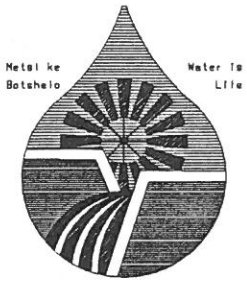
BOPHUTHATSWANA
DEPARTMENT OF WATER AFFAIRS



MORETELE 1 REGIONAL WATER SUPPLY SCHEME
PROJECT 4: STAGE 1
STINKWATER AND NUWE EERSTERUS
PRELIMINARY ENGINEERING DESIGN

OCTOBER 1993

EVN CONSULTING ENGINEERS (RSA) (PTY) LTD
CONSULTING, STRUCTURAL AND AGRICULTURAL ENGINEERS
EVN CASA LABORE, 182 WATERMEYER STREET, MEYERSPARK, 0184
P.O. BOX 40193, ARCADIA, 0007
TEL: (012) 803–7444
FAX: (012) 803–8328

DOCUMENT NO. 8823/51 IR26

ENQUIRIES: J.W.M. LIJNES/D. FABEL

REPUBLIC OF BOPHUTHATSWANA
DEPARTMENT OF WATER AFFAIRS

MORETELE 1 WATER SCHEME - PROJECT 4 - STAGE 1
STINKWATER AND NUWE EERSTERUS

PRELIMINARY ENGINEERING DESIGN

EXECUTIVE SUMMARY

This report entails the Preliminary Engineering Design of the proposed trunk mains and reticulation to Stinkwater as well as the upgrading of Reservoir R6 with an additional 16 Ml storage capacity.

The proposed project comprises the following :

The construction of trunk mains from Reservoir R6 to Stinkwater and Nuwe Eersterus. These trunk mains comprises approximately 3060 m of 400 mm diameter, 1100 m of 350 mm diameter 2600 m of 300 mm diameter and 2050 m of 200 mm diameter FC pipes. The estimated cost for the trunk main is R3 700 000.

12000 m of primary reticulation traversing a route determined by dummy standpipe positions. The estimated cost for the primary reticulation is R1 600 000.

The extent of the secondary reticulation is dependant on the number of applications for yard connections and is estimated as 40% of the total for 1994. This represents approximately 32000 m of reticulation and the cost is estimated at R3 600 000.

A 16 Ml Reservoir at command point R6 which is estimated at R2 300 000.

It is thus recommended that an amount of R11 200 000 be approved for this project which includes for 10% contingencies, estimated escalation, community participation, fees and disbursements and VAT.

REPUBLIC OF BOPHUTHATSWANA
DEPARTMENT OF WATER AFFAIRS

MORETELE 1 WATER SCHEME - PROJECT 4 - STAGE 1
STINKWATER AND NUWE EERSTERUS

PRELIMINARY ENGINEERING DESIGN

TABLE OF CONTENTS

PART 1 : BACKGROUND AND LOCAL CONTEXT OF PROJECT

Section 1 : Development Rationale

1.1 Locality

The townships of Stinkwater and Nuwe Eersterus are situated approximately 12 km west of Hammanskraal and approximately 45 km north of Pretoria. The locality of Stinkwater and Nuwe Eersterus is shown in Figure 1 included at the end of this report.

1.2 Moretele 1 Water Scheme Context

The regional water supply scheme comprises the bulk distribution and reticulation of potable water to the Moretele 1 region of Bophuthatswana. This phased development is further described in Table 1.1. Potable water is to be provided to a total present day population of some 255 000 people which is expected to grow to some 424 000 by 2010.

TABLE 1.1 : MORETELE 1 WATER SCHEME : PROJECTS AND PHASING

PROJECT	PHASE	COMMENTS
Project 1 : East Bank Rudimentary Supply		
a) Marokolong Low Rudimentary Reticulation	N/A	Complete
b) Marakolong High Rudimentary Reticulation	N/A	Complete
c) Ramotse Rudimentary Reticulation	N/A	Complete
d) Bosplaas East Reticulation and Link Main	TBD	Private owned land
e) Wynandskraal Reticulation and Link Main	1	Tribal Land/State
f) Maubane 2 Reticulation and Link Main	1	Tribal Land/State
g) Maubane 1 Reticulation and Link Main	1	Tribal Land/State
i) Witgatboom	N/A	Boreholes
j) Thulwe	N/A	Boreholes
k) Priska	N/A	Boreholes
l) Potwane	N/A	Boreholes
m) Trunk main from Babalegi reservoir to Babelegi Industry	N/A	Complete
n) Trunk main from Babelegi Industry to Carousel	N/A	Complete
o) L.P. reticulation to Ramotse/Marokolong	N/A	Complete
Project 2 : Raw water source, treatment and bulk supply to service reservoirs		
a) Leeuwkraal Dam Pumpstation	1	Commenced
b) 800 Pipeline from Kudube Dam to Treatment Works	1	Commenced
c) Treatment Works	1	Commenced
d) Kudube Pumpstation 2A to Reservoir R4	N/A	Complete
e) Trunk main from Pumpstation 2A to Reservoir R4	N/A	Complete
f) Reservoir R6	3	Stage 1 complete
g) Reservoir R2	3	Additions to existing for Project 3
h) Link between East Bank and West Bank	3	Future flexibility
Project 3 : West Bank Supply		
a) Kudube Reticulation	N/A	Complete
b) Kudube Unit D High Reticulation	N/A	Complete
c) Kudube South Reticulation	N/A	Complete
d) Majaneng Low Reticulation	1	Tenders October 1993
d) Bosplaas West Low	TBD	Private owned land
e) DMS Group Link Main and Reticulation	2 & 3	
f) Makapanstad Link Main and Reticulation	1 & 3	
g) Moratele	N/A	Boreholes
h) Kontante	N/A	Boreholes
i) Kgomo–Kgomo	N/A	Boreholes
j) Tladistad	N/A	Boreholes
k) Kwa–Mmatlhwaela	N/A	Boreholes
l) Leeukraal	N/A	Boreholes

PROJECT	PHASE	COMMENTS
Project 4 : South Western Supply		
a) Sekampaneng	TBD	Kudube Town Area
b) Suurman Link Main and Reticulation	1	Tenders October 1993 – Link Main completed
c) Dilopye Link Main and Reticulation	TBD	Private owned land
d) Ga–Mokone Link Main and Reticulation	TBD	Private owned land
e) Stinkwater and Nuwe Eersterus Link Main and Reticulation	1	State land
f) Mogogelo Link Main and Reticulation	2	
g) Kwa–Ratsiepane Link Main and Reticulation	3	
h) Kromkuil Link Main and Reticulation	TBD	Private owned land
i) Ga–Motle Link Main and Reticulation	3	
j) Ga–Moeka Link Main and Reticulation	TBD	Private owned land
k) Swartdamstad South Link Main and Reticulation	3	
l) Swartdamstad North Link Main and Reticulation	TBD	Private owned land
m) Mmakaunyane East Link Main and Reticulation	3	
n) Legkraal	N/A	Boreholes
o) Kudube Unit D Ext	N/A	Link Main completed – Reticulation by BHC
p) Majaneng High Reticulation	1	Tenders October 1993
q) Bosplaas West High Reticulation	TBD	Private owned land

* TBD = To be determined by Department

fb\8823\IR26\tab1

1.3 Existing development and town size

The extent of the current development is shown on the 1:2 000 layout plans included with this report. The borders indicated on the 1:10 000 orthophotos are as determined by Setplan and noted in their report "Southern Odi-Moretele Development Appraisal" of May 1991 and further investigations conducted in September 1993. The development area comprises approximately 245 ha for Stinkwater and 456 ha for Nuwe Eersterus surrounding a privately owned area of some 730 ha in Ga-mokone. These three areas are collectively known as Stinkwater.

1.4 Population estimate and growth

The average number of persons per dwelling as determined in the 1990 Socio-Economic Survey by Data Research Africa in association with Settlement Planning Services is 6,77 persons per dwelling. The dwelling count is estimated as 1186 and 2047 dwellings for Stinkwater and Nuwe Eersterus respectively. This gives a total 1993 population estimate as 21 887.

Growth potential as determined by Setplan is 4,8% for 1989 to 2000 and 3,8% for 2001 to 2010 which gives a predicted population of 44 134 in 2010.

1.5 Local Authority function

The local authority believed to be active in these areas are the Tidisano Community Authority. This will be confirmed once a community participation programme commences.

1.6 Community Participation

The outline of the Community Participation Programme as referred to in Diagram 1 is proposed.

PART 2 : TECHNICAL REPORT

Section 2 : Water Supply

2.1 Sources of Supply

The feasible sources of water for the South Western Supply Region have been identified as reservoirs (R6) situated at the Command point at the southern boundary of Moretele 1 as well as underground water.

Reservoir R6 obtains potable water from the Kudube treatment works which in turn obtains raw water from Kudube dam. The reservoir is situated on the highest point in the Moretele 1 region and has an operating level of some 1157 m amsl. which commands the entire South Western Supply region.

It was shown in volume III of the appraisal report "Moretele 1 Water Supply Programme : Project 4" that it is more economical to supply the South Western region up to Mmakaunyane with potable water from reservoir R6 than to exploit underground water sources.

Currently residents of Stinkwater and Nuwe Eersterus obtain water from boreholes with high fluoride content and polluted surface water sources.

2.2 Levels-of-service

Previously the Level of Service concept (LOS) as described in Annexure A to the "Guidelines for the selection of Design Criteria (Revision 1)" was used to estimate the primary water demand in a demand centre. Recently policy changes were proposed regarding the provision of rudimentary stand pipes.

In view of vandalism to and water wastage at such standpipes, it has been proposed that only yard- and house connections be supplied for in future projects. This would however not influence the calculation of the water demand as it is envisaged that some of the privately owned yard connections will replace public standpipes. The right is reserved for any yard connection owner to sell water to the public from his property.

2.3 The demand for potable water

Moretele is a warm and semi-arid region. Consumptive water demands are thus higher than in cooler, wetter regions of the RSA. Taking this fact into account, as well as the nature of the supply and the corresponding guideline figures, the following unit demands have been adopted for Stinkwater and Nuwe Eersterus.

a) Yard connections - 80 l/capita/day
b) Yard connections operating as water vendors - 80 l/capita/day and in addition 35 l/capita/day for all prospective water buyers envisaged to utilize such a supply
c) House connections - 120 l/capita/day

House connections are expected to be required to the permanent buildings.

Table 2 (Section 7) predicts the growth in both the annual average and the summer daily demands for the Moretele 1 region, and has been based on the population growth table and levels of service calculated in Table 1 (Section 7).

2.4 The demand for fire

As these are rural villages and in accordance with the guidelines, no provision has been made for fire flow.

2.5 Storage

Storage for the South Western supply area including Stinkwater and Nuwe Eersterus is provided in the command reservoir R6 situated on the southern border of the Moretele 1 region.

The current capacity of reservoir R6 is 5 Ml. Allowing for Suurman, Majaneng, Dilopye, Stinkwater, Nuwe Eersterus and Kudube Unit D Extension, the required storage capacity at Reservoir R6 in 1995 is some 12 Ml. It is therefore recommended that Reservoir R6 be upgraded by an additional 16 Ml storage capacity in 1994. From demand growth curves it is estimated that another 16 Ml storage capacity will be required by the year 2000.

2.6 Distribution mains

In the planning, distinction has been made between bulk, trunk and reticulation mains.

Bulk mains can be defined as that portion of the water supply system that is used for bulk supply to or from reservoirs or pumpstations designed to cater for a supply not higher than summer daily demand.

Trunk mains can be defined as that portion of the water supply system that is used for bulk supply from reservoirs or pumpstations, to the points of draw-off to specific development cells or units. Trunk mains are designed for peak flow rate. Yard and house connections are not normally provided from trunk mains.

Supplying individual development areas through trunk mains, and not through the reticulation or adjacent cells, result in numerous advantages for the control and management of water supply.

Trunk mains planned for Stinkwater and Nuwe Eersterus are shown schematically on Figure 2.

No information regarding geotechnical conditions is available and it is recommended that a full geotechnical investigation be executed prior to tender stage.

The minimum depth of cover over reticulation mains is 600 mm in verges and 1 000 mm below the travel ways. Trunk mains will be graded to ensure adequate air venting. A minimum cover of 1 000 mm will be adopted.

Preliminary calculations have shown that pipe classes providing for 90 m internal pressure, i.e. uPVC class 9 or FC class 18, will be adequate. It is proposed that uPVC mains for sizes ranging from 63 mm dia (minimum) to 160 mm dia and FC mains for larger diameters be adopted as this is at present the most cost-effective for small diameter water mains. Fittings will be cast-iron and steel suitable for coupling to FC or uPVC pipelines.

Isolating valves will be cast-iron, non rising spindle, clockwise closing valves to SABS 664 - class 10. Isolating valve positions will be selected in order that sections of reticulation can be isolated for maintenance purposes when required.

Scour valves will be installed at the low end of isolation zones, in order to properly drain the reticulation mains for maintenance purposes.

Yard connections and water supply fittings in dwellings within residential areas will allow air to be released from reticulation mains during normal operation, and to enter mains when these are drained for maintenance purposes. No specific airvalves are therefore proposed within the reticulation except where venting is required during filling. Air valves will be provided to vent trunk mains, as no direct connections will generally be made to these mains.

2.7 Phasing

As shown in Figure 2 the trunk mains proposed for Dilopye, Stinkwater, Nuwe Eersterus, Ga-Makone and Matenteng will be phased as follows:

Links ABCDEFG will be installed in Phase 1 and will allow for :-

a) Nuwe Eersterus (47 l/s DPFR 1995)
b) Stinkwater (28 l/s DPFR 1995)
c) Dilopye (22,4 l/s 2010)

The trunk mains required will comprise of 3060 m of 400 mm diameter, 1100 m of 350 mm diameter and 2600 m of 300 mm diameter FC Pipes totalling some 6760 m.

Phase 2 comprises the construction of an additional parallel pipe to link AB and the construction at links BHIG.

On completion of Phase 2 links ABCDEF will supply :

a) Stinkwater (73 l/s DPFR 2010)
b) Dilopye (22,4 l/s DPFR 2010)

Phase 2 (links BHIG) will allow for:

a) Ga-Makone & Matenteng (143 l/s DPFR 2010)
b) Nuwe Eersterus (130 l/s DPFR 2010)
c) Balance of South Western Region up to Mmakaunyane (261 l/s DPFR 2010)

It is envisaged that a total length of 9,2 km of steel and FC Pipelines will be required comprising of 3,1 km of 700 mm diameter steel, 3,4 km of 700 mm diameter steel, 3,4 km 650 mm diameter steel, 650 m of 600 mm diameter steel, 1 km of 500 mm diameter steel and 1,1 km of 300 mm diameter FC Pipes.

We believe this to be the most economical phasing for supply to this region.

2.8 Extent of Construction

A minimum reticulation will be installed to serve as the main reticulation rings on pipes. The position of these pipelines are determined according to the guidelines as if public standpipes are still being installed and follow a route through dummy standpipe positions. Tender quantities will be based on the level of service as predicted in the reports by Setplan for the year 1994. The actual extent of construction, apart from the minimum described earlier, will be determined by the number and positions of yard and house connections being applied and paid for by the residents prior to and during the construction period.

Trunk mains from reservoir R6 to the points of draw-off are required.

PART 3 : FINANCIAL REPORT

Section 3 : Capital Costs

3.1 Cost Base

Planning and construction costs are subject to escalation and are therefore a function of the specific development programmes that are followed. A cost base should therefore be coupled to any cost estimate that is included in this report.

The cost base coupled to the estimates included in this report, is December 1993. This month is expected to be the month prior to the closing date of tenders, and thus represents the base month for the calculation of contract escalation. Pre-contract escalation has been allowed to December 1993 and a separate allowance made for Contract Price Adjustment after December 1993.

3.2 Summary of Capital Costs

Initial capital costs are depended on the quantity of applications received from residents prior to and during the construction period. The Setplan reports predict the Level of Service for Stinkwater and Nuwe Eersterus as 5 for 1994. This level of service represents 40% of the total number of dwellings to be supplied with yard connections.

The estimated capital costs for Phase 1 can thus be summarized as follows :

a)	Trunk mains :	R2 900 000
b)	Primary reticulation :	R1 200 000
c)	Secondary reticulation : (40% of total)	R2 800 000
d)	16 Ml Reservoir	R1 800 000
		R8 700 000
	Add 14% VAT	R1 218 000
		R9 918 000

These costs include for Preliminary and General items as well as Dayworks, but exclude for Fees and Disbursements.

3.3 Fees and Disbursements

Estimated fees and disbursements related to civil work are summarized below :

a)	Professional Fees (Form 1)	R 720 000
b)	Time Basis (negotiations, wayleaves, DBSA, etc)	R 40 000
c)	Site Supervision	R 200 000
b)	Disbursements (survey, geotechnical etc.)	R 80 000
		R 1 040 000
	Add 14% VAT	R 145 600
		R 1 185 600

3.4 Community Participation Costs

The estimated cost for the Community Participation Programme over a 12 month period is summarized below :

a)	Budget : Community Participation :	R 118 400
	Add 14% VAT	R 16 600
		R 135 000

3.5 Total

The total project cost is therefore estimated at some R11,2M.

Section 4 : Cost Allocation

4.1 General

Costs were apportioned according to the status as envisaged in 2010 (Table 4, Section 6). Costs included are for trunk mains, Phases 1 and 2 as shown in Figure 2 and for additional storage capacity at Reservoir R6, Phases 1, 2 and 3

4.2 Trunk Mains

Cost allocations for trunk mains are as follows:

a)	Stinkwater	-	22,9%
b)	Nuwe Eersterus	-	18,2%
c)	Ga-Makone and Matenteng	-	15,1%
d)	Dilopye	-	7,3%
e)	Balance of the South Western Supply Zone	-	36,5%

4.3 Storage Cost

Cost allocations for additional storage capacity at Reservoir R6 are as follows:

a)	Stinkwater	-	7,6%
b)	Nuwe Eersterus	-	13,5%
c)	Ga-Makone and Matenteng	-	14,9%
d)	Dilopye	-	2,4%
e)	Balance of the South Western Supply Zone	-	61,6%

PART 4

Section 5: Programme

A construction period of 18 months is proposed to allow adequate time for applications for house connections to be processed and installed.

A proposed programme is attached as Figure 3 (Section 7).

PART 5

Section 6 : Recommendations

It is recommended that an amount of R11 200 000 be approved for the First Phase construction of trunk mains and reticulation to the state land potions of Stinkwater and Nuwe Eersterus as well as a 16 Ml Reservoir at R6. This amount includes for 10% contingencies, estimated escalation, Community Participation, Fees and disbursements and 14% VAT.

APPENDICES

TABLE 1

MORETELE 1 – SCHEDULE OF AREA GROWTH

MORETELE 1					GROWTH		PROBABLE POPULATION ESTIMATES																				SUMMARY OF ESTIMATED PROBABLE POPULATIONS				
No.	DEMAND CENTER	1989 HH	1989 POP	1989 DENS	1990 – 2000	2001 – 2010	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990	1995	2000	2005	2010
APIES RIVER EAST BANK																																
1	BABELEGI IND.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	MAROKOLONG Low	397	2175	5.48	3.20	2.90	2244	2318	2390	2467	2546	2627	2711	2798	2888	2980	3075	3165	3256	3351	3448	3548	3651	3757	3866	3978	4093	2244	2627	3075	3548	4093
3	MAROKOLONG High	228	1250	5.48	3.20	2.90	1290	1331	1374	1418	1463	1510	1559	1608	1660	1713	1768	1819	1872	1926	1982	2039	2099	2159	2222	2286	2353	1290	1510	1768	2039	2353
4	RAMOTSE	570	3124	5.48	3.20	2.90	3224	3327	3434	3543	3657	3774	3895	4019	4148	4281	4418	4546	4678	4813	4953	5096	5244	5396	5553	5714	5880	3224	3774	4418	5096	5880
5	BOSPLAAS EAST	1083	5935	5.48	3.20	2.80	6125	6321	6523	6732	6947	7170	7399	7636	7880	8132	8393	8628	8869	9118	9373	9635	9905	10182	10467	10761	11062	6125	7170	8393	9635	11062
6	WYNANDSKRAAL	318	1743	5.48	3.00	2.70	1795	1849	1905	1962	2021	2081	2144	2208	2274	2342	2413	2478	2545	2613	2684	2757	2831	2907	2986	3066	3149	1795	2081	2413	2757	3149
7	MAUBANE 2	902	4943	5.48	3.00	2.70	5091	5244	5401	5563	5730	5902	6079	6262	6449	6643	6842	7027	7217	7412	7612	7817	8028	8245	8468	8696	8931	5091	5902	6842	7817	8931
8	MAUBANE 1	345	1891	5.48	2.90	2.60	1946	2002	2060	2120	2182	2245	2310	2377	2446	2517	2590	2657	2726	2797	2870	2944	3021	3100	3180	3263	3348	1946	2245	2590	2944	3348
9	WITGATBOOM	163	893	5.48	1.80	1.60	909	925	942	959	976	994	1012	1030	1049	1067	1087	1104	1122	1140	1158	1176	1195	1214	1234	1253	1274	909	994	1087	1176	1274
10	THULWE	189	1036	5.48	1.80	1.60	1055	1074	1093	1113	1133	1153	1174	1195	1216	1238	1261	1281	1301	1322	1343	1365	1387	1409	1431	1454	1477	1055	1153	1261	1365	1477
11	PRISKA	139	762	5.48	1.80	1.60	776	790	804	818	833	848	863	879	895	911	927	942	957	972	988	1004	1020	1036	1053	1070	1087	776	848	927	1004	1087
12	POTWANE	53	290	5.47	1.80	1.60	295	301	306	311	317	323	329	334	341	347	353	359	364	370	376	382	388	394	401	407	414	295	323	353	382	414
13	CAROUSEL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14	KUDUBE (Hammskraal)	0	0	4.50	NA	NA	0	0	115	153	230	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	0	300	300	300	300
SUB–TOT EAST BANK (RB)		4387	24042	5.48	2.78	2.48	24751	25480	26347	27160	28035	28927	29774	30647	31545	32471	33426	34304	35207	36134	37086	38064	39069	40100	41160	42249	43367	24751	28927	33426	38064	43367
15	HAMMANSKRAAL	191	764	4.00	3.20	2.80	788	814	840	867	894	923	952	983	1014	1047	1080	1111	1142	1174	1207	1240	1275	1311	1347	1385	1424	788	923	1080	1240	1424
TOTAL EAST BANK		4578	24806	5.42	2.79	2.49	25539	26294	27187	28027	28929	29850	30727	31629	32560	33518	34506	35415	36349	37308	38293	39305	40344	41411	42508	43634	44791	25539	29850	34506	39305	44791
APIES RIVER WEST BANK																																
16	KUDUBE	4459	20333	4.56	0.50	0.50	20435	20537	20639	20743	20846	20951	21055	21161	21266	21373	21480	21587	21695	21803	21912	22022	22132	22243	22354	22466	22578	20435	20951	21480	22022	22578
17	KUDUBE UNIT D High	455	2075	4.56	0.50	0.50	2085	2096	2106	2117	2127	2138	2149	2159	2170	2181	2192	2203	2214	2225	2236	2247	2258	2270	2281	2292	2304	2085	2138	2192	2247	2304
18	KUDUBE South	800	4029	5.04	1.00	1.50	4069	4110	4151	4193	4235	4277	4320	4363	4406	4451	4495	4562	4631	4700	4771	4842	4915	4989	5064	5140	5217	4069	4277	4495	4842	5217
19	MAJANENG Low	1341	7874	5.87	4.80	3.80	8252	8648	9063	9498	9954	10432	10932	11457	12007	12583	13187	13688	14209	14749	15309	15891	16495	17121	17772	18447	19148	8252	10432	13187	15891	19148
20	BOSPLAAS WEST Low	743	4360	5.87	4.25	3.50	4545	4738	4939	5149	5368	5596	5834	6082	6341	6610	6891	7132	7382	7640	7908	8184	8471	8767	9074	9392	9720	4545	5596	6891	8184	9720
21	DMS GROUP	4273	25090	5.87	2.80	2.60	25793	26515	27257	28020	28805	29611	30441	31293	32169	33070	33996	34880	35787	36717	37672	38651	39656	40687	41745	42830	43944	25793	29611	33996	38651	43944
22	MAKAPANSTAD	2831	16623	5.87	2.80	2.60	17088	17567	18059	18564	19084	19619	20168	20733	21313	21910	22523	23109	23710	24326	24959	25608	26273	26957	27657	28377	29114	17088	19619	22523	25608	29114
23	MORATELE	71	417	5.87	1.80	1.60	425	432	440	448	456	464	472	481	490	498	507	516	524	532	541	549	558	567	576	585	595	425	464	507	549	595
24	KONTANTE	92	540	5.87	1.80	1.60	550	560	570	580	590	601	612	623	634	645	657	668	678	689	700	711	723	734	746	758	770	550	601	657	711	770
25	KGOMO–KGOMO	632	3711	5.87	2.60	2.40	3807	3906	4008	4112	4219	4329	4441	4557	4675	4797	4922	5040	5161	5285	5411	5541	5674	5810	5950	6093	6239	3807	4329	4922	5541	6239
26	TLADISTAD	505	3420	6.77	2.40	2.20	3502	3586	3672	3760	3851	3943	4038	4135	4234	4335	4439	4537	4637	4739	4843	4950	5059	5170	5284	5400	5519	3502	3943	4439	4950	5519
27	KWA–MMATLHWAELA	67	454	6.78	2.20	2.00	464	474	485	495	506	517	529	540	552	564	577	588	600	612	624	637	650	663	676	689	703	464	517	577	637	703
28	LEEUKRAAL	33	194	5.88	2.20	2.00	198	203	207	212	216	221	226	231	236	241	246	251	256	262	267	272	278	283	289	295	300	198	221	246	272	300
SUB–TOT WEST BANK		16302	89119	5.47	2.34	2.13	91213	93371	95596	97891	100258	102699	105216	107814	110494	113259	116113	118761	121483	124279	127153	130106	133141	136261	139468	142764	146152	91213	102699	116113	130106	146152
SOUTH WESTERN AREA																																
29	SEKAMPANENG	148	869	5.87	4.80	3.80	911	954	1000	1048	1099	1151	1207	1264	1325	1389	1455	1511	1568	1628	1690	1754	1820	1890	1961	2036	2113	911	1151	1455	1754	2113
30	SUURMAN	1420	9618	6.77	4.80	3.80	10080	10563	11071	11602	12159	12742	13354	13995	14667	15371	16109	16721	17356	18016	18700	19411	20149	20914	21709	22534	23390	10080	12742	16109	19411	23390
31	DILOPYE	329	2228	6.77	4.80	3.80	2335	2447	2564	2688	2817	2952	3093	3242	3398	3561	3732	3873	4021	4173	4332	4497	4667	4845	5029	5220	5418	2335	2952	3732	4497	5418
32	GA–MOKONE*	2837	19206	6.77	2.80	2.60	19744	20297	20865	21449	22050	22667	23302	23954	24625	25314	26023	26700	27394	28106	28837	29587	30356	31145	31955	32786	33638	19744	22667	26023	29587	33638
33	STINKWATER*	983	6655	6.77	4.80	3.80	6974	7309	7660	8028	8413	8817	9240	9684	10148	10636	11146	11570	12009	12466	12939	13431	13941	14471	15021	15592	16184	6974	8817	11146	13431	16184
34	NUWE EERSTERUS	1697	11489	6.77	4.80	3.80	12040	12618	13224	13859	14524	15221	15952	16716	17520	18361	19242	19973	20732	21520	22338	23187	24068	24983	25932	26917	27940	12040	15221	19242	23187	27940
35	MOGOGELO	1517	10275	6.77	3.00	2.80	10583	10901	11228	11565	11912	12269	12637	13016	13407	13809	14223	14621	15031	15452	15884	16329	16786	17256	17739	18236	18747	10583	12269	14223	16329	18747
36	KWA–RATSIEPANE	836	5662	6.77	2.80	2.60	5821	5984	6151	6323	6500	6682	6869	7062	7260	7463	7672	7871	8076	8286	8501	8722	8949	9182	9420	9665	9917	5821	6682	7672	8722	9917
37	KROMKUIL	955	7342	7.69	2.90	2.60	7555	7774	7999	8231	8470	8716	8969	9229	9496	9772	10055	10316	10585	10860	11142	11432	11729	12034	12347	12668	12997	7555	8716	10055	11432	12997
38	GA–MOTLE	1210	8195	6.77	2.80	2.60	8424	8660	8903	9152	9408	9672	9943	10221	10507	10801	11104	11393	11689	11993	12304	12624	12953	13289	13635	13989	14353	8424	9672	11104	12624	14353
39	GA–MOEKA	791	5357	6.77	2.80	2.60	5507	5661	5820	5983	6150	6322	6499	6681	6868	7061	7258	7447	7641	7839	8043	8252	8467	8687	8913	9145	9383	5507	6322	7258	8252	9383
40	SWARTDAMSTAD SOUTH	226	1531	6.77	2.40	2.20	1568	1605	1644	1683	1724	1765	1807	1851	1895	1941	1987	2031	2076	2121	2168	2216	2265	2314	2365	2417	2470	1568	1765	1987	2216	2470
41	SWARTDAMSTAD NORTH	249	1686	6.77	2.40	2.20	1726	1768	1810	1854	1898	1944	1990	2038	2087	2137	2189	2237	2286	2336	2388	2440	2494	2549	2605	2662	2721	1726	1944	2189	2440	2721
42	MMAKAUNYANE EAST	1593	10789	6.77	2.80	2.60	11091	11402	11721	12049	12386	12733	13090	13456	13833	14220	14619	14999	15389	15789	16199	16620	17053	17496	17951	18418	18896	11091	12733	14619	16620	18896
43	LEGKRAAL	160	1084	6.78	2.40	2.20	1110	1137	1164	1192	1220	1250	1280	1310	1342	1374	1407	1438	1470	1502	1535	1569	1603	1639	1675	1712	1749	1110	1250	1407	1569	1749
44	KUDUBE UNIT D Ext	0	0	4.56	4.70	3.10	0	0	1824	4560	7752	10716	11220	11747	12299	12877	13482	13900	14331	14775	15234	15706	16193	16695	17212	17746	18296	0	10716	13482	15706	18296
45	MAJANENG High	894	5249	5.87	4.80	3.80	5501	5765	6042	6332	6636	6954	7288	7638	8005	8389	8792	9126	9472	9832	10206	10594	10996	11414	11848	12298	12766	5501	6954	8792	10594	12766
46	BOSPLAAS WEST High	83	484	5.87	4.25	3.50	505	526	549	572	596	622	648	676	705	734	766	792	820	849	879	909	941	974	1008	1044	1080	505	622	766	909	1080
S/TOTAL S–WESTERN AREA (RB)		15928	107720	6.76	3.49	3.01	111476	115372	121239	128170	135715	143196	148388	153782	159387	165210	171261	176519	181945	187544	193320	199280	205430	211777	218326	225084	232059	111476	143196	171261	199280	232059
47	MORETELE SOUTH	0	0	4.5	3.00	2.60	0	0	0	2250	2351	2457	2568	2683	2804	2930	3062	3154	3248	3346	3446	3550	3656	3766	3879	3995	4115	0	2457	3062	3550	4115
TOTAL S/WESTERN AREA		15928	107720	6.76	3.49	3.01	111476	115372	121239	130420	138066	145653	150956	156466	162191	168140	174322	179673	185194	190889	196766	202830	209086	215543	222205	229080	236174	111476	145653	174322	202830	236174
TOTAL MORETELE REGION		36807	221645	6.02	2.95	2.60	228227	235037	244022	256338	267253	278202	286899	295909	305244	314917	324941	333850	343025	352476	362212	372240	382572	393215	404180	415477	427117	228227	278202	324941	372240	427117

* Update August 1993

TABLE 2

MORETELE 1 – WATER DEMAND GROWTH

No.	DEMAND CENTER	AVERAGE ANNUAL DAILY DEMAND									SUMMER DAILY DEMAND									DESIGN PEAK FLOW RATE								
		AADD 1990	AADD 1991	AADD 1992	AADD 1993	AADD 1994	AADD 1995	AADD 2000	AADD 2005	AADD 2010	SDD 1990	SDD 1991	SDD 1992	SDD 1993	SDD 1994	SDD 1995	SDD 2000	SDD 2005	SDD 2010	DPFR 1990	DPFR 1991	DPFR 1992	DPFR 1993	DPFR 1994	DPFR 1995	DPFR 2000	DPFR 2005	DPFR 2010
APIES RIVER EAST BANK		(kl/d)									(kl/d)									(l/s)								
1	BABELEGI IND.	1672	1705	1740	1774	1810	1846	2038	2250	2485	2006	2047	2087	2129	2172	2215	2446	2700	2981	55.7	56.8	58.0	59.1	60.3	61.5	67.9	75.0	82.8
2	MAROKOLONG Low	114	116	122	126	130	134	204	236	343	149	154	159	164	169	175	284	328	495	5.1	5.3	5.4	5.6	5.8	6.0	9.7	11.2	16.9
3	MAROKOLONG High	65	68	70	72	74	77	117	135	197	85	88	91	94	97	100	163	188	284	2.9	3.0	3.1	3.2	3.3	3.4	5.6	6.4	9.7
4	RAMOTSE	125	129	175	181	186	192	294	340	494	150	155	229	236	244	251	409	472	713	5.1	5.3	7.8	8.0	8.3	8.6	13.9	16.1	24.3
5	BOSPLAAS EAST	405	419	433	446	461	475	562	646	741	563	583	601	620	640	661	780	896	1029	19.2	19.9	20.5	21.2	21.8	22.5	26.6	30.5	35.0
6	WYNANDSKRAAL	78	81	83	86	88	106	160	183	264	98	101	104	108	111	138	223	254	381	3.3	3.5	3.6	3.7	3.8	4.7	7.6	8.7	13.0
7	MAUBANE 2	223	230	237	244	252	302	457	523	753	280	289	298	307	316	394	635	726	1085	9.5	9.8	10.1	10.4	10.8	13.4	21.6	24.7	37.0
8	MAUBANE 1	85	87	90	93	95	114	172	196	280	106	110	113	116	120	149	239	272	405	3.6	3.7	3.8	4.0	4.1	5.1	8.1	9.3	13.8
9	WITGATBOOM	40	40	41	42	43	43	50	54	65	50	51	52	52	53	54	63	69	85	1.7	1.7	1.8	1.8	1.8	1.9	2.2	2.3	2.9
10	THULWE	46	47	48	49	49	50	58	63	76	58	59	60	61	62	63	74	80	99	2.0	2.0	2.0	2.1	2.1	2.2	2.5	2.7	3.4
11	PRISKA	34	34	35	36	36	37	43	46	56	42	43	44	45	46	46	54	59	73	1.4	1.5	1.5	1.5	1.6	1.6	1.8	2.0	2.5
12	POTWANE	13	13	13	14	14	14	16	18	21	16	16	17	17	17	18	21	22	28	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.8	0.9
13	CAROUSEL	0	497	1000	1250	1500	1750	2000	2000	2000	0	596	1200	1500	1800	2100	2400	2400	2400	0.0	16.6	33.3	41.7	50.0	58.3	66.7	66.7	66.7
14	KUDUBE (Hammskraal)	0	0	30	101	177	252	252	252	252	0	0	45	152	250	356	356	356	356	0.0	0.0	1.0	2.4	5.1	8.9	8.9	8.9	8.9
SUB-TOT EAST BANK (RB)		2900	3469	4116	4512	4915	5393	6424	6942	8026	3604	4292	5099	5601	6097	6722	8146	8822	10414	110	130	153	165	179	199	244	265	318
15	HAMMANSKRAAL	104	108	111	115	118	122	144	166	190	153	159	164	169	174	180	212	244	280	5.2	5.4	5.6	5.8	6.0	6.2	7.2	8.3	9.6
TOTAL EAST BANK		3004	3577	4227	4627	5034	5515	6569	7107	8216	3758	4451	5263	5770	6271	6902	8358	9066	10693	115	135	158	171	185	205	251	274	327
APIES RIVER WEST BANK		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	KUDUBE	2790	2808	2822	2836	2850	2865	2955	3030	3107	4084	4109	4130	4150	4171	4192	4319	4429	4541	139.0	139.8	140.5	141.2	141.9	142.6	146.8	150.6	154.4
17	KUDUBE UNIT D High	276	278	279	281	282	283	292	299	307	406	409	411	413	415	417	429	440	451	13.9	14.0	14.0	14.1	14.2	14.3	14.7	15.0	15.4
18	KUDUBE South	541	547	552	558	564	569	602	649	699	795	804	812	820	829	837	884	953	1027	27.2	27.5	27.8	28.0	28.3	28.6	30.2	32.5	35.1
19	MAJANENG Low	548	576	604	633	663	695	1123	1353	1771	762	800	839	879	921	966	1616	1947	2574	26.0	27.3	28.6	30.0	31.4	32.9	55.0	66.3	87.6
20	BOSPLAAS WEST	176	184	192	200	209	246	322	424	503	212	221	231	240	251	308	407	553	656	7.2	7.5	7.8	8.2	8.5	10.5	13.8	18.8	22.3
21	DMS GROUP	1231	1269	1305	1341	1379	1571	1825	2484	3056	1555	1602	1647	1693	1741	2045	2373	3375	4220	52.6	54.2	55.7	57.3	58.9	69.3	80.2	114.2	142.9
22	MAKAPANSTAD	804	828	851	875	900	1025	1190	1619	1991	1016	1046	1076	1106	1137	1336	1549	2204	2757	34.5	35.5	36.5	37.5	38.6	45.4	52.5	74.8	93.6
23	MORATELE	18	19	19	20	20	20	23	25	30	23	24	24	24	25	25	30	32	40	0.8	0.8	0.8	0.8	0.8	0.9	1.0	1.1	1.4
24	KONTANTE	24	24	25	25	26	26	29	33	35	30	31	31	32	32	33	36	41	45	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.4	1.5
25	KGOMO-KGOMO	167	171	176	180	185	190	229	258	321	209	215	220	226	232	238	289	326	419	7.1	7.3	7.5	7.7	7.9	8.1	9.8	11.1	14.3
26	TLADISTAD	153	157	161	165	169	173	196	230	256	192	197	202	207	212	217	246	291	324	6.5	6.7	6.9	7.0	7.2	7.4	8.4	9.9	11.0
27	KWA-MMATLHWAELA	20	21	21	22	22	23	25	29	32	25	26	26	27	28	28	32	37	41	0.9	0.9	0.9	0.9	0.9	1.0	1.1	1.3	1.4
28	LEEUKRAAL	9	9	9	9	9	10	11	13	14	11	11	11	12	12	12	14	16	18	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6
SUB-TOT WEST BANK		6757	6892	7016	7145	7277	7695	8820	10446	12125	9319	9496	9661	9830	10005	10654	12223	14645	17113	317	323	329	334	340	362	415	497	581
SOUTH WESTERN AREA																												
29	SEKAMPANENG	55	58	61	64	67	70	97	117	177	76	79	83	87	91	96	135	162	256	2.6	2.7	2.8	3.0	3.1	3.3	4.6	5.5	8.7
30	SUURMAN	621	653	684	717	752	788	1092	1316	1999	848	891	934	979	1026	1075	1513	1824	2876	28.9	30.3	31.8	33.3	34.9	36.6	51.4	62.0	97.8
31	DILOPYE	142	149	156	164	172	180	249	300	456	194	204	214	224	235	246	346	417	657	6.6	7.0	7.3	7.6	8.0	8.4	11.8	14.2	22.4
32	GA-MOKONE	1247	1285	1321	1358	1396	1435	1804	2053	2942	1697	1749	1798	1848	1900	1954	2492	2836	4217	57	59	61	62	64	66	85	96	147
33	STINKWATER	435	456	478	499	523	588	749	1115	1466	593	622	651	681	713	816	1040	1612	2140	20	21	22	23	24	28	35	56	75
34	NUWE EERSTERUS	745	783	821	860	901	1022	1310	1990	2606	1017	1068	1120	1174	1230	1416	1815	2861	3761	34.6	36.4	38.1	39.9	41.9	48.3	61.6	97.3	128.6
35	MOGOGELO	492	508	523	539	555	634	742	1020	1267	622	642	662	682	702	827	968	1391	1757	21.2	21.8	22.5	23.2	23.9	28.1	32.9	47.3	59.7
36	KWA-RATSIEPANE	268	277	284	292	300	342	397	540	614	340	350	360	370	380	447	517	737	837	11.6	11.9	12.2	12.6	12.9	15.2	17.6	25.1	28.5
37	KROMKUIL	349	360	371	382	393	448	522	710	873	442	456	469	483	497	584	680	968	1211	15.0	15.5	16.0	16.4	16.9	19.9	23.1	32.9	41.2
38	GA-MOTLE	390	402	413	425	437	498	577	785	966	494	508	523	537	552	649	752	1071	1340	16.8	17.3	17.8	18.3	18.8	22.1	25.6	36.4	45.6
39	GA-MOEKA	254	261	269	276	284	324	375	510	580	321	331	340	350	359	423	489	697	792	10.9	11.3	11.6	11.9	12.2	14.4	16.6	23.7	27.0
40	SWARTDAMSTAD SOUTH	72	74	75	77	79	81	92	114	127	91	93	95	98	100	102	116	148	165	3.1	3.2	3.3	3.3	3.4	3.5	4.0	5.1	5.6
41	SWARTDAMSTAD NORTH	79	81	83	85	87	89	101	125	140	100	103	105	108	110	113	128	163	182	3.4	3.5	3.6	3.7	3.8	3.8	4.4	5.6	6.2
42	MMAKAUNYANE	516	532	547	562	578	594	689	869	988	653	672	691	711	730	751	870	1132	1287	22.2	22.9	23.5	24.2	24.8	25.5	29.5	38.4	43.7
43	LEGKRAAL	48	50	51	52	53	54	65	72	81	61	62	64	65	67	68	82	92	102	2.1	2.1	2.2	2.2	2.3	2.3	2.8	3.1	3.5
44	KUDUBE UNIT D Ext	0	0	242	605	1029	1422	1811	2106	2453	0	0	356	891	1514	2093	2659	3093	3603	0.0	0.0	12.2	30.4	51.7	71.5	90.7	105.5	122.9
45	MAJANENG High	364	382	401	420	440	461	744	897	1174	506	531	557	584	612	641	1072	1292	1708	17.3	18.1	19.0	19.9	20.9	21.9	36.5	44.0	58.2
46	BOSPLAAS WEST High	19	20	21	22	23	27	35	47	55	23	24	25	27	28	34	45	61	72	0.8	0.8	0.9	0.9	0.9	1.2	1.5	2.1	2.5
S/TOTALS-WESTERN AREA (RB)		6092	6321	6784	7376	8036	8990	11360	14399	18646	8070	8373	9024	9863	10804	12235	15591	20109	26500	275	285	307	336	368	417	530	684	901
47	MORETELE SOUTH	0	0	0	87	91	107	141	182	211	0	0	0	104	109	134	179	237	275	0.0	0.0	0.0	3.5	3.7	4.6	6.1	8.1	9.4
TOTAL S/WESTERN AREA		6092	6321	6784	7463	8129	9097	11501	14581	18857	8070	8373	9024	9967	10913	12369	15770	20346	26775	275	285	307	339	371	421	536	692	911
TOTAL MORETELE REGION		15853	16790	18028	19235	20439	22308	26889	32134	39197	21147	22319	23947	25567	27188	29925	36351	44057	54581	707	743	794	845	897	988	1202	1463	1819

Table 3

EVN Consulting Engineers – Community Participation

Budget – Moretele 1 – Stinkwater / Nuwe Eersterus
Cost estimate for 12 month period

No	Community Activity	Hrs	Rate	Sub–Total	Total
1	**Community Public Relations visits**	38.00	200.85	7632.30	7632.30
2	**Official meetings**				
	– Steering Committee Meetings	38.00	200.85	7632.30	
	– Village Water Committee meetings	75.00	200.85	15063.75	
	– Village Information meetings	40.00	200.85	8034.00	
	– Village Functions Direct Costs (2 Functions)		5000.00	10000.00	
	– Co–ordination Feedback meetings at DWA			0.00	40730.05
3	**Education and Awareness Training**				
	– Training time included in meetings		Sum	Nil	
	– Expenses for posters and training material		Sum	Nil	
4	**Administration**				
	– Administration duties, agendas, Minutes, etc.	60.00	200.85	15666.30	
	– Disbursements				
	* Telephone		Sum	400.00	
	* Faxes		Sum	2500.00	
	* Photo copies		Sum	350.00	
	* Travelling kilometer expenses		Sum	9500.00	
	* Accomodation expenses		Sum	2450.00	30866.30
5	**Promotion and Marketing**				
	– Pamphlets		Sum	4500.00	
	– Posters		Sum	1500.00	
	– Entertainment at meetings		Sum	7500.00	13500.00
6	**Occasional attendance at meetings by J Lijnes J du Preez and Deon Fabel**	25.00	200.85	5021.25	5021.25
7	**Full time Community Participation officer on Site (Shared amongst all Moretele Projects)**		Sum	Nil	0.00
8	**Preference Survey – remunuration of people**		Sum	2600.00	2600.00
9	**Numbering of houses**		Sum	18000.00	18000.00
	Total excl. VAT				118349.90
	VAT @ 14%				16568.99
	TOTAL				134918.89

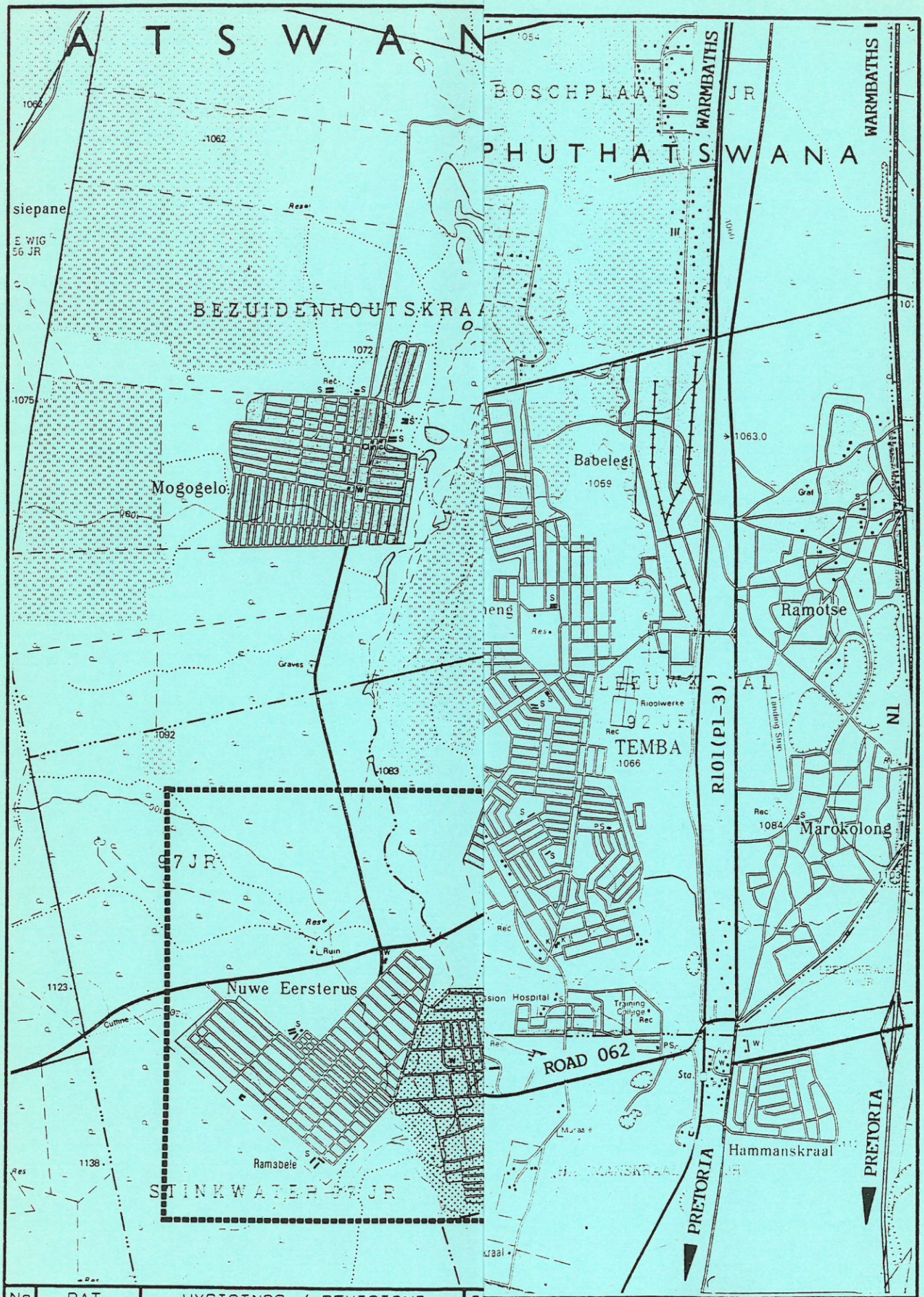
TABLE 4

APPORTIONMENT OF COSTS
(x R1000)

LINK	FLOW	COST	NUWE EERSTERUS			STINKWATER			DILOPYE			GA-MOKONE			BALANCE		
			FLOW	%	COST	FLOW	%	COST	FLOW	%	COST	FLOW	%	COST	FLOW	%	COST
AB[1]	95,4	1435				73	76,5	1098,1	22,4	23,5	336,9						
AB[2]	534	3513	130	24,3	855,2							143	26,8	940,7	261	48,9	1717
BC	95,4	451				73	75,5	345,1	22,4	23,5	105,9						
CD	22,4	372							22,4	100	372						
CE	73	879				73	100	879,0									
EF	73	217				73	100	217,0									
BH	534	1502	130	24,3	365,7							143	26,8	402,2	261	48,9	734,1
HI	464	2092	130	28,0	586,1							73	15,7	329,1	261	56,3	1176,8
IG	391	646	130	33,2	214,8										261	66,8	431,2
EG	0	251															
		11107		18,2	2021,8		22,9	2539,2		7,3	814,8		15,1	1672		36,5	4059,1

RESERVOIR	CAPACITY	COST	REQ. CAPACITY	%	COST	REQ. CAPACITY	%	COST	REQ. CAPACITY	%	COST	REQ. CAPACITY	%	COST	REQ. CAPACITY	%	COST
R6	37 Ml	2300	5	13,5	311	2,8	7,6	175	0,9	2,4	55	5,5	14,9	343		61,6	1417

fb\8823.51\IR26\stkwater.ped



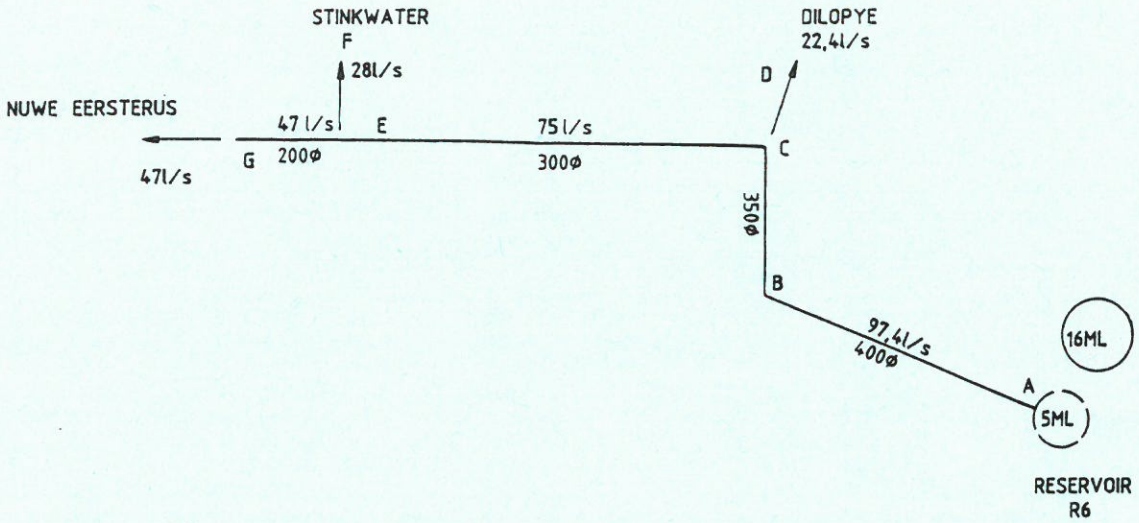
No	DAT.	WYSIGINGS / REVISIONS

RS (RSA) (EDMS) BPK
(RSA) (PTY) LTD
4/5
EVN CASA LABORE
WATERMEYER STR. 182
MEYERSPARK
0184

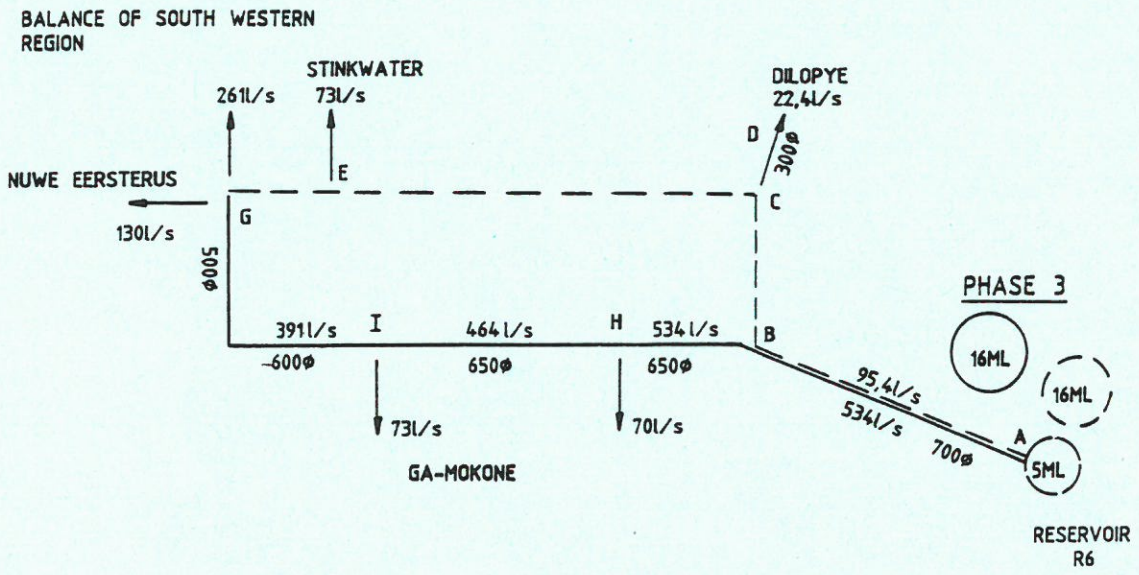
VEL NR
SHEET NO

FIG. 1

PHASE 1



PHASE 2



EVN RAADGEWENDE INGENIEURS (RSA) (EDMS) BPK
CONSULTING ENGINEERS (RSA) (PTY) LTD
POSBUS 40193
P.O.BOX
ARCADIA
0007
TEL.012-8037444/5
PRETORIA
EVN CASA LABORE
WATERMEYER STR.182
MEYERSPARK
0184

MORETELE 1 - WATER SCHEME
STINKWATER AND
NUWE EERSTERUS

VEL NR
SHEET NO

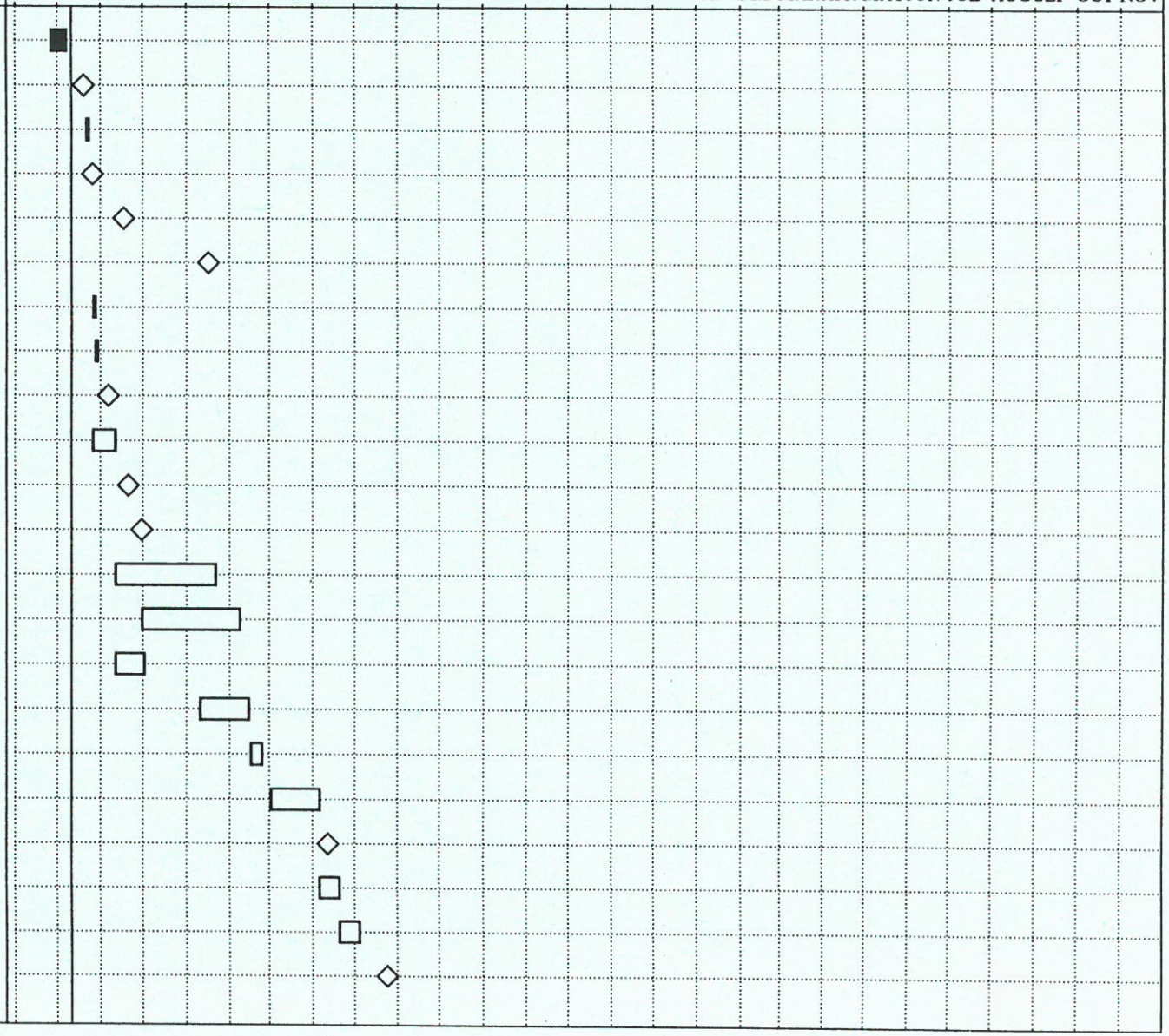
FIGURE 2

FIGURE 3

PROJECT: Moretele 1
CURRENT DATE: 12/10/93
AS OF DATE: 06/07/93
REVISION: 14 11/10/93

GANTT CHART REPORT

Job#	Name	Dates
1	Preliminary Engineering Desi	27/09/93 08/10/93
2	BWSA Concept Meeting	20/10/93 20/10/93
3	Proposals to DWA	21/10/93 23/10/93
4	Approval DWA	26/10/93 26/10/93
5	Steering Group Meeting 1	18/11/93 18/11/93
6	Steering Group Meeting 2	17/01/94 17/01/94
7	1:10 000 Concept Layout	26/10/93 28/10/93
8	Concept approval	28/10/93 29/10/93
9	Inform Tribal Authority	07/11/93 07/11/93
10	1:2000 Layouts	26/10/93 11/11/93
11	Village Information Meeting	21/11/93 21/11/93
12	VWC Meetings	30/11/93 30/11/93
13	House Numbering	11/11/93 21/01/94
14	Preference survey	30/11/93 08/02/94
15	Primary Reticulation	11/11/93 01/12/93
16	Tender Documentation	10/01/94 14/02/94
17	DWA Approval	15/02/94 23/02/94
18	Tender Period	02/03/94 06/04/94
19	Site Inspection	12/04/94 12/04/94
20	Adjudication	06/04/94 20/04/94
21	Award	20/04/94 04/05/94
22	Sod Turning	24/05/94 24/05/94



Job#	Name	Dates
23	Construction	04/05/94 30/10/95
24	Hand-over	31/10/95 31/10/95

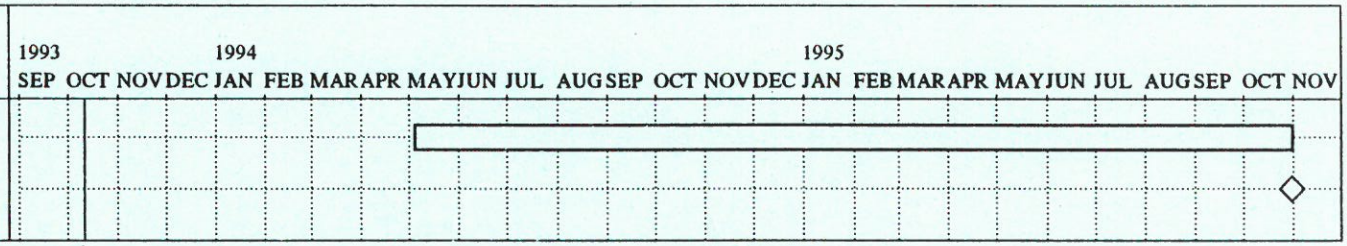


Diagram 1

EVN Consulting Engineers

Work Breakdown Structure – Community Participation

Lateral Responsibilities	Line Responsibilities	Action Items	Date
	BWSA Meeting	– Concept meeting with PRM	20/10/93
	Proposal to DWA	– Concept Layout, Programme, Procedures and Costs to be discussed.	23/10/93
Numbering of Plans Starting Date: ASAP Duration: 1 Week Ordering of numbers			
	Inform Tribal Authority	– Meeting: Minister, BWSA, DWA, Tribal Authority and Consultant.	07/11/94
Stinkw. & Nuwe Eerster Tour for Tribal Auth			
	First Steering Committee Meeting	– Tribal Authority Members,BWSA, DWA, Governor, Consultants – Meeting – Member of Parliament – Governer – BWSA–Mrs Tshaka and Mr Modise – Tribal Authority – Johan du Preez/Nic Grobler – Consultant – DWA – Administrator – Mrs Mary Kgarimetsa	18/11/94
Detail Design plus Documentation of Primary Reticulation 01/12/93			
	Village Information Meeting and election of VWC	– Arange meeting – Mr Modise – Prepare Agenda – Modise/Grobler – Invite Minister, Steering Committee Members, Tribal Authority, Consultants and Village People. – Send out invites and promote. – Elect VWC and Chairman. – Discuss Agenda and Preference Survey forms/procedures/people remuneration and execution.	21/11/94
	First VWC Meeting	– Discuss normal items on Agenda – Train people in filling out preference survey forms. – Action preference survey – forms/ people/remuneration and execution.	30/11/94
DWA Approval–23/02/94			
	Second VWC Meeting	– Action normal agenda items. – Return preference survey forms. – Training session.	
Tender Period 2/3/93 – 6/4/94			
	Second Steering Committee Meeting	– Feedback on progress to date. – Attendance: Members and VWC Chairman.	17/01/94
	Ongoing VWC Meetings	– Action Agenda items. – Feedback on progress to date including a training session.	
	Monthly		
Construction Procedure and details of Secondary Reticulation. Sod Turning Function			24/05/94