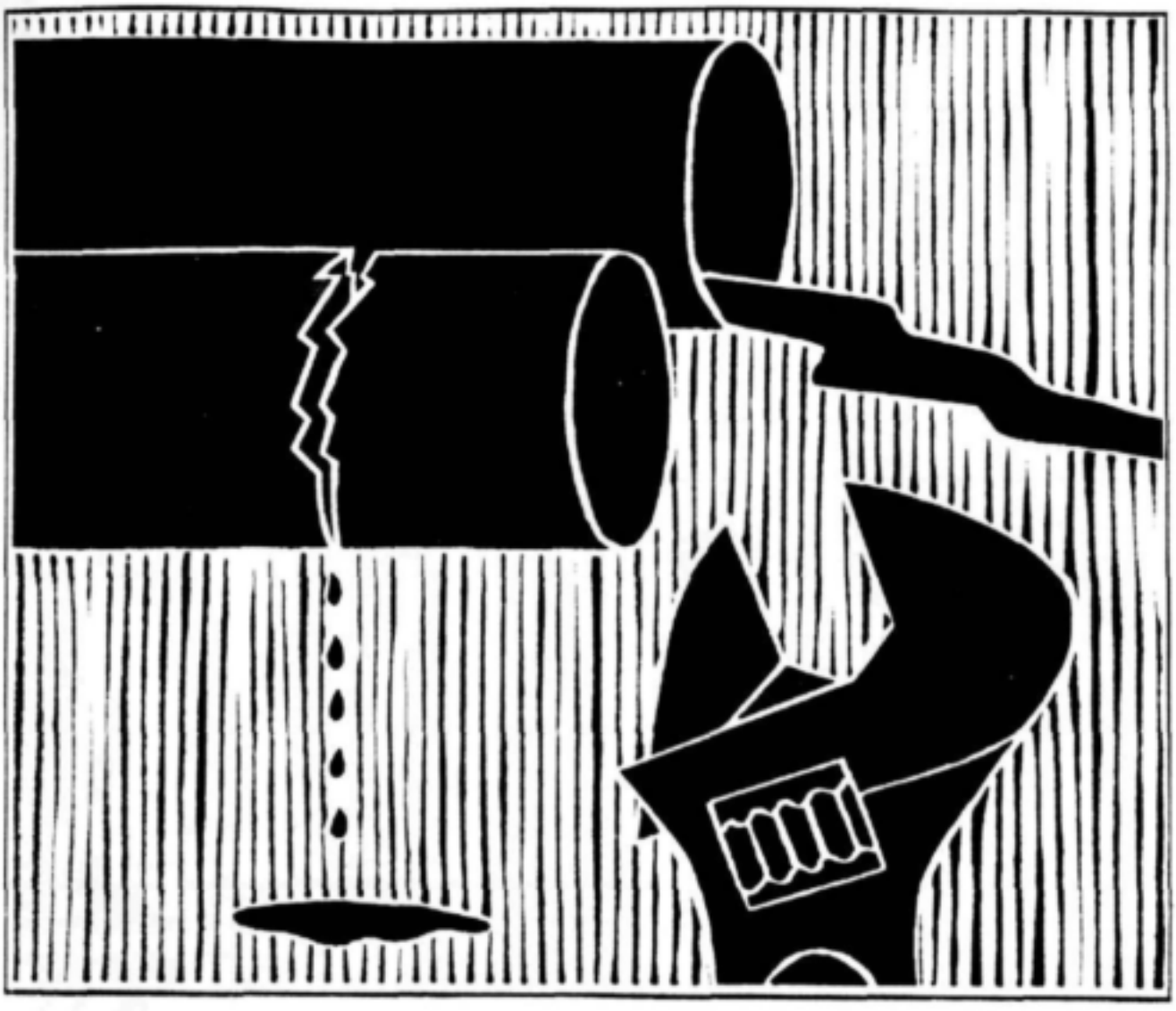
WATER RESEARCH COMMISSION



Mamelodi:

Case study of a water supply system in a metropolitan area.

SUPPORTING DOCUMENT TO REPORT KV 73/95

Working paper prepared as part of a project titled:

Evaluation of Water Supply to Developing Urban Communities

May 1994

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Preface

The Water Research Commission appointed Palmer Development Group to carry out an evaluation of water supply to developing urban communities in South Africa in May 1992.

The broad objective of this project is: to carry out a strategic evaluation of the present status of domestic water supply to developing communities in the urban areas of South Africa with a view to providing relevant and up to date information and analysis upon which rational policy and practice may be based so that the large and increasing demand for basic water supply services in developing urban communities may be met in an economically efficient and equitable manner.

The project was conceptually divided into three phases as follows:

Phase 1: Overview

a. A review of the current status with water supply to developing areas internationally.

b. Execution of a survey of water supply to the urban areas of South Africa, based on questionnaires and interviews, to determine who has access to adequate water supply, what type of systems are being used, and to obtain as much operating and cost information as possible.

Phase 2: Evaluation

a. Evaluation of water supply systems from the point of view of: level of access and acceptance by communities; technical options; cost; financial viability; management efficiency; and environmental impact. The method of evaluation was largely based on a case study approach.

Phase 3: Proposals

a. Putting forward proposals for improving water supply in these developing urban areas over the next decade.

b. Preparation of guidelines for the planning and implementation of water supply systems.

A comprehensive set of reports has been prepared for each phase of the project, as listed on the following page.

This report is one of the set of case studies which has been carried out to get a more in-depth understanding of the factors affecting water supply in South Africa, with an orientation as described below.

Orientation of case studies

The intention has been to select case studies to cover a wide variety of water supply situations, from those in metropolitan areas to those in "dense settlements" which are remote but still considered to be functionally urban. In each case specific factors of importance were identified. The findings from each case study have been drawn together in the summary report (Report No 20) where they are used to develop overall proposals for improving water supply services in South Africa.

It is important to note that the case studies are not intended to be used as a basis for planning water supplies in the particular areas studied.

List of documents

PHASE 1

1 Main Report: **Evaluation of Water Supply to Developing Urban Communities in South Africa**

Regional profiles: Domestic Water Supply : Regions A - J

2 Region A: Western Cape
3 Region B: Northern Cape
4 Region C: Orange Free State, including QwaQwa and part of Bophuthatswana
5 Region D: Eastern Cape, Ciskei and portion of Transvaal
6 Region E: Natal / Kwazulu
7 Region F: Eastern Transvaal
8 Region G: Transvaal, Gazankulu, Lebowa and Venda
9 Region H: PWV and the Adjacent Areas of KwaNdebele and Bophuthatswana
10 Region J: Western Transvaal including Bophuthatswana

Bulk Water Supply to Metropolitan Areas

11 Bloemfontein
12 Cape Town
13 Port Elizabeth

PHASE 2

14 **Ikapa: Case study of a water supply system in a metroploitan area.**
15 **Mamelodi: Case study of a water supply system in a metropolitan area.**
16 **Botshabelo: Case study of water supply and sanitation arrangements.**
17 **Inanda: Case study of water supply arrangements to a peri-urban area.**
18 **Winterveld: Case study of informal water supply arrangements.**
19 **Lebowa: Case study of water supply in dense settlements.**

PHASE 3

20 **Main report: Evaluation of water supply to developing urban communities: summary**

21 Costing of water supply arrangements.
22 Water and sanitation handbook for communities.
23 Guidelines for the provision of water supplies to developing urban communities (Still to be prepared).

Acknowledgements

The research in this report emanated from a project funded by the Water Research Commission and entitled:

"Technical, socio-economic and environmental evaluation of water supply to developing urban areas in South Africa".

The Steering Committee for this project included the following people:

HC Chapman	Water Research Commission (Chairman)
BM Jackson	Development Bank of Southern Africa
C Croeser	PLANACT
C Sweigers	Department of Water Affairs
B Myrdal	Development Action Group
M van Ryneveld	University of the Witwatersrand
JP Rodrigues	Municipality of Durban
S van der Merwe	Rand Water Board
A Fourie	Cape Provincial Administration

The financing of the project by the Water Research Commission and the contribution of the members of the Steering Committee is gratefully acknowledged.

The information upon which this document is based was obtained from a range of persons and organisations whose assistance is sincerely appreciated (see list of interviews at the back of the document).

Project team

This document has been written by Ernst Zöllner of Palmer Development Group, together with Eric Ngomane. Ian Palmer, Richard Palmer and Rolfe Eberhard assisted with data collection, editing and the drawing of conclusions. Frances Cullinan (edits), Trevor Hughes (graphs), Lynette Booyens (maps and figures) and Meta Zöllner (cover page) provided technical assistance.

Summary

Mamelodi was selected as a case study as it an example of a black local authority in a metropolitan location which applies the principle of metering all water consumers. Mamelodi also has the reputation of being a well managed in relation to many other "townships".

Mamelodi, which currently has an official population of 155 000 (1991 Census), has a fairly typical township history, having been established in the 1950s with a public housing programme, followed by a period of private developer driven middle-income housing provision which stalled at the end of the 1980s due to lack of demand. New development in Mamelodi is now orientated towards the lower income group, with projects under way to provide serviced sites for people who have settled informally to the east of Mamelodi, having no other housing option.

From an infrastructure point of view Mamelodi has been comparatively well off: the older part of the township is provided with a reasonably high level of service, including a metered water supply to each residential stand. Although the water supply reticulation has some problems, these are receiving attention. In the case of the informal housing area, the Mamelodi City Council has provided shared toilet blocks and standpipes, as a temporary measure while new areas are developed to provide fully serviced sites for the people in this settlement.

Bulk water is supplied to Mamelodi by Pretoria City Council, the current delivery rate being 26,3 Ml per day and this is growing at an estimated rate of 5,9% per annum. Current bulk use is at an average of 170 litres per resident, a fairly high figure in relation to other black local authority areas. Data is not available on aggregated household water use and therefore, the situation regarding water losses can not be estimated accurately.

The City Council has been operating at a deficit over the last years and this has been addressed through the recent imposition of rates and tariff increases. Nevertheless, the water supply account does not operate on a cost recovery basis and water to Mamelodi residents is subsidized by the state. This need for subsidy has increased recently as a rates boycott and "protest" payment policy has been imposed by community based organisations in Mamelodi, which is adversely affecting income.

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1. INTRODUCTION

1.1 Case study objectives

Mamelodi was selected as a case study because it is an example of a "black" local authority in a metropolitan area which has provided a comparatively high standard of water and sanitation service. Also, it has had a system of metering all consumers, with accounts sent to all consumers. There has therefore been the opportunity for unaccounted for water to be assessed. Another factor of importance is the fact that, until recently, the majority of residents in Mamelodi have paid their accounts and this is of interest with regard to cost recovery.

It was also hoped that the arrangements for managing the water system could be assessed in some detail. But, unfortunately, the council was facing difficult circumstances at the time the study was done and therefore it was difficult to get information at the level of detail required.

1.2 Structure of the document

This document is divided into three parts. Section 2 deals with the general background to Mamelodi from an urban development point of view. The next section deals with the water supply arrangements, including physical, organisational and financial arrangements. Finally section 4 draws conclusions relating to these water supply arrangements.

More detailed information relating to the physical aspects of the water supply system are included as appendix A.

2. BACKGROUND TO MAMELODI

2.1 Background

Mamelodi was established in June 1953 to accommodate black people being removed from Riverside, Eastwood and Lady Selborne in Pretoria in terms of Group Areas Act. Its growth stopped in 1968 when government froze all new black housing developing in urban areas, a policy which was reversed in 1978. The township was granted municipal status in 1984.

Growth of the town was strictly controlled until the demise of influx control when a sudden increase in backyard shacks occurred throughout the older western parts of Mamelodi. Informal settlement in the east began in 1989 and a substantial number of backyard shack dwellers moved to the new settlement. This internal movement and construction of more formal houses led to a slight decrease in population densities since 1990.

2.2 Metropolitan context

Mamelodi is located on the eastern periphery of the Pretoria metropolitan area on the southern slopes of the Magaliesberg range, approximately 30 km from the central city (see Figure 1). It is adjacent to Eersterust (a former Coloured residential area) to the west and Silverton to the south-west. Mamelodi is well-connected to the rest of the city via an adequate rail and road network. The major centres of general employment are the close-by industrial areas of Waltloo, Dispatch and Silvertondale, some of the most important manufacturing areas in Pretoria.

2.3 The people

A number of population estimates for Mamelodi have been made:

1991 census count:	155 000
1991 official RSC figure:	233 000
1992 Rand Water Board estimate:	166 000
1992 Mamelodi Town Council housing count:	300 000
1992 Pretoria City Council estimate:	315 000

Population growth is currently around 5.8% per year and is expected to increase sharply if commuter bus transport subsidies to Kwa-Ndebele, Lebowa and Bophuthatswana are phased out in the near future.

Figure 1: Metropolitan context

Monthly income per household in 1991 according LHA Consultants (1991) was:

Income range	Percentage of households
R1-599	45
R600-799	17
R800-900	14
R1000-1999	20
R2000+	4

2.4 Urban structure and housing

The older part of Mamelodi was established on the western banks of the Pienaars River. From here the town grew eastwards and was extended to the east of the Pienaars River in the area between the Magaliesberg and the Pretoria-Delmas railway line. In the late 1980s, the squatter settlement was established further east, on the other side of the railway (see Figure 2).

This area beyond the railway line is known as the 'hinterland'. Here a large portion of land was set aside for middle income private housing development, but the lack of demand for such houses has led to stagnation. Currently only a small pocket of suburban houses are scattered in the veld beyond the squatter settlement.

The older eastern part of the township has an extensive and relatively well-maintained green open space system linked to the mountain which contributes in making this an attractive residential area in relation to most other townships. Commercial activity in the town concentrated around Stormvoël Road (which connects Mamelodi with Silverton and the central city), Denneboom station and the taxi/bus terminus in the south-western corner of the township.

There are approximately 22 000 formal stands, of which 500 are currently vacant. Average plots sizes are around 200m^2. The housing situation in May 1993 was as follows:

Formal houses:	21 500
Backyard shacks:	13 000
Free-standing shacks:	6 000
Hostel beds:	11 000

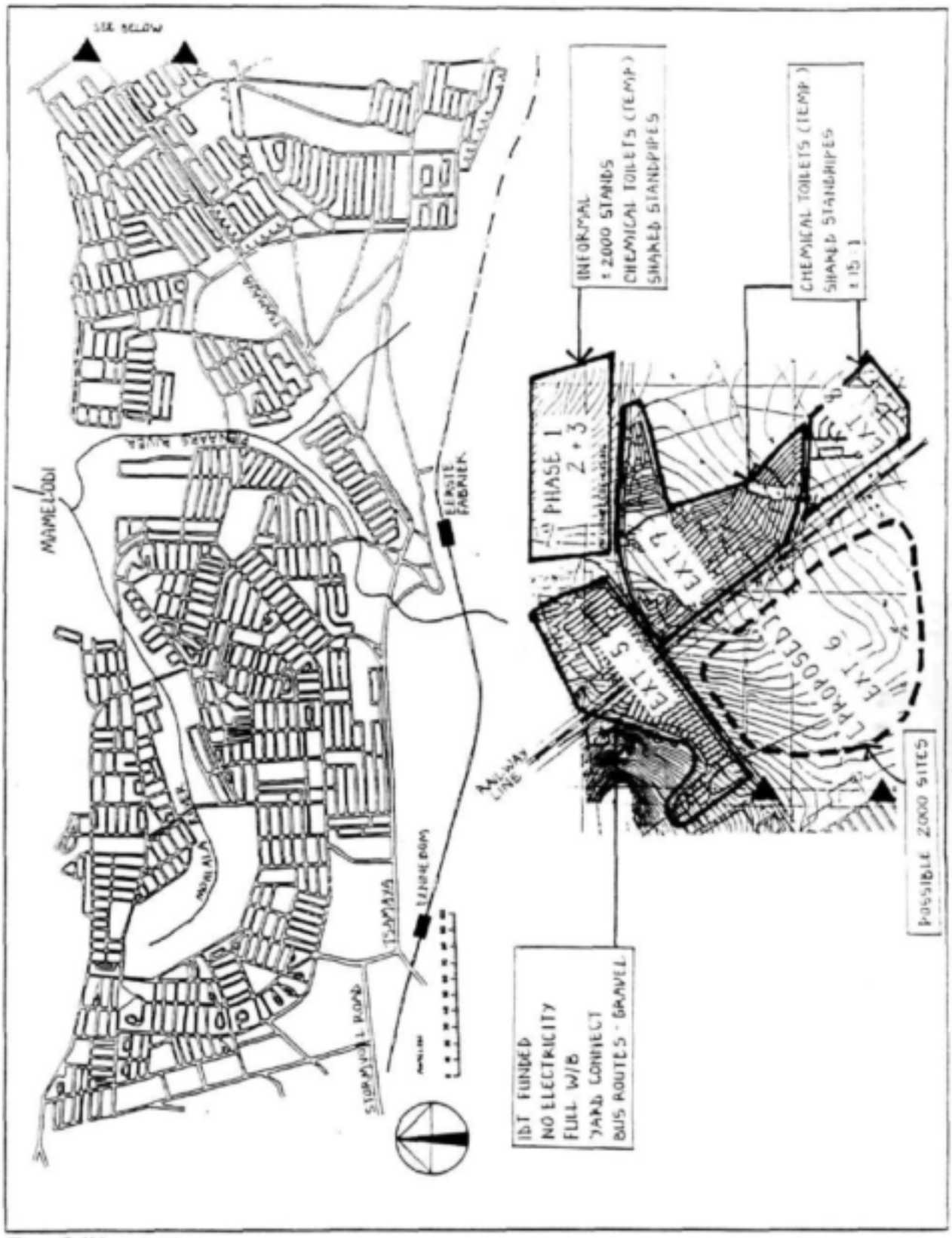

Figure 2: Urban structure

The free-standing shacks are distributed as follows (see Figure 2):

Phase 1,2 & 3	(Rubbish dump area)	2 000
Extension 7 & 8		2 000
Extension 5	(I.D.T. Project)	2 000

Assuming a population of 155 000, there are, on average, 5,6 people per site, in the formal sites, and 4,0 people per free-standing shack. These figures are on the low side, which does suggest that the Census population figure may be low. However, the Census figure is used here for consistency. Backyard shacks are mainly concentrated in the older, western parts around Stormvoël Road. Compared to other PWV townships, a large proportion of houses in Mamelodi are privately-owned.

2.5 Engineering services

Electricity was provided to all formal stands in 1987. Formal stands are serviced by a mid-block waterborne sanitation system, whereas the informal areas use conservancy tanks at public wash houses with chemical toilets being used in Extension 7 and 8, and waterborne sanitation in Extension 5. Phases 1, 2, 3 and Extension 7 and 8 are provided with standpipe water supply.

All the main bus routes are paved. Some of the other roads are paved, but many are still gravel surfaced.A refuse removal service provides collection twice a week from every stand.

3. WATER SUPPLY ARRANGEMENTS

3.1 Description of infrastructure

This section of the report describes the existing and proposed water supply arrangements, from a physical, organisational and financial point of view.

The water supply infrastructure serving Mamelodi has been developed progressively since the township was established in 1953 until 1968 when the development of the older formal areas was stopped. More recently expansion has taken place in new formal areas for middle-income people. With the lack of housing and services poorer people were forced to squat in areas to the east of Mamelodi and there is now a programme to provide these people with serviced sites, requiring further extension of the infrastructure to the east. In the interim these squatters have been provided with "temporary" services.

a) Level of service

In the older formal areas of Mamelodi, all of the residential stands have been provided with metered house connections and therefore nominal access to water in these areas can be considered to be good. There are also an estimated 13 000 backyard shacks in the older part of the township, where the degree of access to water is not certain. This issue of access to services by backyard shack dwellers has been covered by a separate report (Palmer Development Group, 1993a).

In the case of the informal houses in the hinterland area, temporary services have been provided in the form of standpipes and communal toilet blocks. There are 50 standpipes serving an estimated 1 000 households, i.e. one per 20 households. The communal toilet blocks are provided with flush toilets with outflow to conservancy tanks.

b) Distribution system - existing

The distribution system within existing Mamelodi is described in some detail in Appendix A. This part of Mamelodi is served by four reservoirs with a combined capacity of 80 Ml which is sufficient for the medium term needs of the area. Water from these areas is delivered via a network of trunk mains into the reticulation. At present this system comprises the following pipe lengths:

Trunk mains:	25,7 km

Reticulation mains: 68,1 km

Most of the trunk mains (diameters above 160 mm) are steel and most of the reticulation mains are of fibre reinforced cement (asbestos cement). A small proportion of the mains are made of uPVC.

The reticulation arrangement locally within blocks is unusual. All of the older township was developed with a "midblock" system with local storage tanks for each block. Each stand was served from this local storage tank. The tanks have subsequently been removed and stands provided with direct connections. However, this has resulted in some areas with inadequate pressures at peak times.

The reticulation has been recently analyzed by TOPAC who have prepared a "Master Planning" report for the existing water supply system (TOPAC, 1993). This report is difficult to interpret but it is evident that there are problems with the existing reticulation:

- Pressure deficiencies in Block F.
- Insufficient supply to Blocks B, P, Q and V.

These blocks have a total of 2 558 stands, 13% of the total, and therefore the problems are limited in extent.

TOPAC include in their report proposals for rectifying these problems. One new 300 mm diameter pipeline is required between reservoirs R2 and R4 and several interconnections within the existing network need to be changed.

c) Distribution system - new area

A water supply system has been planned for the new extension to Mamelodi (the "hinterland" area), by Eksteen, van der Walt and Nissen (EVN, 1988). This area is planned with a low density of stands (15/ha) and the new supply system will provide for 18 600 new housing units. Planning is based on an annual average daily demand (AADD) of 800 litres per stand, with the total average daily demand for the new area predicted at 25,5 Ml/d. This can be compared with current bulk supply of 26,3 Ml/d.

EVN propose 9,1 km of bulk supply pipelines, with diameters from 300 to 700 mm, delivering to two new reservoirs. Water from the reservoirs will be conveyed to the reticulation network by 18,3 km of trunk mains with diameters of 200 to 700 mm. The total cost of this distribution system was estimated in 1988 to be R9,3 million (R18,7 million at current price levels).

d) Bulk water supply

Bulk water is supplied to Mamelodi by the Pretoria City Council, from their Garsfontein reservoir, via a 525 mm diameter trunk main. This main has two branches which deliver to two distribution reservoirs in Mamelodi: Reservoir R2 (11 Ml) and R3 (22 Ml). It can be inferred from the TOPAC "Master Planning" report that some upgrading is needed to the bulk supply in the from of the 300 mm diameter connection between reservoirs R4 and R2 which is mentioned above.

Bulk water supply planning has been carried out for the new Mamelodi "hinterland" area and is described the EVN report. This report proposes that the whole of Mamelodi is supplied directly by the Rand Water Board via a new pipeline from Rietvlei.

3.2 Water demand

a) Bulk water demand

The growth in metered supply to the whole of Mamelodi is given as Figure 3

Over a five year period, from January 1987 to January 1992, the flow increased from 600 000 kl per month to 800 000 kl per month, an average rate of increase of 5.9% per annum. This is comparable with the estimated rate of population increase of 5.8%.

With a population of 155 000, according to the 1991 Census, and bulk water supply rate of 800 000 kl per month (26,3 Ml/d), the bulk water use rate is 170 l/cap/d. This can be compared to other local authority figures:

Umlazi	171	Daveyton	95	Cape Town	355
Ikapa	142	Khayelitsha	83	Durban	562
Soweto	162	Atteridgeville	115	Randburg	671

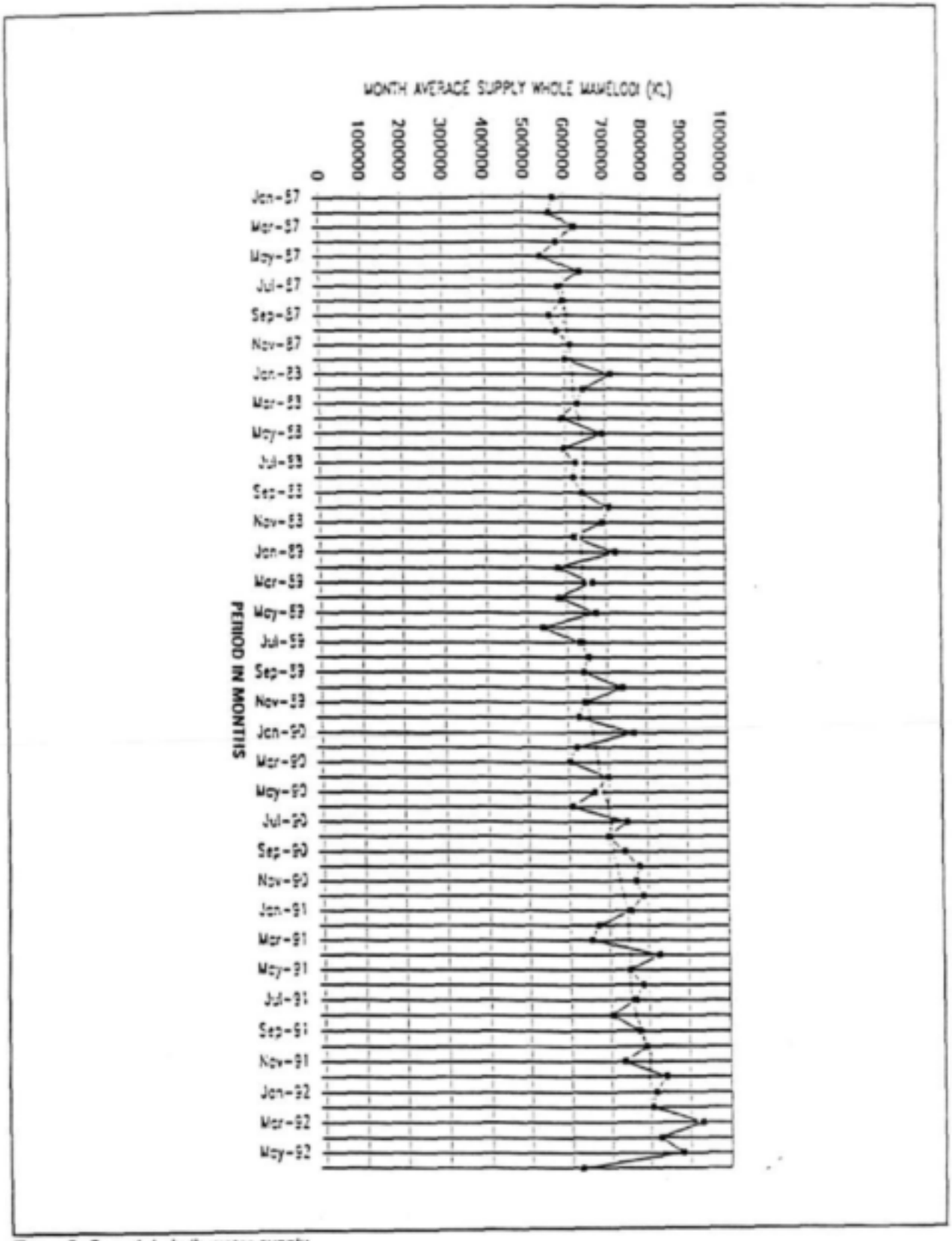

Figure 3: Growth in bulk water supply

The bulk water supply situation to the new "hinterland" area can be related to it's planned population of 123 000 people. With a design bulk requirement of 25,5 Ml/d, this gives a design bulk water use rate of 207 l/cap/d. This is an unusually high per capita use considering the extent of metering and payment.

b) Domestic consumption

According to the TOPAC report, there are a total of 19 991 residential stands in the existing part of Mamelodi, of which 19 156 are "developed" which is assumed to mean they are occupied. Based on information provided by the city treasurer's department, there are a total of 20 898 water consumers, all of them metered. This suggests that there are about 1 700 non-domestic consumers (businesses, public institutions etc.).

Mamelodi also has several hostels, with a total of about 11 000 beds, and there are an estimated 6 000 free-standing shacks in the area to the east.

As part of the "Master Planning" exercise carried out by TOPAC, an analysis was done on a sample of water accounts from metered residential stands, with 135 accounts selected (0,7% sample). The average billed consumption for these users was 1 115 l/d. With such a small sample this figure needs to be treated cautiously but, as it is the best figure available relating to individual user's water consumption, it is used here to build a picture of total demand.

With an estimated 120 000 people living in formal housing on metered residential stands, average stand occupancy is 6,3 people per stand. Therefore, based on the sampled accounts, individuals on these stands use an average of 178 l/cap/d.

Using this figure, the total water demand in Mamelodi can be pictured as follows:

Consumer type	Population	Use rate (l/cap/d)	Water use (Ml/d)
Metered formal houses:	120 000	178	21,4
Informal area:	24 000	50	1,2
Hostels:	11 000	75	0,8
Non-residential:			2,0
Unaccounted for:			0,9[1]
TOTAL (Bulk supply)	**155 000**		**26,3**

The unaccounted-for water (UAW) in this summary of water use is too small, which relates to the inaccuracy of this picture. This inaccuracy could be primarily to do with the estimate of use by metered consumers in formal houses which may be somewhat less than 1 115 l/stand/day, and the non-residential use which is included as a guess. The correct picture can only be obtained through a detailed analysis of all meter readings. Such an analysis is important but has not been carried out by the Mamelodi City Council to date.

3.3 Unaccounted for water

There is considerable uncertainty regarding the proportion of water which is unaccounted-for in Mamelodi. In 1989 TOPAC, consultants to the Mamelodi City Council, estimated the percentage at 47%. More recently, officials in the Mamelodi and Pretoria municipalities estimate a figure of 30%. TOPAC themselves have re-calculated UAW in their "Master Planning" report of 1993, giving a figure of 9%. However, this was based on a very small sample of water accounts, as described in the previous sub-section, and therefore this figure is not reliable.

The uncertainty regarding UAW in Mamelodi remains. However, based on the recent TOPAC work, the fact that the reticulation is fairly well maintained, and that metering is properly carried out, it is probable that it is not as high as 30% and may be as low as 10%.

Again, a more accurate figure will only be possible once a proper analysis of water supply and usage is carried out. The fact that meters are generally old would suggest a higher UAW figure.

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[1] The actual unaccounted for water is likely to be much higher (see section 3.3). The fact that a lower figure is calculated here is indicative of the uncertainty of the water balance in this picture.

3.4 Operation and maintenance

The water supply system is managed by the Mamelodi city engineer's department with a staffing level as follows:

	Salaried	Wages	Total
Total council	414	321	735
Engineering	257	115	372
Water and sewerage	67	190	257

Based on these figures, the water and sewerage branch has 16% of the municipal salaried staff and 59% of staff working for wages (weekly paid).

Using the Census population figure of 155 000, the water and sewerage branch of Mamelodi has 1,65 employees per thousand population served. This is a relatively high figure and is of the same order as figures for Johannesburg, Randburg and Roodepoort given by Deloitte & Touche (Deloitte & Touche, 1992). Soweto, by comparison, has less than 0,5 water and sanitation employees per thousand population served.

The indication from interviews with officials of the Mamelodi City Council is that maintenance of the water supply system is carried out on a "response basis" with leakages and breakages dealt with as they are discovered. The Council does not currently have a planned maintenance programme.

3.5 Financial situation

The financial situation of the Mamelodi City Council needs to be seen against the background of problems being faced by Black Local Authorities in South Africa generally. These authorities have never had the political support of the majority of their residents and they have not been economically viable, created as they were to serve largely lower income rate payers with little commercial and industrial activity within their areas of jurisdiction. The lack of political legitimacy has lead to a period of protest action over the last few years where political and civic groupings have acted to "make the townships ungovernable" (Kane-Berman, 1993). The primary goal of such action has been to force the councillors out of office and this has been largely successful, taking the country as a whole. However, the use

of rates boycotts has also had a dramatic effect on the already tenuous financial position of Black Local Authorities. These authorities have become less able to deliver services satisfactorily and have had to rely on increasing subsidies from the state to continue functioning.

a) Overall financial position of Mamelodi

Although the Mamelodi City Council has not been financially viable, it has been more successful in running its financial affairs than the great majority of Black Local Authorities in South Africa. This obviously relates also to the willingness of Mamelodi's residents to pay for the services they receive.

The comparative success of Mamelodi in this regard has been marred recently by allegations that some officials have been embezzling funds. Also, the protest action against the Council, using payment boycotts as a tool, has been seriously affecting the Council's financial position over the last year.

The financial figures for the last six years are given in some detail in Appendix B. This information is based on audited income and expenditure statements for the period 1987/88 to 1990/91 and city treasurer's records for the most recent two years. The situation is summarized in Table 1 below.

Table 1: Overall financial deficit by year

Financial year	Deficit before transfers (R'000)	Transfers from government (R'000)	Net deficit or (surplus) (R'000)
1987/88	7 520		7 520
1988/89	5 851		5 851
1989/90	15 777		15 777
1990/91	16 443		16 443
1991/92	20 563	34 887	(14 324)
1992/93	3 405	16 255	(12 850)

Over the period 1987/88 to 1991/92, Mamelodi was faced with an increasing deficit. Income was increasing but not at a sufficient rate to cover expenses. At this time the inadequate

income was not due to payment boycotts: the great majority of Mamelodi residents paid their accounts. Rather, the rates and tariffs were too low to achieve full cost recovery.

In order to reduce the deficit, substantial increases in rates and tariffs were imposed by the Mamelodi City Council, in January 1992. This raised income dramatically and the Council budgeted for a surplus in the 1992/93 financial year. Once again the great majority of Mamelodi residents paid their accounts, at the higher rates. However, the increases were unpopular and political protest action against the Council was increasing.

b) "Protest" rates payments

In October 1992, the civic association in Mamelodi called for a boycott of rates payments, until the remaining city councillors resigned. There was mixed reaction to this boycott with some people continuing to pay and others paying nothing. The income to the Council started to decline.

At this time there were also negotiations between civic and political organisations and the Pretoria City Council, aimed at drawing Pretoria into the management of Mamelodi. During the 1992/93 year, Pretoria City Council agreed to take certain responsibility for the area. The civic association then started negotiating over rates with the Pretoria council.

Early in 1993, the civic changed it's approach and agreed to pay rates but moved for a "protest" rate of payment to be made which was fixed at R50 per month. This was increased to a fixed R75 per month in September 1993. Not all Mamelodi residents accepted the policy of the civic: some continued to pay their full accounts while others paid nothing. An indication of the effectiveness of this control over rates payments is indicated in Table 2. The total number of accounts paid needs to be seen in relation to the total of 22 500 accounts which are sent out every month.

It can be seen from Table 2 that the response to the call from the civic to make protest payments at certain flat rate amounts has been substantial. However, it is evident that the total number of accounts paid is declining. This could be expected as the "culture" of non-payment spreads and the local authority does not have a mandate to follow up on defaulters.

Aside from the financial consequences to the council, the issue of "protest" payments does raise concern over methods which are used to enforce a policy such as this, possibly through intimidation.

Table 2: "Protest" rates payments

Amount paid (R per month)	Number of payments in different amount ranges			
	June '93	July '93	Aug '93	Sept '93
0-49	151	131	129	299
50	17 623	15 438	13 715	2 501
51-74	425	388	148	244
75			1 267	12 288
76-100			111	92
>100	3 445	2 840	1 874	1 488
TOTAL	21 644	18 797	17 244	16 912

Table 3: Water account income and expenditure

Description	1989/90	1990/91	1991/92	1992/93•
INCOME (R'000 excl VAT)				
Fees	3659	3630	5149	6698
Inter-govt transfer			733	
Total Income	**3659**	**3630**	**5882**	**6698**
EXPENDITURE (R'000 excl VAT)				
Bulk water supply	3451	5887	7785	6423
Interest on arrears				168
Repair & maintain	486	485	343	247
Finance charges	4		2	24
Total Expenditure	**3941**	**6372**	**8132**	**6862**
DEFICIT	**282**	**2742**	**2250**	**164**

• VAT excluded

c) The water account

The city treasurer of the Mamelodi City Council keeps a separate set of accounts for the water supply service. Income and expenditure figures from this account, for the last four years, are given in Appendix B and are summarized in Table 3.

It is notable that the expenditure reflected in Table 3 does not include salaries and wages. These are covered in a separate cost centre in the accounting system. It is also notable that expenditure on bulk water purchases declined from 1991/92 to 1992/93, although the amounts which the Mamelodi City Council was billed increased. This is because the Council was unable to make payments and therefore started to run up arrears on their bulk water account.

Income from fees (tariffs and connection fees) has been increasing, even during the 1992/93 year. Over the last two years this relates primarily to the increase in rates which were applied in January 1992. This has been offset to some extent by the protest payments. The tariffs applicable from particular dates are given below:

1/4/84	34c/kl
1/8/87	42c/kl
1/12/87	46c/kl
14/12/88	R3,00 + 60c/kl
1/1/92	R4,40 + 88c/kl

Assuming an average water consumption per household of 1 115 l/d, an average monthly water charge would be:

mid 1993	R34,20
mid 1988	R15,60

This represents a 17% per annum increase over this five year period.

Although the water tariff has been substantially increased over the last years, it is still not sufficient to cover the cost of providing the supply. It does not even cover the cost of the bulk purchase of water which has recently been increased to 91,07c/kl by Pretoria City Council. It is estimated that roughly R1,50 per kl would need to be charged if a cost recovery approach was applied. This would need to be even higher if a marginal cost approach was followed.

The cost of bulk water to Mamelodi is increased by the charge which Pretoria City Council apply to the bulk water they purchase from the Rand Water Board. Pretoria adds on 11,5% for "overheads", currently an amount of 9,4c/kl which could be saved if Mamelodi purchased water direct from Rand Water Board.

In the medium term - probably by the end of 1994 - the issue of water tariffs will become one to be dealt with by the Pretoria metropolitan area as a whole. Under this situation, some form of cross-subsidy from commercial users and residential consumers using large volumes of water, may be applied, which will mean that the poorer residents of Mamelodi do not have to pay for water at full cost recovery tariffs.

4. CONCLUSIONS

This case study has been focused on the management arrangements of a black local authority in a metropolitan area. This case study has only been able to deal with these issues to a limited extent but some significant conclusions can be drawn relating to the most important issues, as follows:

Effective provision of services

The Mamelodi local authority has been able to provide the residents of the township with adequate services, including water supply. Water is supplied to all stands in the old formal part of Mamelodi, with the supply metered and monthly accounts sent to consumers. In the new formal areas there is, in fact, an over-supply of services. This is because the predictions relating to the development of the "hinterland" area have been too optimistic and bulk infrastructure has been over-provided.

Although it has taken some time to properly provide for the services needs of "squatters", these households living to the east of old Mamelodi have been provided with temporary services and projects are currently under way to provide fully serviced sites for them, with water supply to each site.

Well staffed water and sewerage branch

Mamelodi City Council has a well staffed water and sewerage branch, with staffing levels comparable to many large "white" local authorities. This allows it to carry out maintenance of the water supply system in a comparatively effective way, although planned maintenance of infrastructure is not carried out routinely.

Uncertain water losses

The unaccounted for water (UAW) in Mamelodi is not properly monitored and there are a wide range of estimates of the UAW percentage. It is probable that UAW is not as high as 30% and it may be much lower. The failure to properly assess unaccounted for water also rests with Mamelodi's consultants who have not dealt adequately with this matter in what is termed a "Master Planning" report.

Cost recovery and willingness to pay

Although Mamelodi Town Council has a history of running at a deficit, since 1992 there has been a trend towards reducing this deficit, largely because rates and tariffs for services were increased substantially. It is evident that the rates were still not high enough to allow full cost recovery but the budgets of the City Treasurer for 1992/93 indicated that this was possible.

Central to the issue of cost recovery has been the willingness of Mamelodi's residents to pay their accounts, even at the increased rates, although it is accepted that payment at higher levels is unpopular.

Imposition of "protest" payments

Over the last year a rates boycott has been promoted by the Mamelodi Civic Association, in protest over the fact that Mamelodi city councillors remain in office. This boycott has been modified into an arrangement of "protest" payments where a fixed sum per month is paid by residents for all services. The amount to be paid has been negotiated by the Civic with the Pretoria City Council but there is some contention about this.

The "protest" payments policy of the Civic has been fairly successful, with the majority of the residents paying the agreed amount. However, the overall rate of payment of accounts is falling off, presumably as people realize they don't have to pay and that the Mamelodi City Council, who collect the rates, is politically unable to take action against them.

From the point of view of water supply policy, the flat rate payment is not considered to be economically defensible. Water does not become valued and there is no incentive to conserve.

Water trading account

Although the Mamelodi city treasurer's department runs separate accounts for the water supply system, it does not include all the costs associated with water supply, particularly staff costs. In assessing cost and efficiency in providing the service, the move towards an independent trading account is important.

Integration of Mamelodi into Pretoria

Given the trend in negotiations over future local authority arrangements in South Africa, it is inevitable that Mamelodi will become part of a unified Pretoria metropolitan local authority system. This will bring benefits to Mamelodi, both from a political and economic point of view. In the latter case, Mamelodi will be able to share in the much stronger rates base of Pretoria, with poorer residents in Mamelodi benefitting to some extent from the rates income generated by businesses and wealthier residents in the metropole. A future tariff policy for the metropole should take the issue of cross-subsidy into consideration and, with higher unit charges for larger water consumers, the residents of Mamelodi who use services comparatively sparingly, stand to gain from this.

5. BIBLIOGRAPHY

Deloitte & Touche (1993) **Central Witwatersrand Metropolitan Chamber: Water and Sanitation Task Team.** Report to meeting on 25 February 1993.

EVN (Eksteen, van der Walt and Nissen), **Mamelodi hinterland bulk water supply**, report prepared for the Mamelodi City Council.

Kane-Berman, J (1993) "Violence in South Africa", **SA Institute of Race Relations**.

Palmer Development Group (1993a) "Backyard living in inner city townships", **Survey of on-site access to water and waste services**, prepared for the Water Research Commission, Pretoria.

TOPAC Consultants (Pty) Ltd, **Mamelodi water system master plan**, prepared for Mamelodi City Council.

APPENDIX A:
PHYSICAL WATER SUPPLY ARRANGEMENTS

1 Pipe layout

Apart from the newly developed townships (after 1986) all old township sections were developed with midblock water supply from storage tanks at the highest point of a township block and reticulation pipes varying between 20 mm to 75 mm diameter to metered taps at each stand. Distribution to the storage tanks occurred through a trunk main system consisting of 75 mm to 375 mm diameter fibre reinforced and steel pipes located in street reserves, and steel reticulation mains of 20 mm to 50 mm diameters.

For future upgrading of the water system, only the existing trunk mains of 75 mm and larger comply with the usable requirements and were incorporated in the planned future water systems carried out by Topac.

a) Condition

No record of failures and repairs of existing trunk main could be obtained from the City Council of Mamelodi (CCM) to ascertain the condition of existing system elements. In fact no record of any kind of water related incidents were kept in any statistical format and therefore no record of 'hot' spots can be identified.

b) Delivery mains

Mamelodi would be supplied by the City Council of Pretoria until the commissioning of the RWB supply in the near future. The existing CCM delivery mains consist of a 525 mm diameter steel main that is supplied from the Garsfontein Reservoir in Pretoria and enters Mamelodi just west of Denneboom Station. Opposite Denneboom Station a 300 mm diameter steel main is connected to the 525 mm diameter supply main to supply the western sections of Mamelodi. The total lengths of the 525 mm and 300 mm delivery mains are 5 148m and 1 777m, respectively. The two mains discharge at Reservoir 3 and Reservoir 2, respectively.

c) Trunk mains

Table 4: Trunk Mains

EXISTING TRUNK MAINS (> 160 mm DIAMETER) (mm)				
PIPE DIA.	STEEL	FRC	uPVC	TOTALS
200	866	1 154	30	2 050
225	4 785	775	140	5 700
250	4 349	1 227	0	5 576
300	7 185	430	0	7 615
315	0	0	0	0
375	2 560	0	0	2 560
450	1 276	0	0	1 276
525	985	0	0	985
TOTALS	22 006	3 636	170	25 762

Trunk mains are defined as pipes of diameter larger than 160 mm. A summary of all the trunk mains is tabled in Table 4.

d) Reticulation mains

Reticulation mains are pipes with diameters varying from 63 mm to 160 mm. They consist mainly of fibre reinforced cement (FRC) pipes and lately uPVC pipes. Steel was also installed. Apart from the newer developments (from 1986 onwards) which have street reticulation, all the old sections are characterised by a midblock reticulation system.

A summary of all the reticulation mains is tabled in Table 5.

2 Reservoirs

Water for the supply of the area of jurisdiction of Mamelodi is stored in four reservoirs named R1, R2, R3 and R4 respectively consisting of 3 reinforced concrete and one floating cover earth walled reservoirs.

Table 5: Reticulation Mains

EXISTING RETICULATION MAINS (> 75 mm < 160 mm DIAMETER)(mm)				
PIPE DIA.	STEEL	FRC	uPVC	TOTALS
63	0	0	0	0
75	2 992	32 376	508	35 876
100	319	10 438	187	10 944
110	0	1 386	10 385	11 771
150	0	5 853	174	6 027
160	1 161	1 382	923	3 466
TOTALS	4 472	51 435	12 177	68 084

A description of the name, construction type and capacity of each of the storage reservoirs are given in a table Table 6.

Table 6: Reservoirs

EXISTING RESERVOIR DESCRIPTION		
NAME	CONSTRUCTION TYPE	CAPACITY
R1	Reinforced concrete (circular)	1.5 Ml
R2	Reinforced concrete (rectangular)	11 Ml
R3	Post tension reinforced concrete (circular)	22 Ml
R4	Hypalon-Hydroline composite floating cover (irregular)	45 Ml

Reservoir 1 is supplied from Reservoir 2 with 2 electric motor pumps.

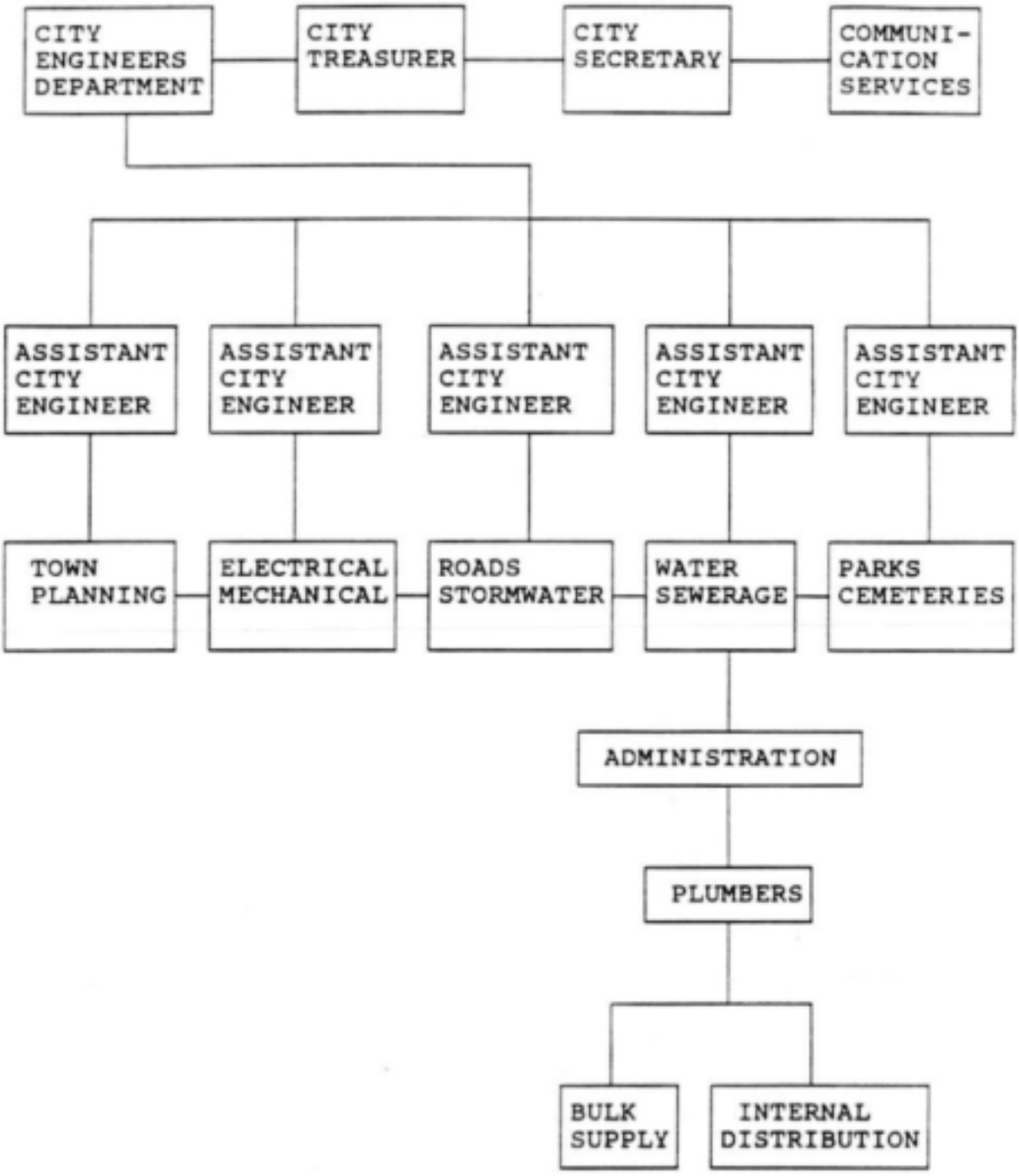
APPENDIX B: FINANCIAL DETAILS

INCOME AND EXPENDITURE SUMMARY

DESCRIPTION	87/88			88/89			89/90			90/91		
	Expend (R'000)	Income (R'000)	Deficit (R'000)	Expend (R'000)	Income (R'000)	Deficit (R'000)	Expend (R'000)	Income (R'000)	Deficit (R'000)	Expend (R'000)	Income (R'000)	Deficit (R'000)
Admin and finance	6292	3337	-2955	9483	5107	-4376	14207	7236	-6971	11492	7961	-3531
Traffic			0	415	14	-401	771	333	-438	892	570	-322
Refuse removal	725	789	64	871	935	64	3009	1309	-1700	3636	1307	-2329
Sanitation	1702	936	-766	2146	1166	-980	4865	1691	-3174	2227	1733	-494
Electricity	11682	5316	-6366	9384	7071	-2313	18121	12449	-5672	21420	12278	-9142
Water	3328	2141	-1187	3828	2821	-1007	4937	3776	-1161	6526	4066	-2460
Social services	3563	247	-3316	4298	2976	-1322	2753	1506	-1247	2192	970	-1222
Sport and recreation	377	73	-304	626	102	-524	1291	313	-978	1226	412	-814
Housing service	4214	11524	7310	4245	9253	5008	5380	10944	5564	6295	10166	3871
TOTAL	31883	24363	-7520	35296	29445	-5851	55334	39557	-15777	55906	39463	-16443

3 Staff structures and responsibilities

The management functions of the City Council of Mamelodi with relevance to water supply, are represented in the organogram below.



RECENT INCOME AND EXPENDITURE ACCOUNTS

	89/90		90/91		91/92		Trans from	Est 92/93		Trans from
	Expend	Income	Expend	Income	Expend	Income	Govt.	Expend	Income	Govt.
Council & committees	1089	0	587	0	1464	0		558	0	
Management TC	185	0	195	0	226	184	184	225	0	
Management Secretary	302	0	371	1	463	250	250	438	1	
Staff function	351	1	529	0	681	531	531	616	0	
Sec & com services	507		423		529	530	530	592		
Legal services	54		92	1	229	157	157	161		
General	3							3		
Security & civil def			1							
Distr vehicle HO	14	13	11		0			3		
Management CT	305		307	1	444	247	247	429	1	
Votes (budgets)	121		115		147	116	116	151		
Financial control	2608	3108	2832	1825	3755	7354	3411	4602	27335	15366
Computer services	601		692		1020	153	153	1215		
Stores & supplies	382	590	485	308	582	787	454	649	339	
Final accounts	76		114		136	116	116	149		
Management CE	486	1	287		200	188	188	352		
Housing technical	907	1220	1348	1372	1155	2252		764	1994	
Single quarters	2375	3134	2624	2529	3854	3833	639	2958	678	
Streets & stormwater	1732	7	2910		1284			1279		
Water services	3943	3659	6374	3631	8132	5882	733	7515	7379	
Electricity services	12798	10286	17745	11236	19692	31874	16255	18511	22525	
Sewerage services	3955	1310	1242	1580	4335	7637	3146	3550	3019	
Refuse removal	2727	1041	3312	1119	4392	1726		5374	3058	
Parks	71		58		69			46		
Paving plant	591	272	273	231	0	0		0	38	
Distr labour elec	1019		216		1825	1650	1650	2352		
Distr labour eng. CE	2146		552		3668	3042	3042	4515		
Distr labour works	132		57	173	173	244	244	445		
Distr vehicle eng	143		21		385			170		
Distr vehicle works	5	2	25		15			9		
Management com serv	205		337		395	343	343	450	1	
Health & clinics	6		5		4			3206	3206	
Care centres	763	276	960	366	1165	1190	693	1411	538	
Old age homes	156	39	166	56	241	71		264	86	
Welfare services	451		469		575	551	551	660		
Cemeteries	69	45	92	35	110	39		135	45	
Municipal police	782									
Housing admin serv	1328	4609	1501	6668	1820	7182		2003	10708	
Community halls	31	4	25	4	37	1		32	2	
Sport and recreation	752	302	870	249	1115	551	342	1304	165	
Libraries	91	6	130	9	168	182	174	184	6	
Swimming pool	83		66		89			87		
Traffic control	667	332	862	381	978	873	536	1119	304	
TOTAL	45014	30257	49301	31795	65612	75536	34687	66578	81428	15366

WATER ACCOUNT INFORMATION

	89/90 Expend	89/90 Income	90/91 Expend	90/91 Income	91/92 Expend	91/92 Income	Est 92/93 Expend	Est 92/93 Income
INCOME								
Connection fees		62		88		106		64
Inter-govt grant						733		
VAT recoverable								681
Water fees		3597		3542		5043		6634
TOTAL		3659		3630		5882		7379
EXPENDITURE								
General								
Bulk water supply	3451		5887		7785		6420	
VAT services							653	
Interest on arrears							168	
Hire of equipment			1		2		3	
Sub-total	3451		5888		7787		7244	
Repair & maintenance								
Bulk water meters	5							
Pumps	2		1					
Reservoirs	11		4					
Networks	320		459		343		247	
Water mains	148		21		0		0	
Sub-total	486		485		343		247	
Loan charges					2		22	
Capital outlay	4						2	
TOTAL	3941		6373		8132		7515	
SURPLUS	-282		-2743		-2250		-136	