DT-0270
7	-ANTICLIMBING DEVICE	D-DT-0399
EQUIPMENT EARTHING		
	-RECLOSER EARTHING	D-DT-1825 (Sheet 2)

NOTE :  
 THIS STRUCTURE IS MADE UP OF  
 - H-POLE STRAIN  
 - BY-PASS  
 - AUX. POWER SUPPLY  
 - PMRTU  
 - RECLOSER  
 - VARIOUS PERMUTATIONS OF THE ABOVE MAY BE USED.  
 THE BOM FOR THIS DRAWING ONLY INCLUDES  
 THE RECLOSER WITH ITS CONTROL BOX EARTHING  
 AND ASSOCIATED EQUIPMENT.

2	RETICULATION REMOVED FROM TITLE BLOCK	N.M.	P.A.T.	P.A.T.	11.10.2009	
1	VARIOUS CHANGED DONE, ANTI-CLIMBING AND DANGER SIGNS ADDED	P.A.V.	R.THERON	R.THERON	06.06.2003	
REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
		<b>ESKOM</b> MV RECLOSER STRUCTURE (GENERAL ARRANGEMENT)				
AUTH: B. BRANFIELD						
DATE: 13/01/1999						
CHKD: B. BRANFIELD						
DATE: 13/01/1999						
DRAWN: P. VERMAAK						
DATE: 23/06/1998						
<h1>D-DT-1825</h1>				SET <h2>2</h2>	SHEET <h2>1</h2>	REVISION <h2>4</h2>



	22 kV	33kV
A (max)	1380mm	1510mm
B (max)	200mm	200mm



ITEM	:- DISCONNECTOR 3 PH 22 + 33kV 400A 8KA							
MATERIAL SPECIFICATION	:- BS 2816							
CORROSION SPECIFICATION	:- SANS 121 OR ISO 1461							
STANDARD SPECIFICATION	:- IEC [SANS] 60265-1							
ESKOM SPECIFICATION	:- 34-1665							
TEST & CERTIFICATION REQUIREMENTS :-								
INSPECTION	Yes	No	ESKOM RELEASE NOTE			Yes	No	
IDENTIFICATION:- INDELIBLE MANUFACTURES TRADEMARK & PART No. ON ALL ITEMS								
8	DRAWINGS UPDATED AS PER 34-1665. ORIENTATION OF ITEM CHANGED FROM VERTICAL TO HORIZONTAL CONFIGURATION. POST INSULATOR REQUIREMENT DELETED.			A.B. P.A.T.	A. BIECHOOK	24.04.2009		
7	SHORT DISCRIPTIONS CORRECTED ON 22kV 1-POLE UNITS PAGE 4 OF 9			P.A.V.	R. THERON	02.10.2007		
6	LOAD BREAK TECH. DESCRIPTION CHANGED AND NON LOAD BREAK ITEMS ADDED			P.A.V.	S.MOLOKO	S.MOLOKO	15.09.2006	
REV	REVISION DESCRIPTION			BY	CHKD	AUTH	DATE	
AUTH:	P. CROWDY	DATE:	20.12.1999	SCALE				SAP No:
CHKD:	R. THERON	DATE:	20.12.1999	NTS				
				CAD REF:	<b>D-DT-3085</b>			SET
				SERIES 3000				7
				FILE No:				SHEET
DRAWN:	P.A. VERMAAK	DATE:	10.11.1999	3085	REV	8		

# **Section 6**

## **Supporting Documents**

**Network Development Plan**

**CRA Form**

**Job Schedule**

**Scoping Meeting Minutes**

**Cost Summary**

Created By	: Sune Coetzee	Date Created:	14 Nov 2008
Revised By	: Sune Coetzee	Date Revised:	14 Nov 2008
E-mail address	: CoetzeSu@Eskom.co.za	Tel:	021 980 3569

## Kommagas Buffelsrivier Integration

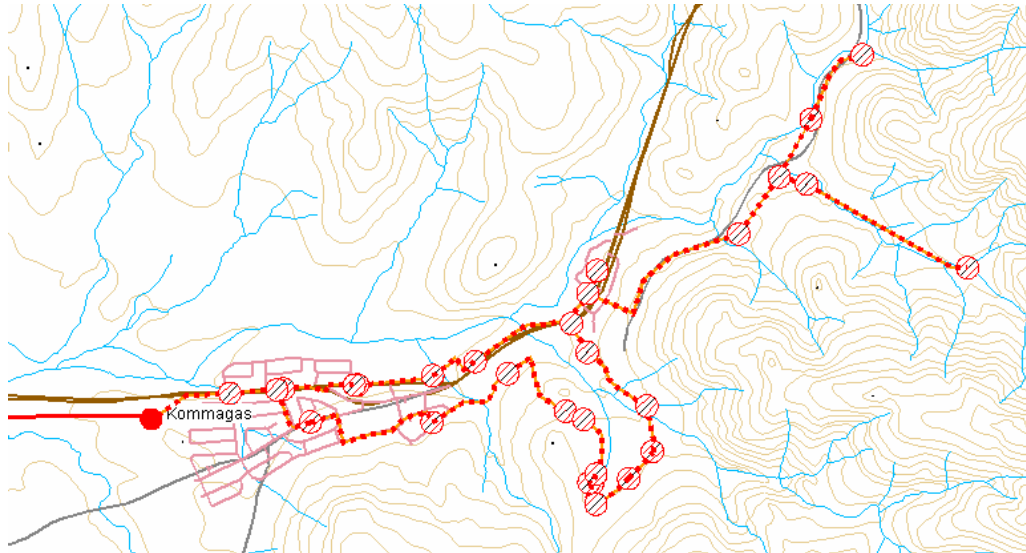
<b>1. Background</b> .....	<b>2</b>
1.1 Kommagas, 1x5MVA 66/22kV .....	2
1.2 Spektakel 33kV .....	2
<b>2. Growth</b> .....	<b>3</b>
<b>3. Technical Evaluation</b> .....	<b>4</b>
3.1 Problem Statement: .....	4
3.2 Proposed Alternatives: .....	5
<b>3.2.1 Option 1: Do Nothing:</b> .....	5
<b>3.2.2 Option 2: Feeding Buffelsrivier via Kommagas:</b> .....	5
<b>4. Project Scope:</b> .....	<b>6</b>
<b>5. Financial Analysis:</b> .....	<b>7</b>
5.1 Cost Assumption: .....	7
5.2 Financial performance indicator:.....	7
<b>6. Recommendation:</b> .....	<b>7</b>
<b>7. Conclusion:</b> .....	<b>7</b>

<b>Submitted by:</b>	<b>Accepted by:</b>	<b>Project ID:</b>
..... Sune Coetzee	..... C F Smit Network Planning Manager	<b>3353A</b>

## 1. Background

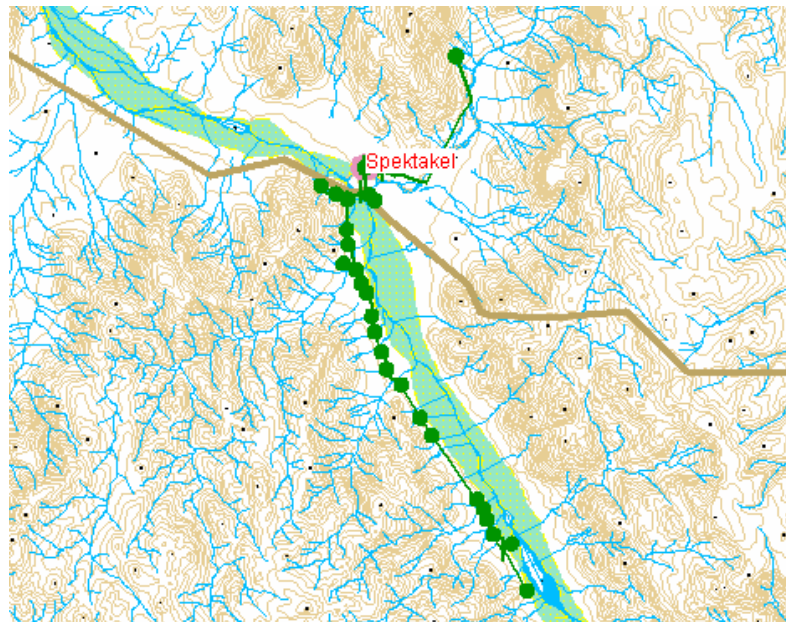
### 1.1 *Kommagas, 1x5MVA 66/22kV*

Kommagas substation supplies one 22kV feeder, Kommagas 1.



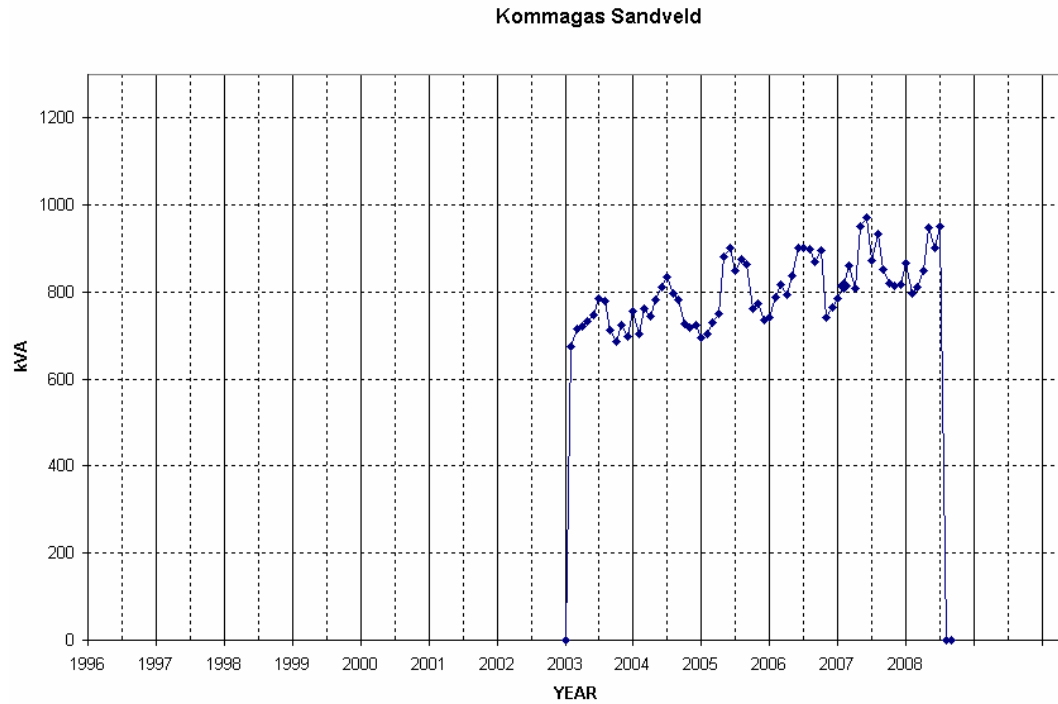
### 1.2 *Spektakel 33kV*

Buffelsrivier is currently supplied via Spektakel, a 33/11kV substation of Nama Khoi municipality.

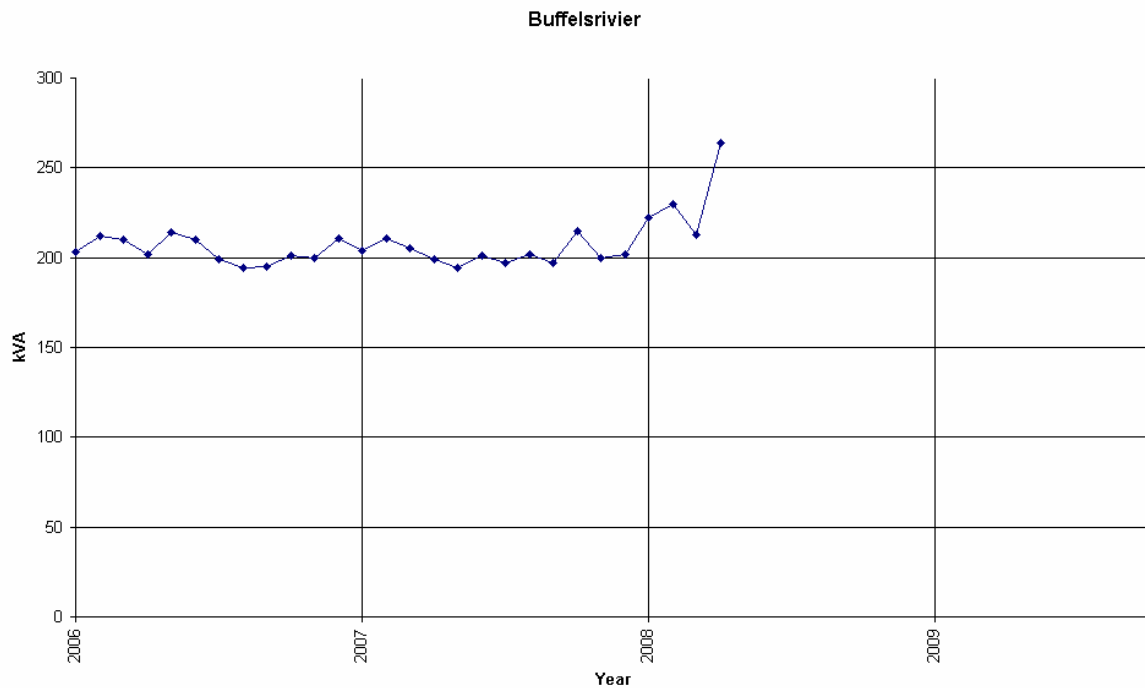


## 2. Growth

The growth on Kommagas F1 has been  $\pm 37\text{kVA}$  per year for the last 5 years (4.2%). The feeder had a peak loading of  $\pm 970\text{kVA}$  in 2007.



Buffelsrivier stats available from the meter reader in Springbok.



### 3. Technical Evaluation

#### 3.1 *Problem Statement:*

Currently Kommagas have no Voltage Regulators or Shunt Capacitors. The total backbone length is  $\pm 7.5$ km, with FOX conductor. The feeder does not experience any voltage or thermal problems.

Buffelsrivier is currently supplied via Spektakel, a 33/11kV substation of Nama Khoi municipality. This substation is not in a good condition, as no maintenance is being done in and around this substation. This means that Eskom does not have any control of the quality being fed into the 11kV network. This 33/11kV transformer will not be easily replaceable if damage/fault occurs on the transformer, because this is not a standard transformer size in the area.





**3.2 Proposed Alternatives:**

**3.2.1 Option 1: Do Nothing:**

If nothing is done, about this Third party supply to Buffelsrivier, the Eskom customers will have quality of supply problems. Eskom currently has no control over this supply.

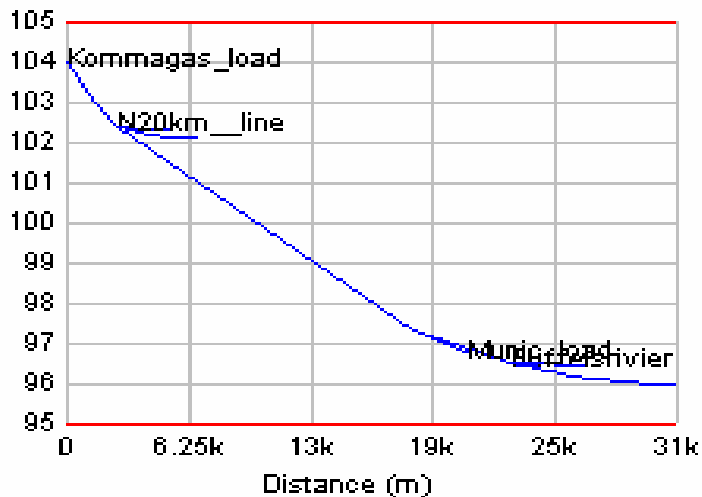
**3.2.2 Option 2: Feeding Buffelsrivier via Kommagas:**

Nama Khoi has installed booster water pumps between Kommagas town and Spektakel. The pipe line runs along the road from Spektakel to Kommagas side. The first pump station is a 15kW motor and the second pump station is a 45kW motor. The line was built at 22kV, but is currently operated at 11kV, as Spektakel is a 33/11kV Step-down.

Eskom will use this line to their advantage. A 22kV line will be build from Kommagas along the road to join the line that Nama Khoi has build from Spektakel. The line was build with a FOX conductor as Eskom recommended and per the Eskom standards.

If this proposal is successful, we can get rid of the OCC 33kV supply. The only problem that is foreseen is that Buffelsrivier is an 11kV network. The whole 11kV network will have to be converted into a 22kV network. Currently this network is also 22kV, but operated at 11kV, so  $\pm 28$  transformer will be replaced with 22kV transformers and also the transformers at the pump stations. Nama Khoi Munic did indicate that  $\pm 10$  customers within the area will connect to this line.

With installed load.



#### 4. Project Scope:

Below is a summary of the preferred alternative (Option 2):

- Build a Fox line from TR41 to Coordinate S: 29°42'10.53" E: 017°31'51.72"
- Convert Buffelsrivier 11kV into 22kV including the transformer to the pumps.

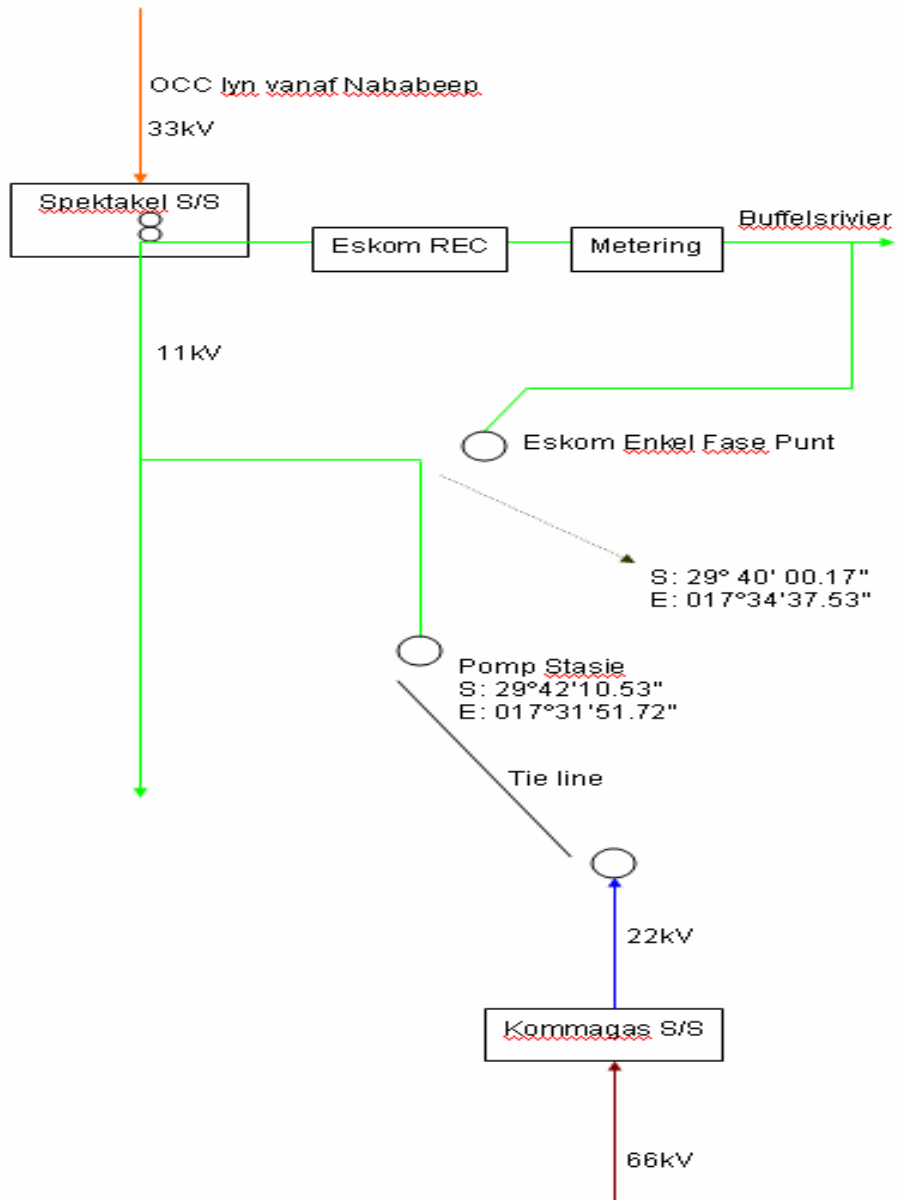


Figure as supplied by Springbok TSC.

## 5. Financial Analysis:

The financial evaluation model was based on the preferred alternative (**option 2**):

### 5.1 Cost Assumption:

Cost was assumed as input from Project Engineering is unavailable.

• ±14km of 22kV FOX conductor	= R 2,600,000
• 5 x 16kVA 22kV/230V Transformers	= R 50,000
• 1 x 32kVA 22kV/460V Transformers	= R 10,000
• 14 x 25kVA 22kV/415kV/400kV Transformers	= R 140,000
• 6 x 50kVA 22kV/415kV/400kV Transformers	= R 120,000
• 1 x 100kVA 22kV/415kV/400kV Transformers	= R 20,000

### 5.2 Financial performance indicator:

The Kommagas load profiles were used as input to the FEM.

ALF = 0.86

ADF = 0.37

PF = 0.95

#### Based on WEPS Costs

<b>NPV (in 2008/9 Rand value):</b>	<b>R 2,782,013</b>
<b>Project PI:</b>	<b>2.0</b>
<b>Project MIRR:</b>	<b>16.2%</b>
<b>Discounted Payback Period:</b>	<b>16.0 Years</b>

## 6. Recommendation:

- Springbok TSC will help with solving the problem of converting the 11kV to 22kV.
- The TSC should also verify the RENI data (transformers), as this was used in the cost breakdown of this project.
- Survey should investigate the most optimal route for this tie line.
- Springbok Munic to forward the applications of the farmers in the area who needs power.

### Project ID :

### **3353A = Kommagas Buffelsrivier Integration**

The completion date of this project is Apr 2010.

## 7. Conclusion:

Option 2 is viable both technically and financially to accommodate the growth experienced within this area.

Revision 0

**Job Initiation**

Priority HIGH

**General Details**

<b>Project ID</b>	3353A		
<b>Project Name</b>	Kommagas Buffelsrivier Integration		
<b>Job Name</b>	Kommagas Buffelsrivier Integration	<b>Job ID</b>	3353A
<b>Project Initiator</b>	COETZESU	<b>Form Registered Date</b>	2008-11-17
<b>Distribution Region / RED</b>	WESTERN_REGION		
<b>Field Service Area</b>	WEST COAST FSA	<b>Network Planning Area</b>	SPRINGBOK
<b>Technical Service Area</b>	SPRINGBOK	<b>Energy Balancing Code</b>	
<b>Customer Service Area</b>	WEST COAST	<b>Engineering Area</b>	WESTERN ENGINEERING AREA
<b>District Municipal Area</b>	NAMAKWA DISTRICT MUNICIPALITY	<b>Local Municipal Area</b>	NAMA KHOI (SPRINGBOK)
<b>Business Process</b>	STRENGTHENING	<b>Job Category</b>	DISTRIBUTION RETIC LINES & CABLES (11-33KV) DISTRIBUTION RETIC LINES & CABLES (11-33KV)

**Project Description and Motivation**

**Executive Summary / Motivation**

Currently Kommagas have no Voltage Regulators or Shunt Capacitors. The total backbone length is ±7.5km, with FOX conductor. The feeder does not experience any voltage or thermal problems. Buffelsrivier is currently supplied via Spektakel, a 33/11kV substation of Nama Khoi municipality. This substation is not in a good condition, as no maintenance is being done in and around this substation. This means that Eskom does not have any control of the quality being fed into the 11kV network. This 33/11kV transformer will not be easily replaceable if damage/fault occurs on the transformer, because this is not a standard transformer size in the area.

**Scope of Work Description**

•Build a Fox line from TR41 to Coordinate S: 29°42'10.53" E: 017°31'51.72" •Convert Buffelsrivier 11kV into 22kV, including the transformer to the pumps Roughly 26 points with installed capacity of 850kVA This solution is also more cost effective than to refurbish the Municipal network for Eskom's use. Remove Buffelsrivier 11kV recloser and 11kV metering unit

**Interdependent Job Details**

Job ID	Job Name	Active Job Form	Approved Job Value
3353A	Kommagas Buffelsrivier Integration	DRA FORM Rev: 0	3,970,075.11
<b>Total</b>			<b>3,970,075.11</b>

**Interdependent Transmission Assets**

Job ID	Job Name	Value
<b>Total</b>		<b>0.00</b>
<b>Total Parent Project Value</b>		<b>3,970,075.11</b>

**Job Dates**

<b>Job Required Completion Date</b>	2010-04-30
<b>Contracted CRA Form Approval Date</b>	2009-01-31

**Project Initiator Manager Acceptance**

Role	User	Type	Date	Sign Now
INITIATOR MANAGER	SMITR	APPROVED	2008-11-18 17:00:27	

Job Name Kommagas Buffelsrivier Integration  
 Job ID 3353A WBS Root Element WCN981

Economic Sensitivity Analysis (In accordance to the latest FEM model)

Evaluation Type ADDITIONAL LOAD FEM Revision Classification ECONOMIC

Additional Load and Cost Saving	Marginal Energy Cost		WEPS Energy Cost	
	CPIX	CPIX + RFPI	CPIX	CPIX + RFPI
NPV (In Rand value)	0	0	0	2,782,013
Project PI	0.00	0.00	0.00	2.00
Project MIRR (%)	0.00	0.00	0.00	16.20
Discounted PP (years)	0.00	0.00	0.00	16.00

**COSTING ASSUMPTIONS - ESCALATION RATES (%)**

2008/2009 5.00 2009/2010 5.00 2010/2011 6.00 2011/2012 6.00 2012/2013 6.00  
 Current Overhead % 10.00 Current IDC % 4.15

**JOB COSTS (SUPPLY and CAPITAL COSTS including Escalation)**

WBS Level 2	Contingency Amount	% Contingency	Capital Amount (Rand)	%
ENGINEERING COSTS	0.00	0.00	258,865.00	6.52
MATERIALS	0.00	0.00	3,241,350.00	81.64
INTERNAL CONSTRUCTION	0.00	0.00	0.00	0.00
EXTERNAL CONSTRUCTION	0.00	0.00	0.00	0.00
COMMISSIONING	0.00	0.00	0.00	0.00
OVERHEADS			350,021.50	8.82
IDC			119,838.61	3.02
LAND AND RIGHTS	0.00	0.00	0.00	0.00
Capital Cost Subtotal	0.00	0.00	3,970,075.11	100.00
Supply Cost Subtotal	0.00	0.00	0.00	0.00
<b>Total Cost (DRA Form)</b>	<b>0.00</b>	<b>0.00</b>	<b>3,970,075.11</b>	<b>100%</b>
Last Approved Project Cost	0.00	0.00	3,970,075.11	
<b>Variance</b>	<b>0.00</b>		<b>0.00</b>	

Cost Variance Explanation

Pre-Engineering Approved

**Total Pre-Engineering Approved 258,865.00**

Long Lead Time Material Approved

**Total Long Lead Time Material Approved (Refer to Power Office Long Lead details) 0.00**

Contributor/Customer Name

% Customer Contribution (Capital Only) 0.00 % Standard Supply 0.00

Guarantee Amount 0.00 Guarantee Status

**JOB SCHEDULE**

Contracted DRA Form Approval Date 2009-09-16

Job Required Completion Date 2010-04-30

Job Contracted Completion Date 2010-06-30 61 Days Late

Schedule Variance Explanation

EDNS = Ferdie Julie - Leon Drotsche PE = Zoleka Sisilana LD=Martin Keulder

Environmental Status DESD (INCLUDES EMP)

Job Name Kommagas Buffelsrivier Integration  
 Job ID 3353A

Physical Statistics

LINE	BUILD	Item	Voltage	Distance (km)	Edit	Delete
LINE			22KV	14.00		

NACVC KPIs KPI for this Job Comments

Cost per transformer (sub -transmission)  
 Cost per transformer (reticulation)  
 Cost per km line (44kV to 165kV)

Electrification	Quantity	Total Cost	Cost / Connection
Connections		3,970,075.11	

Job Acceptance

Role	User	Type	Date	Sign Now
PROGRAM MANAGER	ADONISR	SUPPORTED	2008-12-01 12:22:53	
DEFINITION MANAGER	SMITR	SUPPORTED	2008-11-18 17:00:59	

TEF Minutes

**NSM / RIC APPROVAL FOR EXPENDITURE** R 258,865.00 6.52%

RIC Meeting Date 2009-05-08 RIC Meeting Number


NSM / RIC Minutes

Approved by RIC(L3) chairperson S. Mkhabela

Job Approval

Role	User	Type	Date	Sign Now
NETWORK SERVICES MANAGER	WAHLP	SUPPORTED	2009-02-04 16:59:00	
RIC CHAIRPERSON	BOOYSECN	APPROVED	2009-05-19 21:47:37	

ID	Task Name	Duration	Start	Finish	2007		2008		2009		2010		2011		2012		2013	
					H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
0	<b>Summary Task</b>	<b>813 days</b>	<b>Wed 07/01/09</b>	<b>Fri 17/02/12</b>														
1	3353A_Kommagas Buffelsrivier Integration	813 days	Wed 07/01/09	Fri 17/02/12														
2	<b>Plan</b>	<b>619 days</b>	<b>Wed 07/01/09</b>	<b>Mon 23/05/11</b>														
3	<b>CRA Approved</b>	<b>0 days</b>	<b>Fri 08/05/09</b>	<b>Fri 08/05/09</b>														
4	<b>Project Planning Meeting</b>	<b>0 days</b>	<b>Wed 07/01/09</b>	<b>Wed 07/01/09</b>														
5	Profiles to Project Engineer	301 days	Fri 08/05/09	Fri 02/07/10														
6	TEF Approved	1 day	Thu 02/12/10	Thu 02/12/10														
7	<b>DRA Approved</b>	<b>1 day</b>	<b>Mon 28/02/11</b>	<b>Mon 28/02/11</b>														
8	<b>Final Design Package Handover</b>	<b>20 days</b>	<b>Tue 01/03/11</b>	<b>Mon 28/03/11</b>														
9	Tender Process (PRE Contract Award)	40 days	Tue 29/03/11	Mon 23/05/11														
10	<b>ERA Approved</b>	<b>1 day</b>	<b>Tue 26/04/11</b>	<b>Tue 26/04/11</b>														
11	<b>Do</b>	<b>153 days</b>	<b>Tue 29/03/11</b>	<b>Thu 27/10/11</b>														
12	Material Delivery	1 day	Wed 27/04/11	Wed 27/04/11														
13	<b>Execution Phase</b>	<b>153 days</b>	<b>Tue 29/03/11</b>	<b>Thu 27/10/11</b>														
14	Protection Drawings	1 day	Tue 29/03/11	Tue 29/03/11														
15	<b>Construction</b>	<b>120 days</b>	<b>Wed 27/04/11</b>	<b>Tue 11/10/11</b>														
16	Control Plant Commissioning	1 day	Wed 12/10/11	Wed 12/10/11														
17	<b>Commission</b>	<b>1 day</b>	<b>Thu 13/10/11</b>	<b>Thu 13/10/11</b>														
18	<b>Project Handover Documents</b>	<b>5 days</b>	<b>Fri 14/10/11</b>	<b>Thu 20/10/11</b>														
19	<b>Commercial Operation</b>	<b>5 days</b>	<b>Fri 21/10/11</b>	<b>Thu 27/10/11</b>														
20	<b>Review</b>	<b>81 days</b>	<b>Fri 28/10/11</b>	<b>Fri 17/02/12</b>														
21	<b>Close Job Number</b>	<b>30 days</b>	<b>Fri 28/10/11</b>	<b>Thu 08/12/11</b>														
22	<b>FRA Approved</b>	<b>1 day</b>	<b>Fri 17/02/12</b>	<b>Fri 17/02/12</b>														

Rev. 0	CAPITAL PROGRAMME MANAGEMENT		
	<b>Minutes</b> 3353A - Kommagas Buffelsrivier Integration		
	<b>DATE OF MEETING</b> 10-Nov-10	<b>LOCATION</b> Springbok TSC, Boardroom	<b>MEETING N<sup>o</sup>.</b> 001
<b>PURPOSE OF MEETING / DISCUSSION:</b> <b>Constructability Meeting with project team</b>			
<b>Attendees</b>		<b>Apologies</b>	<b>DISTRIBUTION OF MINUTES</b>
Martin Keulder Zoleka Sisilana Gidoen De Waal Ferdie Mostert Shantal Gordon		Mario Eygelaar Sune Coetzee Zaid Omaidien Stefan Terblanche	All attendees and apologies
<b>ITEM</b>	<b>TOPIC OF DISCUSSION</b>		<b>ACTION</b>
	<b>Agenda Confirmation &amp; Apologies</b>		
1.0	1) Confirm scope: .Build a Fox line from TR41 to Coordinate S: 29°42'10.53" E: 017°31'51.72" .Convert Buffelsrivier 11kV into 22kV, including the transformer to the pumps Roughly 26 points with installed capacity of 850kVA This solution is also more cost effective than to refurbish the Municipal network for Eskom's use. Remove Buffelsrivier 11kV recloser and 11kV metering unit 2) Discuss and confirm any concerns on surveyed route prior to design commencement. 3) Constructability concerns 4) Amendment to project schedule 5) Site Meeting (concerns raised on surveyed route)		
	<b>Scope Confirmation</b>		
2.0	2.1 Build a Fox line from Kommagas 22kV supply line to the pumpstation - 14.5km. T-off from Kommagas 22kV supply with recloser on Kommagas and Buffelsrivier leg. (Utilising D-DT-1825). Will be preferred option to be presented at TEC. 2.2 Install pumpstation transformer out of line 2.3 Buy over munic line – Quote received. Martin will confirm with Manie and Sune 2.4 Build a Fox line from start of munic line to metering point. (Approx 2.7km) 2.5 Convert Buffelsrivier 11kV into 22kV, including the transformer to the pumps Roughly 27 points with installed capacity of 850kVA This solution is also more cost effective than to refurbish the Municipal network for Eskom's use. 2.6 Remove Buffelsrivier 11kV recloser and 11kV metering unit (re-use by TSC)		
	<b>Discuss and confirm any concerns on surveyed route prior to design commencement</b>		
3.0	3.1 All trf earthing have been upgrading. Confirmed. Trf at pumpstation to be confirmed. Structures can be re-used. 3.2 Section of line in Buffelsrivier insulated for 11kV. (Change insulators to 22kV). Change in fuseholders (cut-out fuses) possible to be confirmed at site visit		
	<b>Constructability concerns</b>		
4.0	4.1 "Is our current 11kV system designed and built to 22kV insulation levels? (I don't see any reference to this in the documentation.)". <b>Current Installed 22kV insulators and fuseholders (cut-out fuses) not required for replacement - Confirmed during site visit</b> 4.2 "To replace 26 transformers on a single day outage is going to take an enormous amount of resources. Maybe consider splitting this by doing it in sections where possible, i.e. if you construct the short tie-line from 97K5 366 to the existing line going to the pump station, and swinging 97K5 381 to this tee-off, you can do the 4 trfrs on the tee-off on one day and leave the rest on 11kV. (see attached drawing). Further splits is possible - just consider the possibilities." <b>Three trf's per team per day. Outage required = 12 hrs</b> 4.3 "Mention is made in your minutes of building new trf structures and just tying in on the outage - if your existing trf structures are up to standard, it will be quicker to just replace a trf". <b>TSC to confirm Transformer earthing at pumpstation to be confirmed. Structures can be re-used.</b> 4.4 "Please remember the procedure for exchanging these trf i.t.o. phase rotation, when the work is planned. Phase rotation should be taken at ALL points prior to the outage (while the power is on) and marked in the meter boxes. After replacing a trfr, the LV MCB feeding the customers should be left OFF. Once the MV supply is switched on, phase rotation should be checked at EACH point individually before switching on the LV supply to the customer. This should be taken into consideration when planning outage times - MV supply should be switched back on at least 60-90 minutes prior to outage end time to allow phase rotation testing so that last customer is switched on before outage end time". <b>Will be confirmed prior to and during planned outage with time provision made</b>		
5.0	<b>General</b>		
	<b>Signed:</b> _____ <b>Date:</b> _____		



# Project Engineering Job Cost Summary

## Kommagas Buffelsrivier Integration

Job ID: 3353A	Date: 30 November 2010	
Description	Cost	Sub Totals
<b>Materials</b>		
<b>Transformers</b>	<b>R 282,327</b>	<b>R 282,327</b>
- Retic Transformers	R 282,327	
<b>Towers/Poles</b>	<b>R 246,423</b>	<b>R 246,423</b>
- Wood Poles	R 140,469	
- Foundations	R 105,954	
<b>Conductor &amp; Hardware</b>	<b>R 781,443</b>	<b>R 781,443</b>
- Conductor	R 210,110	
- Insulators	R 127,353	
- Hardware	R 122,850	
- Tri-switches	R 34,252	
- Reclosers	R 210,907	
- Fusing	R 8,757	
- Miscellaneous	R 67,214	
<b>ED Materials &amp; Buy Outs</b>	<b>R 0</b>	
<b>Total Materials without Contingencies</b>		<b>R 1,310,193</b>
<b>1 - Material Contingencies</b>		<b>R 104,815</b>
<b>Total Materials with Contingencies</b>		<b>R 1,415,008</b>
<b>Internal Contracts</b>		
<b>Construction</b>	<b>R 860,022</b>	<b>R 860,022</b>
- MEW		
- Site Establishment	R 50,000	
- MV Line	R 726,518	
- Tri-switches	R 11,174	
- Reclosers	R 27,872	
- Fusing	R 44,458	
<b>2 - MEW &amp; TSG Construction Contingencies</b>		<b>R 193,505</b>
- Security	R 20,000	
<b>Total Internal Contracts</b>		<b>R 1,073,527</b>
<b>External Contracts</b>		
Material Transport Only	R 36,000	
<b>3 - External Contracts Contingencies</b>		<b>R 5,040</b>
<b>Total External Contracts</b>		<b>R 41,040</b>
<b>Commissioning</b>		
<b>Field Services</b>	<b>R 15,000</b>	<b>R 15,000</b>
- Technical Service Centre	R 15,000	
<b>EDFS</b>	<b>R 0</b>	<b>R 0</b>
- Electricity Delivery - PE Cost	R 0	
- Electricity Delivery - Construction	R 0	
- Electricity Delivery - Commissioning	R 0	
<b>4 - Commissioning Contingencies</b>		<b>R 4,500</b>
<b>Total Commissioning</b>		<b>R 19,500</b>
<b>Sub Total 1 Excluding Engineering Fees</b>		
		<b>R 2,549,075</b>
<b>Land Development Fees (see notes 3 &amp; 4 below)</b>		<b>R 127,454</b>
<b>Project Engineering Fees</b>		<b>R 147,856</b>
<b>Sub Total 2 Including Engineering Fees</b>		<b>R 2,824,385</b>
<b>Overheads @ 10%</b>		
		<b>282,438</b>
<b>Sub Total 3 (Overheads Included)</b>		<b>R 3,106,823</b>
<b>IDC @9.81% for 9 Months</b>		
		<b>228,585</b>
<b>Grand Total</b>		<b>R 3,335,408</b>
<b>CRA Cost</b>		<b>R 3,970,075</b>
<b>DRA vs CRA Cost</b>		<b>R 634,667</b>