

ASSOCIATION OF
ELECTRICITY DISTRIBUTION
UNDERTAKINGS IN NAMIBIA



**AEDU
NAMIBIA**

ANNUAL BRANCH MEETING

AEDU Namibia - Namibian Branch
of AEME Southern Africa

Network Planning and Design the Easy Way

Presented by: Tom Phillips



PRESENTATION ROADMAP

- ◆ Survey Data Source

- ◆ Software Packages

 - ◆ Survey Data from MicroSoft Excel

 - ◆ CAD using Bentley MicroStation PowerDraft

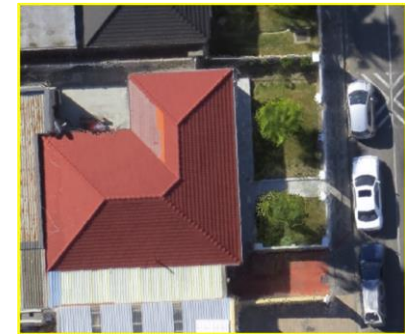
 - ◆ PowerOffice database and interpreter

 - ◆ ReticMaster for network analysis and optimization

 - ◆ Google Earth for displaying in the real world

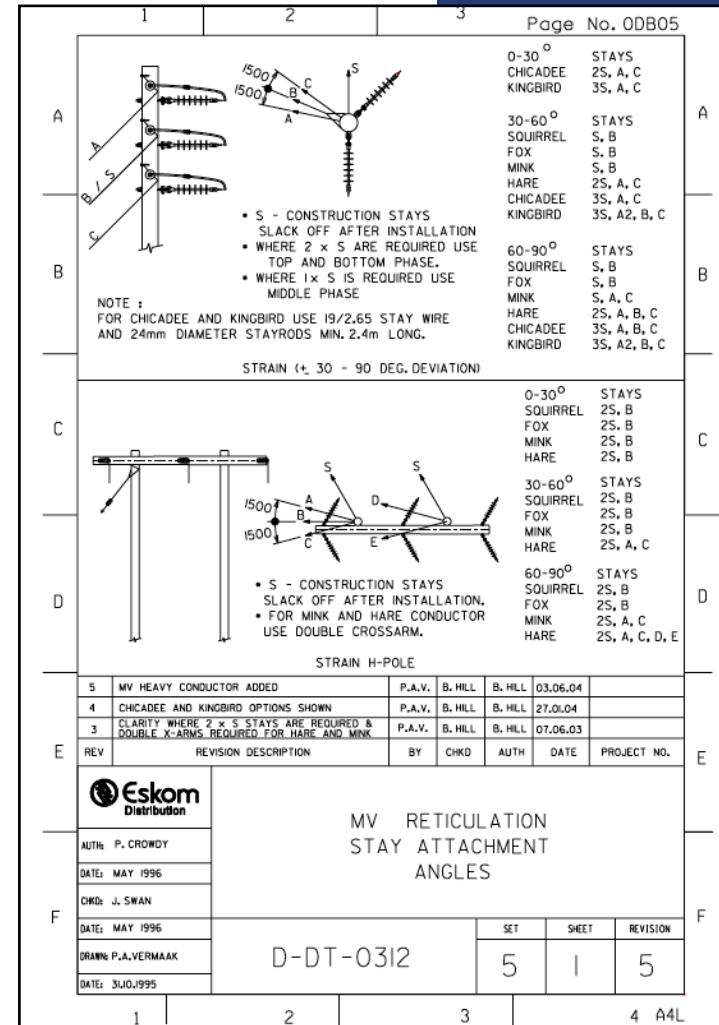
OBTAINING YOUR GIS DATA

- ◆ Nirvana: Using Trimble / Optron's MX7
- ◆ Option 2: Aerial Photography
 - ◆ Using professional drones
 - ◆ Purchasing Aerial Photographs
- ◆ Option 3: Manual capture / surveyor
- ◆ Option 4: Loading from CAD drawings
- ◆ Option 5: Google Earth / Google Maps



POWEROFFICE STRUCTURES

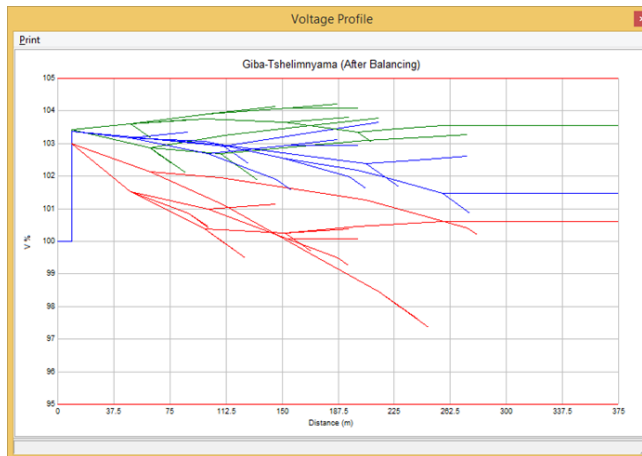
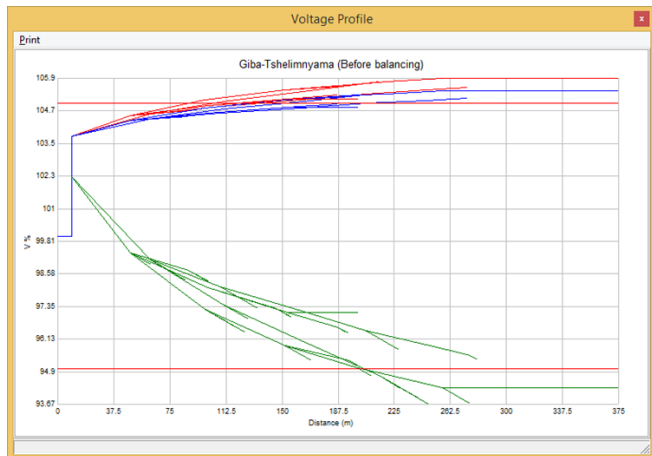
- Structures are made up of individual items
- Include materials, labour, tools & equipment, effort / time, costs and personnel
- Example: Placement of a Kiosk includes everything to put it in the field



ELECTRICAL ANALYSIS

◆ ReticMaster validates the design:

- ◆ Calculates Volt Drop
- ◆ Assesses the network Energy losses
- ◆ Performs cable and transformer analysis and optimization
- ◆ Calculates Fault Currents



Change Text View	
Minimum Voltage	
Maximum Voltage	
Maximum Current	
Cost Code	
3ø Fault	
ø-N Fault	
ø-G Fault	
ø-ø Fault	
ø-ø-G Fault	
Bulk Load A (S,CF(PF))	
Bulk Load A (P+Q x CF)	
Bulk Load B (S,CF(PF))	
Bulk Load B (P+Q x CF)	
Bulk Load C (S,CF(PF))	
Bulk Load C (P+Q x CF)	
Bulk Load (S,CF)	
Bulk Load (P+Q x CF)	
Domestic Connections	
Total Bulk Load (S,PF)	
Total Bulk Load (P+Q)	
Total Load (S,PF)	
Total Load (P+Q)	
Total Domestic Connections	
Empty Text	
Current in Phase A	
Current in Phase B	
Current in Phase C	
Current in Neutral	
Node Rating	
Node Description	
Area Code	
Voltage Phase A	
Voltage Phase B	
Voltage Phase C	
Voltage Neutral Shift	
V(-) Seq %	
Energy Period	
Load Loss (P+Q)	
No Load Loss (P+Q)	
Total Load Loss (P+Q)	
Total No Load Loss (P+Q)	
Bulk Energy	
Domestic Energy	
Load Loss Energy	
No Load Loss Energy	
Total Bulk Energy	
Total Domestic Energy	
Total Load Loss Energy	
Total No Load Loss Energy	
Voltage	
Technology	
Phase Connection	
Load Type	
Bulk Load Category	
Total Length	
Total Z+ (Ohm)	
Total Z0 (Ohm)	
Total Zn (Ohm)	
Domestic Calculation Parameters	
PF	
CF	
SF	
Tap	
Existing Node	
Total Energy	
Total Loss Energy	
Total % Energy Loss	



Inspired Interfaces
Software Developers & Consultants

THE DEMONSTRATION

- ◆ New development in Malmesbury
- ◆ Selected individual domestic connections
- ◆ Used underground cable and domestic street kiosks
- ◆ From Survey to Costed Bill-Of-Materials
- ◆ Demonstrate phase balancing
- ◆ Perform cable optimisation
- ◆ Show the design geospatially

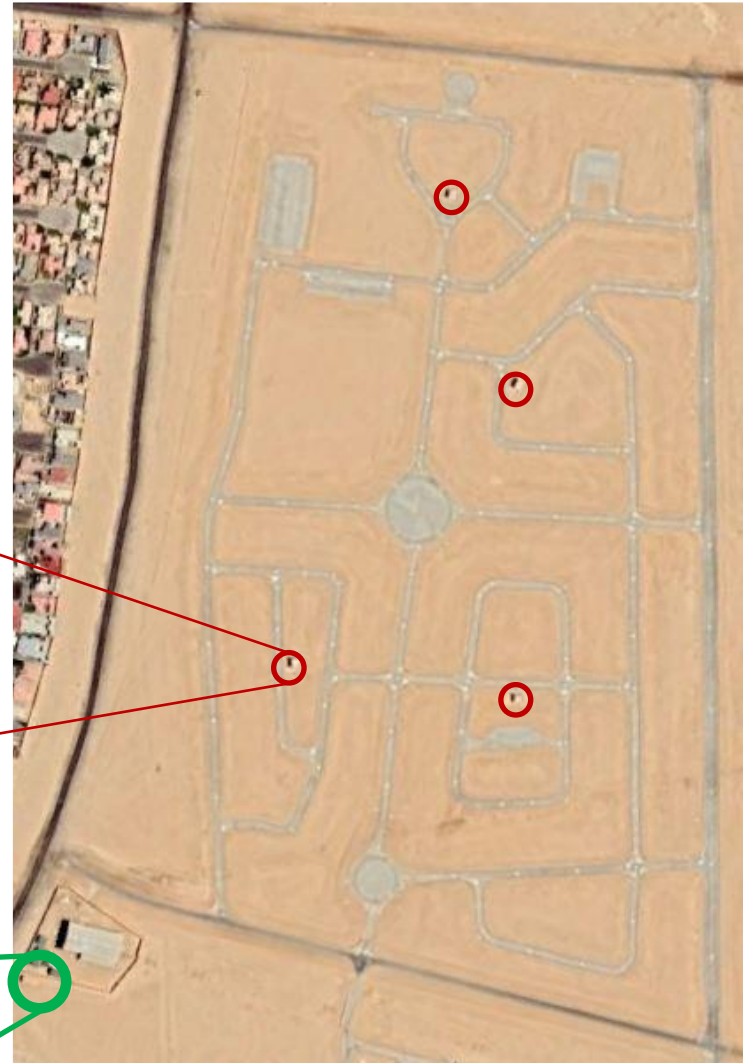


EXAMPLE CLOSER TO HOME

- ◆ New development near the Tamarisk Substation
- ◆ Mini-substations with 2x 630kVA transformers



- ◆ Main Erongo Red Tamarisk Substation



EXAMPLE CLOSER TO HOME

- ◆ 11kV network shown in purple
 - ◆ LV Network shown in Mauve
 - ◆ 16mm² Service cables shown in white
- 
- ◆ All domestic connections are via a street kiosk



SUMMARY

- ◆ Survey data is loaded automatically through the PowerOffice translator into CAD
- ◆ Detailed electrical analysis and optimization is performed in **ReticMaster**
- ◆ The Electrical changes are updated in CAD
- ◆ The network can be viewed Geospatially
- ◆ Automated code selection selects the appropriate structures
- ◆ Generation of a Bill-Of-structures – using **PowerOffice**
- ◆ Creation of a Costed Bills-Of-Materials

THANK YOU



For additional inspiration, please contact:

Inspired Interfaces (Pty) Ltd

PO Box 967, Hillcrest, 3650, South Africa

Tel: +27 31 765 6650

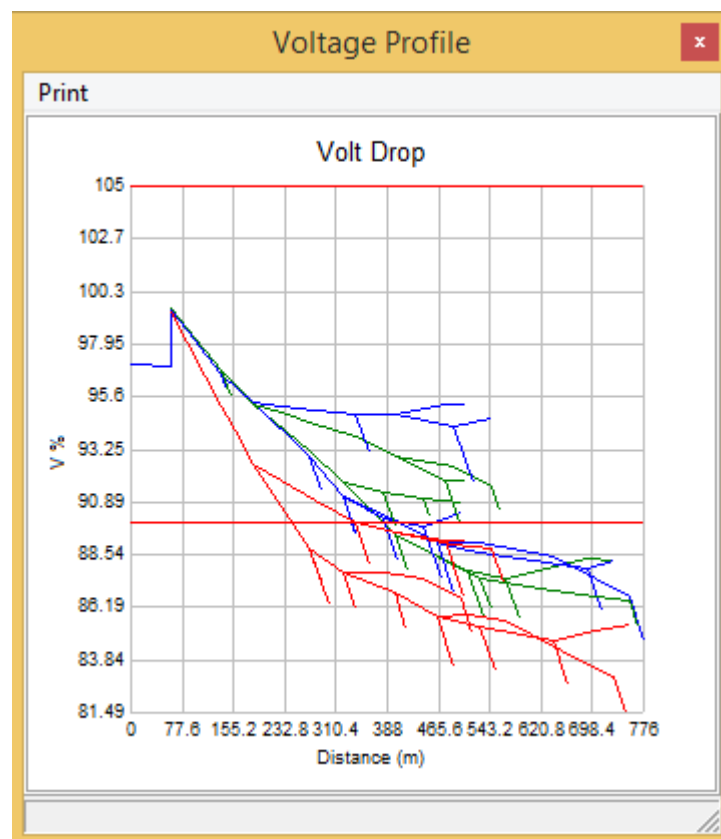
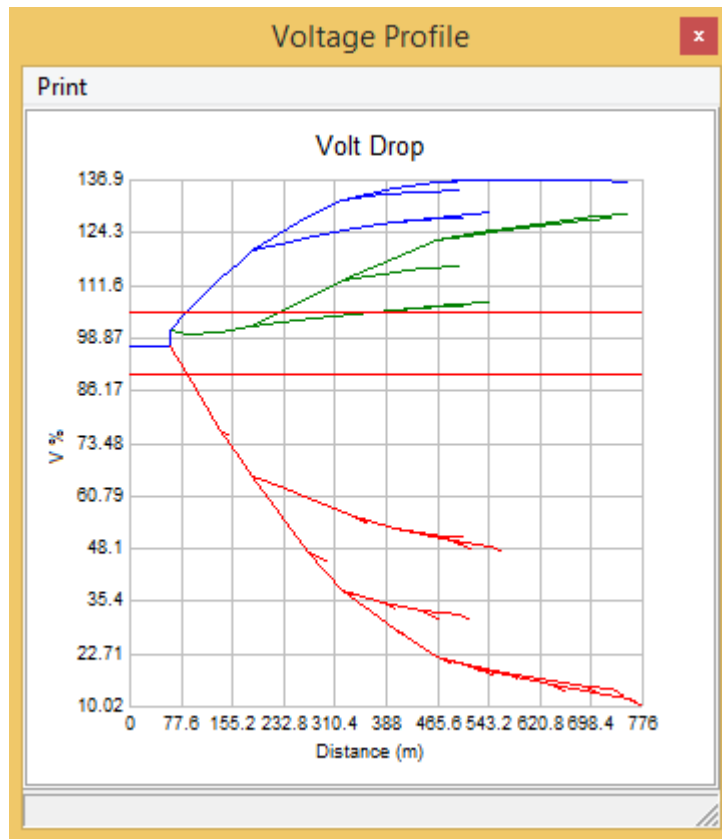
Fax: +27 31 765 6649

Email: support@interfaces.co.za

Web: www.reticmaster.com

PRE & POST BALANCING

◆ Depicting Unbalanced and Balanced design



PROBLEM NODE LOCATION

◆ ReticMaster's Problem Node location feature.

◆ Typical problem nodes include:

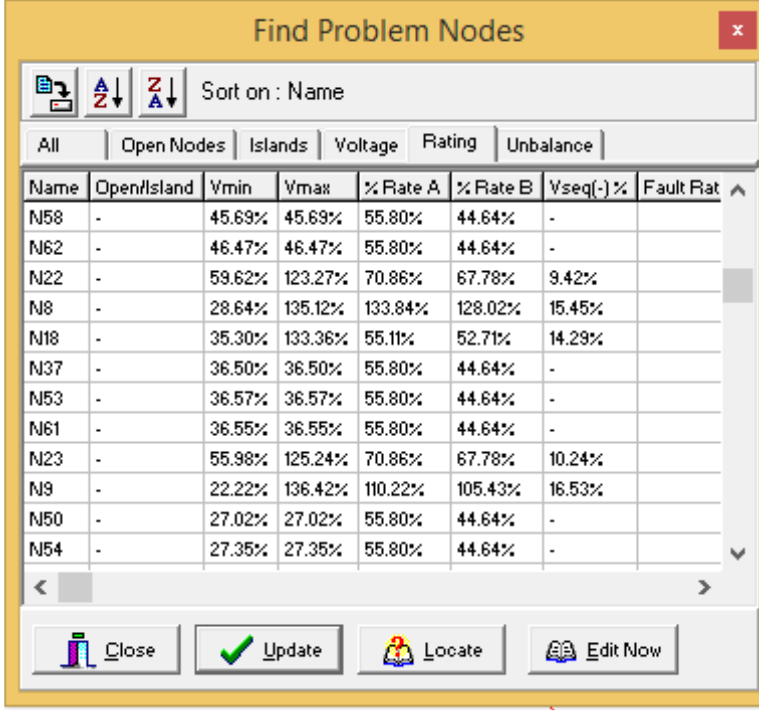
◆ Open Nodes

◆ Islands

◆ Voltage issues

◆ Rating Problems

◆ Unbalanced nodes



Find Problem Nodes

Sort on : Name

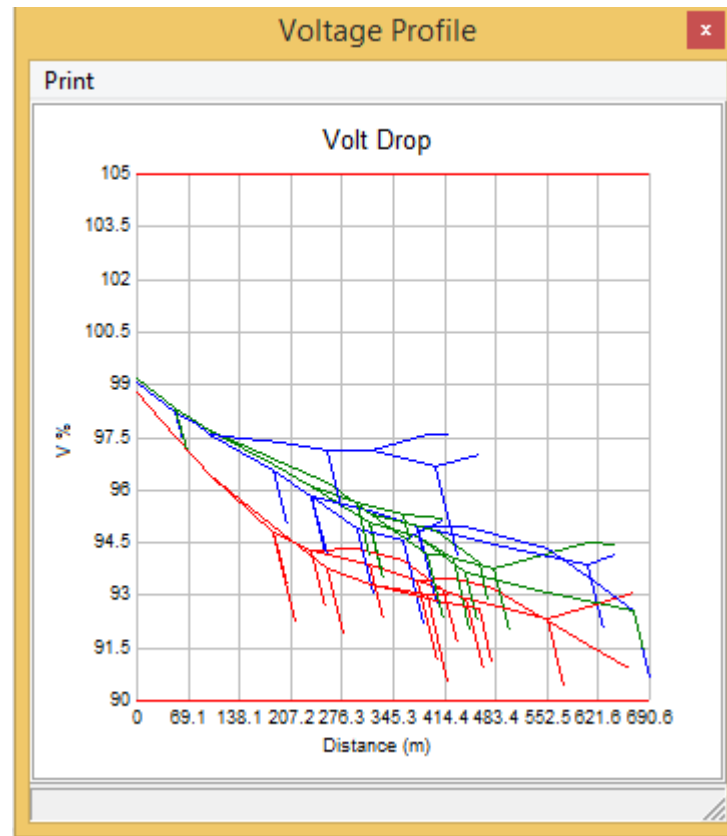
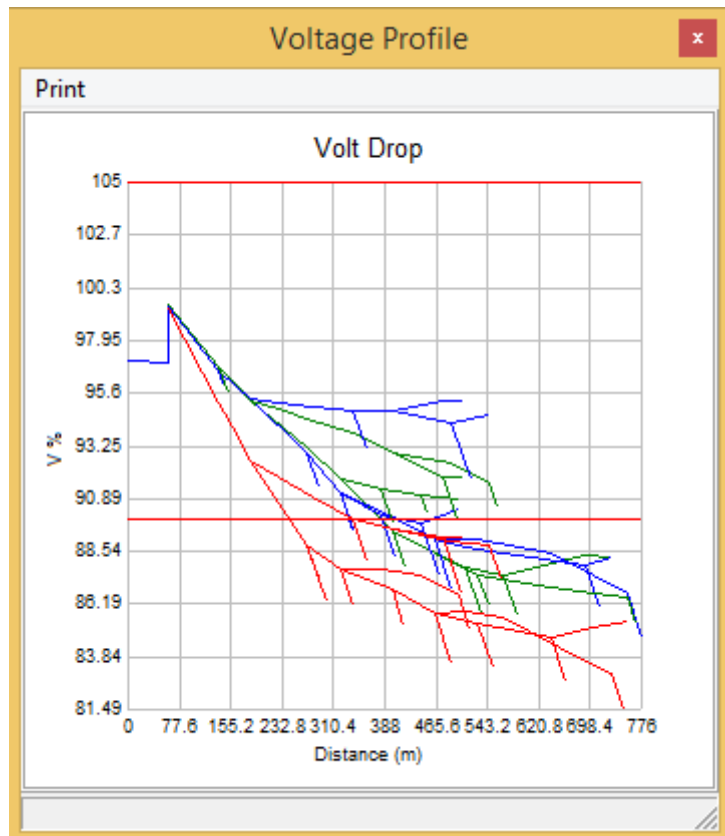
All Open Nodes Islands Voltage Rating Unbalance

Name	Open/Island	Vmin	Vmax	% Rate A	% Rate B	Vseq(-) %	Fault Rat
N58	-	45.69%	45.69%	55.80%	44.64%	-	
N62	-	46.47%	46.47%	55.80%	44.64%	-	
N22	-	59.62%	123.27%	70.86%	67.78%	9.42%	
N8	-	28.64%	135.12%	133.84%	128.02%	15.45%	
N18	-	35.30%	133.36%	55.11%	52.71%	14.29%	
N37	-	36.50%	36.50%	55.80%	44.64%	-	
N53	-	36.57%	36.57%	55.80%	44.64%	-	
N61	-	36.55%	36.55%	55.80%	44.64%	-	
N23	-	55.98%	125.24%	70.86%	67.78%	10.24%	
N9	-	22.22%	136.42%	110.22%	105.43%	16.53%	
N50	-	27.02%	27.02%	55.80%	44.64%	-	
N54	-	27.35%	27.35%	55.80%	44.64%	-	

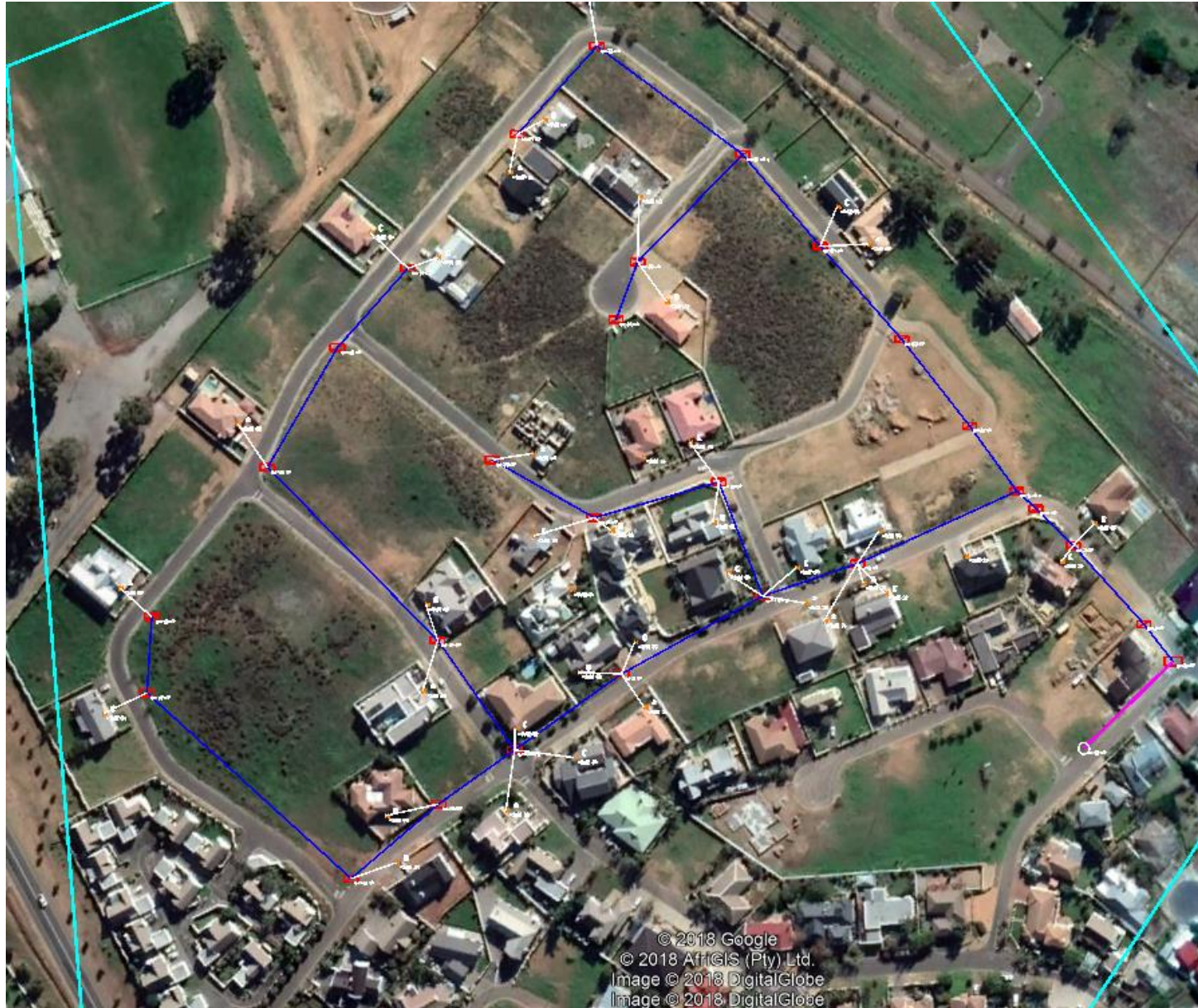
Close Update Locate Edit Now

CABLE OPTIMISATION

- Using the preferred cable types
ReticMaster optimizes the network



GEOSPATIAL REPRESENTATION



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DOMESTIC CONNECTION



BILL OF STRUCTURES

Pre Place-Codes

PowerOffice Project Update Results

Close Export

DRAWING CODE	QTY	Type	DESCRIPTION
3236DK1C2###B	15	Pack	TWO WAY SINGLE PHASE 16kVA METER KIOSK
8050AIDBE####	1	Pack	M/SUB 315kVA 11kV/415V TYPE B INLAND FP
CLFDK1C4#####	6	Pack	FOUR WAY SINGLE PHASE 16kVA METER KIOSK
3145B1YAB##	36	Pack	3145 ECU 1PH W/RAILS TOKEN BRICK
0854ADSP####SM	59.47	Pack	CAB TRCH/HND BACKFILL SOIL 11kV 3C 50 P
0854CVRP####SM	1607.68	Pack	CAB TRCH/HND & BACKFILL SOIL 400V 3C 25
3140E1#E##	684.66	Pack	3140 LV 1PH 4MM CONCENTRIC SERVICE

Post Place-Codes

PowerOffice Project Update Results

Close Export

DRAWING CODE	QTY	Type	DESCRIPTION
3140E1#J##	666.45	Pack	3140 LV 1PH 10MM CONCENTRIC SERVICE
3140E1#E##	18.21	Pack	3140 LV 1PH 4MM CONCENTRIC SERVICE
0854CVRP####SM	937.38	Pack	CAB TRCH/HND & BACKFILL SOIL 400V 3C 25
3145B1YAB##	36	Pack	3145 ECU 1PH W/RAILS TOKEN BRICK
CLFDK1C4#####	6	Pack	FOUR WAY SINGLE PHASE 16kVA METER KIOSK
8050AIDBE####	1	Pack	M/SUB 315kVA 11kV/415V TYPE B INLAND FP
3236DK1C2###B	15	Pack	TWO WAY SINGLE PHASE 16kVA METER KIOSK
0854CVOP####SM	403.62	Pack	CAB TRCH/HND & BACKFILL SOIL 400V 3C 70
0833COVSNQ###B	9	Pack	TERM 4C 400V 35.0 SQ O/D TRSF
0830CIVSRN###B	36	Pack	TERM 4C 400V 25.0 SQ I/D MK DK MINI
0830CIVSON###B	20	Pack	TERM 4C 400V 70.0 SQ I/D MK DK MINI
0833COVSOQ###B	1	Pack	TERM 4C 400V 70.0 SQ O/D TRSF
0854CVNP####SM	266.69	Pack	CAB TRCH/HND & BACKFILL SOIL 400V 3C 35
0854ADSP####SM	59.47	Pack	CAB TRCH/HND BACKFILL SOIL 11kV 3C 50 P
0851AODPSM###B	1	Pack	TERM 3C 11kV 50 SQ O/D PILC DIST. S/A INLAND

COSTED BILL OF MATERIALS

Materials detail

Category	Code	Description	Unit	Quantity	Source Unit Cost	Cost
Material - Stock	171707	METER,STD ECU TOKEN 20A D3145	EA	36 \$	317.03 \$	11,413.08
Material - Stock	171710	PASSIVE BASE UNIT,ECU/CBU WITH RAILD3171	EA	36 \$	101.97 \$	3,670.92
Material - Stock	172393	PLATE,BLANK ALU POLE MK 25X150 D3049	EA	67 \$	1.63 \$	108.91
Material - Stock	172423	SIGN,DANGER ELECT SYMB 150x150x0.6 D3202	EA	1 \$	29.77 \$	29.77
Material - Stock	175532	INSUL,STAT POST 22kV 1.5kN 31mm/kV D3017	EA	3 \$	389.13 \$	1,167.39
Material - Stock	175536	BRACKET,ST CABLE TERM SUPP GALV D3207	EA	1 \$	346.28 \$	346.28
Material - Stock	175871	LUG,CRIMP CU 35.0SQxM12 F/H D3102	EA	36 \$	3.29 \$	118.44
Material - Stock	180019	LUG,BI-MET 9.0-15.0 M12 0 DEG I/C D3166	EA	3 \$	42.35 \$	127.05
Material - Stock	183882	PLASTER,SAND/CEMENT MIX 40kg D3221	EA	1 \$	263.19 \$	263.19
Material - Stock	183883	FLOOR SCREED SAND/CEMENT 40kg D3222	EA	2 \$	301.33 \$	602.67
Material - Stock	186424	REDUCER,METRIC CABL GLND M63-M40 D3229	EA	20 \$	209.58 \$	4,191.60
Material - Stock	186793	TUBING SET 35-50SQ 4C LV CABLE D3138	EA	9 \$	106.83 \$	961.47
Material - Stock	186798	KIOSK,METER 2 WAY 1PH 16kVA D3236	EA	15 \$	5,505.28 \$	82,579.20
Material - Stock	197853	PIPE,LDPE TYPE 1 CLS 3 16ID 20.00D D3127	M	6 \$	2.54 \$	15.24
Material - Stock	212967	KIOSK,METER 4 WAY 1PH 16kVA D3236	EA	6 \$	9,313.87 \$	55,883.22
Material - Stock	216398	PIN, EARTHING MV OHL CABLE TERM D8028	EA	3 \$	562.01 \$	1,686.02
Material - Stock	401110	PADLOCK. GEN MASTER - DTP - NOT IN SAP	EA	21 \$	225.33 \$	4,731.83

COSTED BILL OF MATERIALS

Labour & Other detail

Category	Code	Description	Unit	Quantity	Source Unit Cost	Cost
Labour	305010	Trench/hand .45m wide 1m deep MV soil	M	8.02845	\$ 1,191.00	\$ 9,561.88
Labour	305070	Trench/hand .45m wide 0.6m deep LV soil	EA	160.769	\$ 1,100.00	\$ 176,845.90
Labour	306070	Dig/Drill Holes Depth : 0.8 to 1.0m Pick	EA	9	\$ 1,191.00	\$ 10,719.00
Labour	306185	Sieving bedding/blanket soil	EA	75.0222	\$ 1,100.00	\$ 82,524.42
Labour	306188	Install cable cover / warning tape	EA	6.66864	\$ 1,100.00	\$ 7,335.50
Labour	306190	Backfill and compact Normal Bulk	M3	2.373	\$ 1,191.00	\$ 2,826.24
Labour	307010	Backfill/compact 1m deep trench	M	5.3523	\$ 1,191.00	\$ 6,374.59
Labour	307030	Backfill/compact 0.6m deep trench	EA	107.71523	\$ 1,100.00	\$ 118,486.75
Labour	312010	Laying of cables MV	M	2.9735	\$ 1,191.00	\$ 3,541.44
Labour	312030	Laying of cable LV < 70mm	EA	24.0814	\$ 1,191.00	\$ 28,680.95
Labour	312040	Laying of cables LV >70mm	EA	16.1448	\$ 1,100.00	\$ 17,759.28
Labour	313050	Terminate MV 3-core <=95mm	EA	4.5	\$ 1,191.00	\$ 5,359.50
LABOUR					\$ -	\$ 1,279,318.51
Transport	400190	LDV 2 x 4 1000 kg (km)	KM	901.628	\$ 5.00	\$ 4,508.14
Transport	400220	TRUCK 7000-12000 kg WITH MOUNTED CRANE (km)	KM	120	\$ 27.00	\$ 3,240.00
Transport	400230	TRUCK TRACTOR WITH CABLE TRAILER	EA	185.236	\$ 20.00	\$ 3,704.72
TRANSPORT					\$ -	\$ 11,452.86
ITEMS TOTAL					\$ -	\$ 1,959,510.33
VER TOTAL					\$ -	\$ 1,959,510.33

