Lessons and Experiences

from the

Ethekwini Pilot Shallow Sewer Study

Report to the
WATER RESEARCH COMMISSION

by

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Executive Summary

1. Introduction

The Shallow Sewer concept has been successfully implemented in Brazil, Greece, Australia, USA, Bolivia, India and has become the norm in Pakistan, and has proven to be an extremely practical, low cost solution for installing water borne sewage systems within highly dense, informal communities. The technology is intended to develop and uplift communities while enabling governments and service providers to provide greater coverage of sanitation services. This is done through the relaxation of several design characteristics of conventional sewerage and in the process allows for shallower depths, smaller diameter pipes, flatter gradients and community based construction, operation and management.

Besides offering the convenience and health benefits of waterborne sanitation, the methodology with its intensive social programme, is intended to provide people living in communities with the skills to pull themselves out of poverty and to better organise themselves to use their social, intellectual and other capital for their own upliftment, while at the same time reducing the operational load of the service provider.

Ethekwini Water Services (EWS), in a joint venture with Water and Sanitation Services (South Africa) (WSSA) and the Water Research Commission (WRC), investigated, through a Pilot project, whether Shallow Sewers would provide a viable alternative waterborne sanitation system to the urban poor in dense settlements. The practical applications of the Shallow Sewer methodology were evaluated in two Ethekwini communities, Emmaus and Briardale.

1.1 The Ethekwini Pilot Application

With no South African experience of consequence to use as a guide, the implementation and management for the Ethekwini pilot was based on the successful model used in La Paz, Bolivia as imported by WSSA's Project Manager who had had extensive experience of the implementation of this model. The two pilot communities, Briardale and Emmaus, were selected based on the results of a social evaluation of five potential communities in Ethekwini.

The research objectives were to assess the financial, social acceptance, quality of life, technical, legal and institutional management aspects of Shallow Sewers in Ethekwini. In addition, this initiative evaluated the methodology and how it was applied to the La Pas model imported from Bolivia, and discusses the suitability and relevance of such interventions to the South African environment.

1.2 Parameters and Constraints

Emmaus was an existing community with free hold property rights, who had already been upgraded and therefore had already received their Provincial Housing Board (PHB) subsidies. The existing on-site sanitation system had failed. The community consists of 96 households, with a wide range of incomes, which are distributed into a richer and a poorer sector of the community. One third of the community earn is excess of R1800 /household per month, whilst 36% are very poor, with an income of less than R600 /household per month (5).

The Briardale community was a green-fields development made up of 157 households who were the over-spill from other upgrade projects. This development was being undertaken by an NGO using a "self help" scheme, on land being developed under the Communal Property Association Act. The average household income of this community was approximately R700 /month which was normally distributed about the mean (5).

There were two major factors, one at each of the sites, that were beyond the control of the project management, and that had serious consequences on the project.

At Emmaus, during the Local Council elections the aspirant councilor, who was subsequently elected, promised the community "free basic water" which was interpreted to mean that this included all internal plumbing, connection and consumption costs.

At Briardale the developer was unsuccessful at registering the housing scheme, which meant that the PHB subsidies were not forthcoming, which subsequently lead to the collapse of the development.

1.3 Status Quo Report

The final commissioning and operational phase has not been completed on either project due to community pressures.

In the case of Emmaus, a large percentage of the community have not installed the wet core services, including the water connection and sewer connection costs and Municipal charges, citing:

- Lack of funds, despite initiatives put in place to contribute to these costs, through payment to the community involved in the construction.
- The promise of free basic water, and the community's understanding that this included all internal plumbing, connection and consumption costs

In the case of Briardale, the community has rejected all initiatives it has associated with the failed housing development initiative, including the Shallow Sewers.

Both EWS and WSSA are engaged in resolving the commissioning delay.

2. Findings

Undertaking this research in South Africa through the Ethekwini Shallow Sewer Pilot study has revealed considerable insight into the sanitation environment in general, with particular reference to Shallow Sewers. It has also provided an opportunity to guide the development of a range of similar technologies that would be applicable in the South African context.

2.1 Benefits of Shallow Sewer Systems

There are potentially substantial benefits for "Shallow Sewer type" systems. The study showed that Shallow Sewers can provide all the convenience and benefits of waterborne sanitation at half the capital cost of conventional sewers and that they may even compare favourably with the cost of pit latrines.

- **Technical**

  From a technical perspective, there is no apparent reason why Shallow Sewers should not function as well as, nor provide the same level of service to the customer, as conventional ones.

  In densely settled areas where space between buildings and space for the evapo-transporation is limited, thus limiting the use of conventional sewers and on-site sanitation systems, Shallow Sewers may provide the only technical solution. Their shallow depth, reduces the amount of excavated material that is required to be moved considerably, thus allowing access to areas which are not accessible to conventional sewers.

  The approach of reducing the construction standards has positive effects on the construction and maintenance, and consequently the cost, achieved by simply laying the sewer at a shallower depth. Of particular note is that the soil volumes that are handled are far smaller than in conventional sewers, the pipes are also generally laid above the rock and water table, thus reducing the cost even further. In addition, because of the shallow depth, access to the pipe can be done from the surface thus obviating the reason to have "manholes" large enough for a man to enter. Thus not only the depth of the access point is reduced, but the cross-section dimension too. Access chambers costs were found to be an order of magnitude cheaper than conventional manholes.

  In addition the smaller diameter pipes should provide better solids transportation than conventional sewers in situations where low flush volumes are utilised.

- **Community Based Development**
  There were, nationally, a number of similar community based development projects that were running concurrently with the Shallow Sewers project. Within these technologies there were a group that had similar philosophies and tenets to that of the Shallow Sewers, with slightly different techniques of achieving certain specifics. The Shallow Sewer technology could provide the basis for a "South Africanised" development technology, based on these philosophies, where the best of the various techniques are combined.

  Further, the Shallow Sewers technology is not a single technology but rather a suite of technologies. A range of models could be developed to suite a number of different situations.

- **Social**
  Shallow Sewers improve the householder's quality of life by offering the convenience and health benefits of a water supply and waterborne sanitation to each home.

  One of the features of this technology lies in the social development of the communities. Social upliftment skills were provided at a number of levels.
  - At household level, health and hygiene and general waterborne sewerage utilisation skills were provided.
  - At sub-community level the community is divided into "condominium" which operate a sewer line. The condominiums were taught the fundamentals of maintaining the sewer system as well as the management skills required to keep the condominium sub-community functional.
  - Also at the sub-community level certain of the trade skills such as elementary pipe-laying, brick-laying and plumbing was provided to certain key individuals in the community.
  - At community level management skills were developed. These included skills such as conducting meetings, handling and managing finances ,etc.
  - At a different level participants were taught how to identify and facilitate the solutions to their own problems. They also acquired skills on how to communicate with other community members as well as external parties, and began to understand, that through shared knowledge and human capital, projects can be undertaken even if there are limited resources within the community.

  It was concluded that a social intervention that builds capacity in people to enable them to undertake development for themselves is very important and that perseverance to get the formula right for South African communities could benefit the country enormously. The social aspect is much wider than providing sanitation.

- **Financial**
  Shallow Sewers can be installed at significantly reduced capital costs. The results of the evaluation demonstrated that Shallow Sewers could be installed at approximately 50% of the capital cost of conventional sewers, if the costs are "ring-fenced" to the site of the development (i.e. ignoring the capital costs of the bulk reticulation and treatment works).

  The "on development project" capital cost of Shallow Sewers also compares favourably to that of VIPs: i.e. using the same ring-fencing of the costs as above, then the capital costs per household for Shallow Sewers is similar to that of a double vault VIP. The cost of the social intervention has been included in the capital cost for the Shallow Sewers, for the purpose of this comparison.

  The provision of Shallow Sewers is compatible with the steps and timing of the Provincial Housing Board's subsidised housing system.

  They are also affordable to all, provided that the first six kilolitres per month of water is supplied to each household free of charge.

- **Environmental**
  Environmentally Shallow Sewers have a similar impact to that of waterborne sanitation, protecting watercourses, people and the environment in general from human waste.

2.2 Drawbacks of Shallow Sewers

The Shallow Sewer System potentially provides an excellent sanitation solution in the "water and sanitation package" for South African communities, however there are some primary drawbacks for the South African context.

- **Legal issues**
  Certain issues need to be resolved before Shallow Sewers can become a viable option for service providers.

  Community ownership of the common sewer line is in conflict with land tenure principles. At Emmaus, where the homeowners have title to their individual lots, the legal status of the Shallow Sewer and the necessary requirement that the homeowner must be a member of the condominium is not written into the title deeds and are therefore not enforceable. Briardale has been developed under the Community Property Association Act, and the necessary legal arrangements for the formation of the condominiums have been written into the community property owners' constitution

  There are also contractual difficulties with indigent people. Frustration arises from a lack of enforceability of obligations imposed contractually on indigent parties who, due to lack of financial means are unable to fulfill these obligations.

- **Technical issues**
  Shallow Sewer technology transgresses the National Building Regulations (NBR) in a number of cases, eg pipe diameter and manhole size. The prime one arises due to the unauthorised drainage work undertaken by the community.

  Laying the sewer to a shallow depth obviously changes the risk of damage due to imposed load considerably. Bylaws very often control the minimum depth to which sewers may be laid, and this may conflict with the depth tenet of Shallow Sewers.

  Due to the shallower depth at which the sewers are laid, a number of the appurtenances that have been designed for conventional sewers, are either no longer applicable, do not fit the Shallow Sewers, or their technology is inappropriate for the construction practice. In this particular instance, the conventional gully was replaced by an in situ built, brick grease trap. These grease traps turned out to be very efficient and needed cleaning regularly, which the communities complained about.

  Initially the ingress of soil into the sewer system was a problem, which was resolved by raising the inspection chambers by one course of bricks.

- **Institutional**
  This study could not fully evaluate and quantify how onerous the management of Shallow Sewers would be on the services authority. The final consolidation phase, which has taken longer than planned due to the local situation and dynamics, had not yet been completed and Ethekwini Water Services had not taken over the responsibility of retaining the system by the time the research reports were written. However, it was evident that the key to the successful implementation of Shallow Sewers rests in the social intervention, which requires knowledge and dedication on the part of the implementing agency.

  An essential lesson learned from this experience was that, besides requiring extensive participation by the community in the installation and maintenance of the system, this technology also requires extensive support and participation by the service provider, and that technical support and training needs to be ongoing.

Institutionally, the service provider needs to be structured in a way that it can provide community-based services. An interdisciplinary approach is one of the tenets of the Shallow Sewer system, meaning that community liaison staff and social professionals need to team up with technical staff to provide holistic operation and management solutions. In this instance, it would have been beneficial to have other municipal departments dealing with the housing, treasury and others drawn into the team, to ensure an integrated approach to development of the area as a whole.

Developmental interventions pressurize the communities, and sometimes polarize sectors of the community. Therefore the community leadership needs to be strong enough and have the community support, to guide its members though the implementation.

- **Social**
  A practical drawback relating to training in a community was associated with finding a time that suited the whole group, as limited time windows were available to those members of the community that worked. Some communications were made through condominium representatives, a strategy that did not always work well. It was important that as many members of the community as possible were exposed to the educational sessions, however it is proposed that at least one senior member of each family received the full education.

  In cases when Condominium leaders changed at Briardale, the new leaders sometimes had not received sufficient training or communication. This may also be attributed to conducting training in a green fields situation where some of the community members have not permanently moved to the site.

  Generally in both communities it was found that the condominium (Iqoqo) leaders did not continue to manage the condominiums well over the research period, although there were exceptions to this at Emmaus. These exceptions could, perhaps, be attributed to the fact Emmaus is a well-established community and therefore they may be more self-reliant.

- **Social and Political Influences**
  Some of the more affluent members of the community at Emmaus wanted a full pressure water supply. The majority of the community wanted semi-pressure and the policy of the Ethekwini Water department was to supply only one level of service into a community. The unhappiness that this created led to one of the condominiums withdrawing from the project.

  Local Council elections occurred during the project, and one of the aspirant councilors promised “free water for all”. The aspirant councilor and subsequently the community undertook this to mean that all water supplies, at all service levels, including all connection costs, would be provided by the Council free of charge. This undermined the premise under which the project was undertaken and the community would no longer uphold their side of the agreement and make their water and sewer connections.

  Certain influences are beyond the control of the implementing team. For instance, there is no mechanism in the political system to deal with political promises that do not align with mainstream understanding or the tenets of the project. In this instance the local government elections, occurred during the project. Even if the project team had foreseen the problem, it is unlikely that they could have done much to influence its impact on the project.

- **Timing Issues**
  An issue that arose in relation to the project management was the mismatch between “deadline” related construction, which implies time related management, and community/social management, which implies that the interventions proceed at the rate of community development. This potential conflict occurs on two levels.

The contractual arrangements for the Project Manager and the social consultant had time and cost restrictions although both contracts were extended. Both the parties left the project at the end of the works implementation phase when only two houses in each community had been completed and connected to the sewer and water supply, leaving certain critical interventions incomplete. It was also at this point in the development when serious social issues in both communities surfaced. Working with communities in this type of project does not lend itself to such restrictions and these problems may not have occurred if the service provider had the resources to undertake such interventions in-house, at a pace more suited to the pace of skills assimilation in the community. Continuity of management is also important in maintaining community commitment.

At the political level there is a demand that there should be social development with all infrastructure development. At the same time there is a demand for rapid catch-up of backlogs in infrastructure. Currently there is no guideline to for developers to prioritise between the two. This leads to uncertainty and conflict.

3. Conclusions

At this point in South Africa's development, Shallow Sewers in its pure form (i.e. as intended by the La Paz model) are not applicable to the country in general, although there may be instances where it may work to a degree. This is concluded primarily because:

- Of the mismatches between communities' expectation that the "government will provide" and the self help tenet of the Shallow Sewers, and
- the governments assume that rapid infrastructure development and community social upliftment are concordant.
- The legal conflict between the private land tenure and communal ownership of fixed property on that land and
- The institutional arrangements at local government are not structured for interdisciplinary community development.

3.1 The potential capital saving provided by a reduced depth sewer is enormous, and technically it should not be difficult to develop a reduced depth, conventionally owned and operated, sewer from the lessons learned from the Shallow Sewers pilot.

3.2 This research has provided some understanding of the urban poor market, and some of the lessons learnt from the Shallow Sewer pilot study could be applied to improve the success of other community development projects. In this regard, should it still be the governments intention that infrastructure development should encompass community social development, then the Shallow Sewer methodology could form the basis of a "South Africanised" community development methodology.

4. Recommendations

- As the institutional and long term aspects of the Shallow Sewer project have not been evaluated, resources need to be set aside for these evaluations to be undertaken.

- In order to diminish the conflicts such as "community upliftment" vs. hardware delivery; "self help" vs. "government will provide" etc., a policy review and upgrading of development policies needs to be undertaken, certainly at local authority level, but preferably nationally. In particular the conflict in policy between rapid service provision and community development must be resolved.

- To facilitate rapid service provision and provide technical advantages over conventional sewers whilst policy issues (above) are being clarified, it is recommended that a reduced depth sewer system, based on the technical advantages of Shallow Sewers, be developed and tested as soon as possible. The development of these reduced depth sewers need to take into

consideration the findings of this study, i.e. issues such as the legal conflict regarding land tenure, etc.

As community based development can be used to empower communities, and should the policy review indicate that this is desirable and the process is unfettered, then it is considered that a single uniform methodology would be appropriate to undertake this type of development. In this instance, it is recommended that the Shallow Sewer methodology be used as the basis for this methodology.

LESSONS AND EXPERIENCES OF THE ETHEKWINI PILOT SHALLOW SEWER STUDY

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List of Key Abbreviations

EWS	Ethekwini Water Services	WSSS	Water-borne Shallow Sewer System
WRC	Water Research Commission	CSSS	Conventional Water-borne Sewer System
VIP	Ventilated Pit Latrine	CAP	Community Awareness and Promotions
WSSA	Water and Sanitation Services (South Africa)	PHB	Provincial Housing Board
BESG	Built Environment Support Group	NBR	National Building Regulations
HPF	Homeless Peoples' Federation	WHO	World Health Organisation
LIMA	LIMA Rural Foundation		

1 Introduction

1.1 Background

The extent of the problem in South Africa of inadequate water and sanitation is well documented. In spite of the recent focus to provide basic water and sanitation services, about 11 million South African urban and peri-urban dwellers still lack adequate access to sanitation. (13) The resultant effects on public health, water supplies and the environment is of major concern to service providers throughout the country.

The installation of Ventilated Pit Latrines (VIPs), recommended as a basic sanitation system according to legislation, has not provided local authorities with a solution to the provision of suitable sanitation services in dense peri-urban environments. In these environments, where the water supplied to the land area is greater than the evapotranspiration from the site, removal of wastewater is as critical from a health perspective as dealing with human wastes.

The Ethekwini Municipality (formerly Durban Metro) provides three levels of water service. The first is the conventional full pressure service that has no physical restrictions. The second level is a semi-pressure supply, which is provided at a much-reduced cost for connection and tariff, but the house must be fitted with a 200-litre roof tank in order to reduce the operational pressure of the water supplied. The lowest level is the 200-litre ground tank that is filled once daily thus limiting consumption to 6kl/month. Ethekwini Municipality's policy is that, for technical and financial reasons, only one type of water supply could be provided to a community.

To date no alternative to full waterborne sewerage had been available to support the semi-pressure water supply as an appropriate service level to densely populated, poorer areas. The Shallow Sewer system indicated promise in fulfilling this void. Therefore, pilot studies on Shallow Sewer systems were run at Emmaus and Briardale.

A report published by the Water Research Commission (13) entitled " The Applicability of Shallow Sewer Systems in South Africa," concluded that Shallow Sewers might provide a viable sanitation alternative for urban and peri-urban settlements in South Africa.

International Experience

The Report (13) outlines the experiences of five Shallow Sewer implementations in lower income communities in developing countries, namely in Brazil, Ghana, Pakistan and South Africa. In Brazil Shallow Sewers have worked well and have become the norm, having been constructed at 60 to 80% of the cost of conventional sewers, with a high rate of acceptance and community mobilization.

In Brazil one of the systems broke down when the local residents were unable to address chronic problems associated with design and construction flaws. At that time the system was not widely accepted by the state water company's technical personnel who ignored it for the first five years. However, once the company's operations staff developed a maintenance strategy, which included a social component, they opted to maintain the system themselves, at a lower cost than for conventional systems.

In Brazil it was also found that "the implementation of Shallow Sewers resulted in significant improvement in environmental health, with incidents of infant diarrhoea being half of that in un-serviced areas". They also found that when people were able to experience a successful pilot implementation they were able to raise funds to extend the system rapidly.

The WRC report highlights a variety of experiences and concludes with an extensive list of important lessons to be considered for the international experience.

Vargas (Appendix J) states that “Shallow Sewer systems were developed by South American engineers in the early 1980’s in an attempt to provide an affordable sanitation alternative for dense urban settlements”.

“This model allows for savings in different items, such as length and diameters in pipes, excavation, materials, shuttering, etc. It permits not only to reduce costs for the population served, but also to increase the water and sanitation coverage without increasing projected investment.”

“ Often practitioners in the sanitation field focus on the Shallow Sewer system’s innovations on the modification of some of the technical standards. However the conception of Shallow Sewer systems goes beyond that. Its conception comes from a wider analysis of common practices of service provision, including the role of beneficiaries and institutions, the right to participate in the design and access to information and services.”

“Therefore it is not possible to separate the technical issues from the social and institutional aspects that accompany the implementation of Shallow Sewer systems.”

The Shallow Sewer methodology requires extensive participation by the community hence capacity building and training are required. The system thus provides not only water-borne sanitation but also water to each household, which results in the upliftment of the community through improved services combined with tools for community development. Besides offering a service “package” of water and water-borne sanitation, this methodology also provides education on installation, maintenance and health and hygiene awareness. It was expected that, because of its essential educational component, the installation of Shallow Sewers would be more successful in the upliftment of communities than conventional water-borne sanitation, which is installed without such an intensive education programme.

Key issues to the sustainable operation of this technology are community participation, financial and institutional management.

A key recommendation emanating from the WRC study (13) was to undertake pilot studies in South Africa in large municipalities with existing water and waste departments, which showed an interest in exploring alternative approaches to service provision. The Ethekwini Municipality fitted the bill and provided a suitable forum to implement a pilot project and to undertake a research study in a joint venture between Ethekwini, Water and Sanitation Services (South Africa) and the Water Research Commission.

It is important to note that this project was not fully implemented at the time of writing this report and that the stumbling blocks encountered continue to be addressed after the research period.

Water and Sanitation Services, in conjunction with Ethekwini Water Services, are committed to findings innovative ways to resolve the political and social issues that have delayed the final stages of implementation of Shallow Sewers in the Briardale and Emmaus communities.

The valuable lessons that have been learned from this experience, however, are reported for the benefit of service providers that are considering the installation of Shallow Sewers as a technical option.

1.2 Ethekwini Shallow Sewer Management Structure

The Partnership

In order to investigate whether Shallow Sewers would provide a viable alternative waterborne sanitation system to the urban poor in dense settlements, a joint venture agreement was set up between Ethekwini Water Services, Water and Sanitation Services (South Africa) and the Water Research Commission.

Roles and Responsibilities of the Parties

The partners agreed to undertake certain responsibilities based on their individual expectations and objectives related to the pilot project. Ethekwini Municipality (formerly Durban Metro) is the Water Services Authority for the Durban Metropolitan area and Ethekwini Water Services is its designated water services provider.

Ethekwini Water Services (EWS) was responsible for ensuring the operation of the pilot system, its commissioning in liaison with the community, and ensuring that the community undertook the maintenance.

EWS retained the overall responsibility for the project, including financial management, project management and implementation, including mobilizing the necessary resources to undertake the successful implementation of the project. EWS also identified suitable communities for the pilot, carried out the design of the sewerage collector system, provided the necessary water supply, established and implemented a tariff, coordinated the research, reviewed the legal aspects and was responsible for commissioning the system and provided general support to WSSA.

EWS also administered the research funds and facilitated the research. They recruited an independent research team to formulate, undertake and facilitate the research programme, based on the requirements of the Steering Committee.

EWS will operate the system once it is commissioned in liaison with the community and its particular maintenance responsibilities as defined during the implementation.

Water and Sanitation Services (South Africa) (WSSA) had the overall responsibility for managing the implementation of the project and the project finances. They also provided financial capital and technical expertise. WSSA accessed the international experience and methodology through their South American project manager.

Their project manager also was responsible for the employment and management of the social consultants, assisting in the commissioning of the system; for providing a six-month mentorship period and as well as proposing success indicators and performing international benchmarking.

WSSA provided R2 million to fund the implementation of the project and was responsible for the project management.

Water Research Commission (WRC) provided the research funds and was responsible for managing the research component of the initiative, as well as disseminating the experience gained through the pilot project.

NASCO, SANTAG and the Department of Housing

The National Sanitation Coordinating Office (NaSCO), and the Sanitation Technical Advisory Group (KZN: SANTAG,) and the Department of Housing provided advice and support for the project, although they did not provide funding.

The National Sanitation Coordinating Office (NaSCO) undertook to coordinate the feedback into central government policies.

The Department of Housing, undertook to support the project by executing leverage on the Provincial Housing Board (PHB) subsidy system.

Steering Committee
A Steering Committee represented by all the above parties as well as the Project Manager (WSSA), the independent Research Manager and Ethekwini Municipality Departments of Health, Housing, Water and Wastewater, provided guidance to the project and the research. The Director of EWS chaired the Committee.

Management Committee
A Management Committee, represented by the three main contracting parties, was convened to provide strategic support and direction to the project.

1.3 Research Component

Objectives of the Research
The research function proposed to research the viability of the implementation of the Shallow Sewer system in Briardale and Emmaus, by assessing:

- The capital costs savings compared to conventional waterborne sewerage
- Whether the costs and implementation can be accommodated within the Provincial Housing Board guidelines
- The legal viability of the system in South Africa
- The effectiveness of conveying sewage in terms of water usage and the use of unconventional construction methods and materials
- The community's ability and willingness to pay for the service
- The maintenance and any other running costs to the community
- Customer satisfaction and improvement in quality of life compared with conventional sewerage
- The community's ability to manage the condominial system and agreements
- The community's ability to maintain the system
- The reduction in environmental health risk conditions
- The operation and maintenance costs to the Ethekwini Municipality and
- The administrative burden on the Ethekwini Municipality.
- Health and hygiene awareness and practices compared to communities with conventional waterborne sewerage.

Not all of the objectives of the research component were achieved due to problems encountered during the implementation of the pilot. These being:
- Health awareness and health practices in communities as well as
- The operation and running costs to, and the administrative burden on the service provider.

Data that was collected relating to health aspects was not analysed in detail due to health professionals not being available to undertake this function. The institutional management elements could not be researched in any detail because the Ethekwini Municipality had not taken over the management of the project before the end of the period of research.

1.4 Research Outputs
There are three outputs of this research. A summary report or synthesis, a full research report (WRC 1146/1/03) and a video documenting the Shallow Sewer system and its implementation in the Ethekwini Pilot Study, which is available on CD. The video is aimed at service providers who may want to consider Shallow Sewers as a sanitation option.

Structure Of Report

- The Executive Summary provides a brief overview and overall conclusions.

- The Summary of Lessons and Experience consolidates and synthesizes the research findings, highlighting the essential experiences and lessons learned from the process. It covers all aspects of the research, providing abbreviated results and findings of individual research areas.

  The format of the Summary report is firstly, an overview of the planning and implementation, secondly the results and findings under the specific areas of research, and, finally, the key conclusions of the Ethekwini experience, and recommendations for applying these findings in the South African context.

- Appendices A to G report on the detailed findings and conclusions undertaken for each research area, including the methodologies used.

- Appendices H to I report on the social evaluations undertaken on behalf of the research team by Communities Awareness and Promotions (CAP).

- Appendix J is the Methodology Section of a Report; prepared by M Vargas of WSSA, to EWS on the Ethekwini Shallow Sewer Pilot.

2 Shallow Sewer Technology and Design Criteria

According to Vargas, (Appendix J), "the technology relaxes many design characteristics of conventional sewerage and in the process allows for shallow depths, smaller diameter pipes, flatter gradients and community based construction, operation and maintenance. The concept has been successfully implemented in Brazil, Greece, Australia, USA, Bolivia, India and has become the norm in Pakistan".

2.1 Introduction to Shallow Sewer Technology in South Africa

The technology was developed to service the poorer elements of the community, however in some parts of the world it has been developed as the standard option. It is expected that in South Africa it will, certainly initially, be used for the poorer communities.

This technology is expected to be applicable in South Africa as an intermediate sanitation alternative with a cost between VIPs and conventional sewerage. The WRC Report (13) asserts that "they may be preferable to VIPs in denser (greater than 35 dwellings per hectare) formal and informal peri-urban settlements and that they provide a less expensive alternative to conventional sewerage in low to medium income formal urban residential areas. A significant advantage is that Shallow Sewers systems are appropriate where water use is between 30 and 60 litres per capita per day (i.e. pour flush toilets with yard tanks or yard taps) which may be too high for VIPs and too low for conventional sewerage."

2.2 Shallow Sewer Technical Design Criteria

According to the WRC Report (13), Shallow Sewer systems *"require a relaxation of traditional design and construction standards, and an associated education of the technical personnel who are responsible for their implementation and management.*

- *Technical design standards for sewer systems, such as local authority bylaws, the 'Red Book' (Department of Housing, 1994) (REF (20) and SABS 1200 (1982) (REF (21) need to be relaxed. In particular, the use of smaller diameter sewers (i.e. less than 150mm), shallow block sewer depths (i.e. only 400mm cover), flatter sewer gradients with smaller diameter pipes I.e. 1:167 slope for 100mm pipes) and less stringent access requirements (i.e. inspection chambers rather than manholes).*

- *Building codes for household fittings and house connections should be relaxed, allowing local installation of fittings and connections, with less stringent connection requirements, albeit with quality control in trunk sewer access.*

- *The relaxation of design standards is based on the assumption of high connection rates. Therefore Shallow Sewers should not be implemented where less that 75% of the residents have agreed to connect under the proposed financing and management conditions.*

- *Site specific design of block feeder and trunk sewer system layout should be encouraged to minimise the costs of the system and allow the use of Shallow Sewers in irregular informal settlements.*

- *However the standards should require consultation and user education of residents in cases where traditional standards are relaxed, to increase 'ownership' and ensure appropriate use of the system.*

- *Similarly, community or small contractor capacity building should be required where construction or management of the system is delegated, thereby transferring maintenance skills into the community.*

The last two points highlight the inter-relationship between relaxing design standards, delegating management responsibility and increasing community awareness, all three of which are necessary for efficient and sustainable implementation of Shallow Sewer systems."

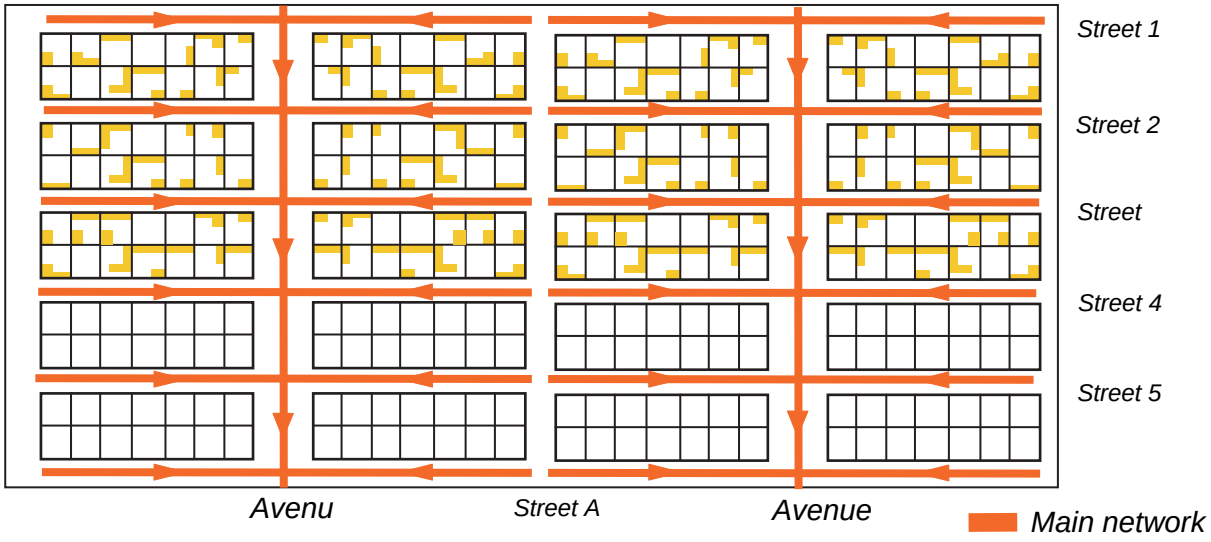
2.3 The Condominial Concept

The fundamental of the Shallow Sewer concept is that a group of citizens who live in a common micro drainage catchment for a sewer will come together and install, manage and operate a sewer system, which is collectively owned by this collection of citizens. The local authority then only supplies one connection to the group of citizens. This group of citizens is collectively known as the "Condominium" or "Iqoqo" (Zulu).

The sewer network consists of three sections each with different owners. The local authority owns the collector sewer which is a conventional sewer draining the collective condominium sewers. The members of the condominium own the condominium or collective sewer jointly. Each member of the condominium then has his own connection to the condominium pipe. The local authority owns, installs, maintains and operates the collector pipes. The condominium pipe is collectively owned, operated, installed and maintained by the condominium. The section of pipe that connects the house to the condominial sewer is owned operated and maintained by the individual house owner. Diagram 1 shows the differences between conventional sewers and Shallow Sewers.

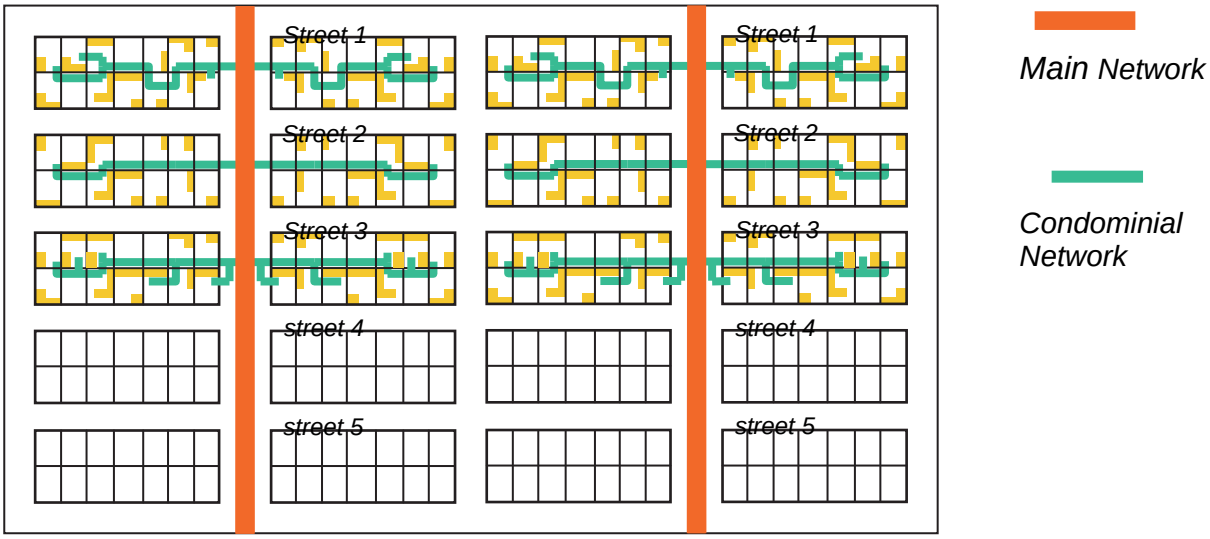
Diagram 1: Comparison of Layouts of Sewers

Conventional System characteristics



Typical layout of a conventional network

Condominial System characteristics



Layout of a condominial network

There are three options for the positions of the condominial sewer. They can either be laid down the mid block in the back yards of the houses, or in the properties of the houses but in their front yards, or they can be laid under the pavements in the local authorities property. Diagram 2 depicts these options and shows the comparison with conventional sewers.

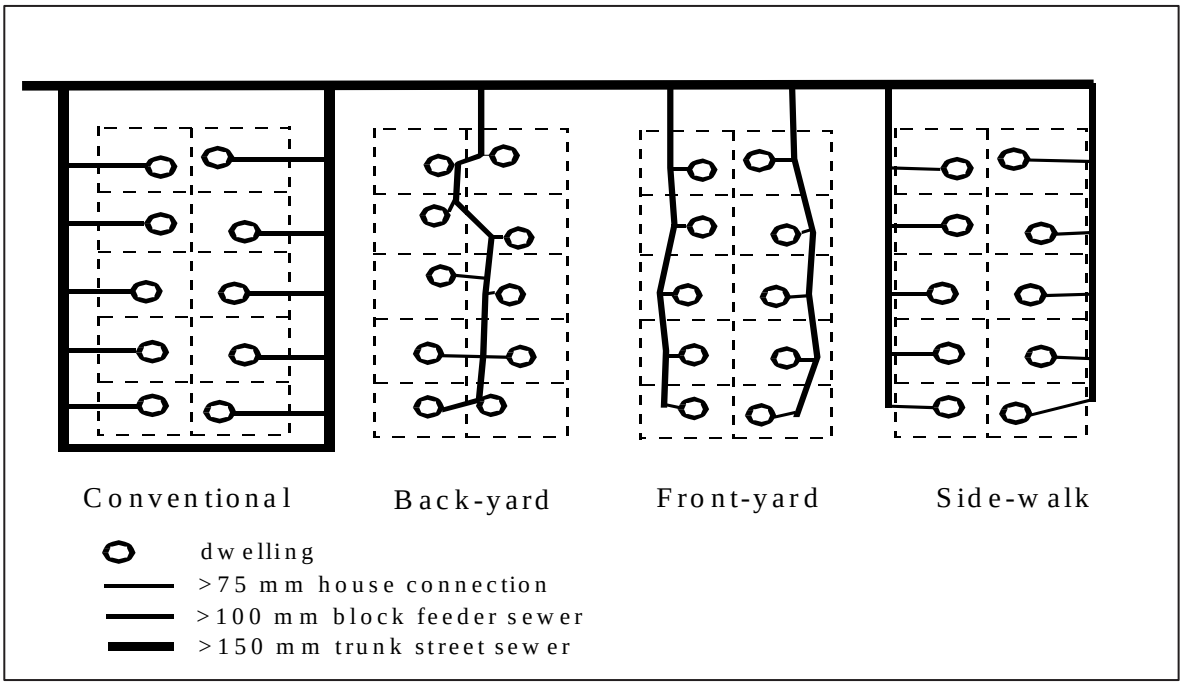


Diagram 2: Options of Shallow Sewer Configurations compared to Conventional Sewers

2.4 Overview of Technical Aspects of Shallow Sewers

The Shallow Sewer system is a gravity system, which provides exactly the same level of conveniences as a conventional waterborne sanitation system. The collector mains are designed and constructed to conventional full waterborne standards. The condominial sewers on the other hand are designed to be laid in un-trafficked areas that do not carry heavy loads. Because they are laid in un-trafficked they are laid much shallower than conventional sewers. The pipe diameters are also smaller than conventional sewage pipes, which provide better solids transportation with lower flush volumes.

Diagram 3: Comparison of Shallow Sewer with Conventional Sewer

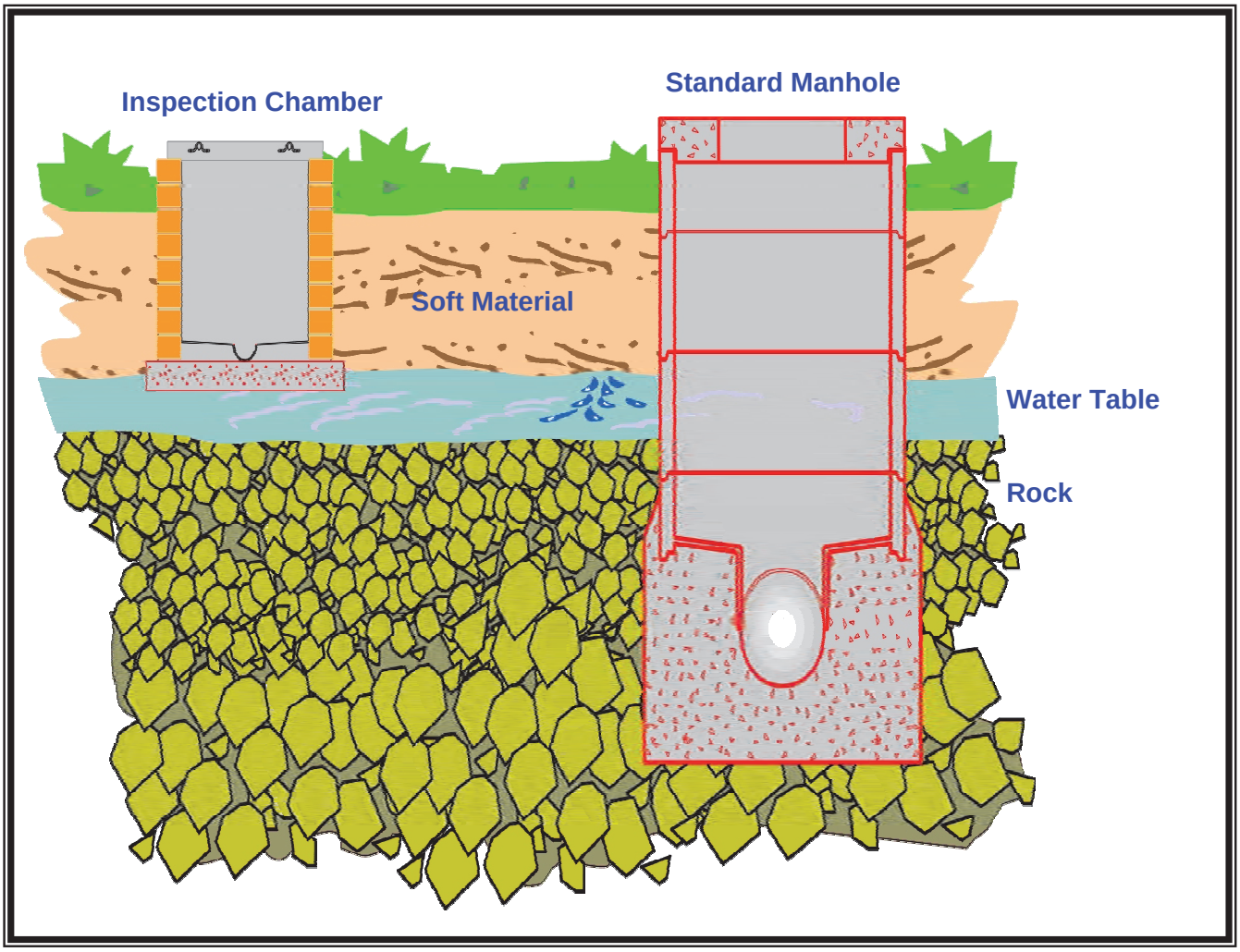


Diagram 3 graphically indicates the differences in:

- Depth
- Size of manhole
- Pipe size
- Volume and type of material excavated

Because condominium sewers are laid shallower than conventional sewers it is not necessary to have manholes in order to gain access, as everything can be reached from the surface. Small access chambers are then provided instead of large conventional manholes.

3 Implementation of Shallow Sewers

3.1 Introduction to the Model used for Implementation

The WRC Report (13) highlights that a number of different simplified sewerage models have evolved. The prime difference between these appears to be how the management of the system has evolved, and these differences apparently evolve due to different local conditions and attitudes.

With no South African experience of consequence to use as a guide, the implementation and management for the Ethekwini pilot was based on the successful model used in La Paz, Bolivia as imported by the WSSA and its Project Manager Miguel Vargas who had extensive experience of the implementation of this model.

The model has evolved out of a community environment with very low access to capital resources, but with a strong culture of “self-help” coupled with a reasonable technical ability in the building environment. The communities have a structured leadership in the form of small local community committees. The commitment to community is strong and community work parties are often seen as a social event as much as a means of achieving an end.

According to Vargas (Appendix J) the objectives of the Shallow Sewer model go way beyond the mere provision of a sanitation system, and should provide social development and upliftment. This includes community leadership development that encourages communication and therefore reduces mistrust, which ultimately should lead to the pooling of resources and the limited social capital and therefore encompasses many of the principles of poverty alleviation. The methodology is not confined to the development of Shallow Sewers but may be used for virtually any social upliftment program and there is anecdotal evidence of it being used for urban environmental greening and even local crime fighting.

Table 1 shows the steps in the Implementation of Shallow Sewers, based on the La Paz model and gives an indication of the time to implement each step. The size of the implementation will obviously affect these times, but those shown are as they were developed in the Ethekwini pilot.

Table 1 Steps in the Implementation of Shallow Sewers:

1. Institutional and community arrangements (4 weeks) During which community and institutions agree on the scope, involvement and resources provided by each party
2. Cadastral and social characterisation (5-6 weeks) Make investigations to provide a socio-economic survey report including a list of key issues to be considered during later project stages. Undertake technical and geo-hydrology assessment (if applicable) to define condominium groupings.
3. Health and hygiene education and community strengthening (2-4 weeks) Tools and strategies are developed for community interaction. The community is trained in health and hygiene and awareness, using participatory tools that equip them to assess their own sanitary condition. Activities take place to build trust between project team and community. Key people to represent condominiums and institutions are identified and listed.
4. Definitive design, task planning and agreements (8-10 weeks) An agreed layout and design is done in consultation with the community. Community makes an informed decision about the type of services they want and are willing to pay for. Key persons and institutions of supporting community awareness process are trained. A detailed and realistic schedule in developed in agreement with the community. Legal agreements are drafted.
5. Works implementation (10 weeks) The community constructs the condominial branches of the system, has ownership of, and understands the proper use of and implications of abusing the system, having received operation and maintenance training.
6. System consolidation (2-4 weeks) Houses are connected to the Shallow Sewer system. The community starts to use the system in a sustainable manner and evaluates the system. Any problem areas are resolved. This would be the final step requiring funds from the PHB subsidy. At the end of this phase, the houses should have functional wet cores that drain into the Shallow Sewer system. All training would have been completed to enable the people to maintain the system themselves.
7. Systemisation and final evaluation (2 weeks) Results of the implementation of the methodology are analysed. Project experiences are formalized and reported on. Any subsequent modification made to the system would be funded by the community
8. On-going social maintenance (on-going) The cost of this would not be included in the subsidy but would have to be born by the local authority as part of their sanitation services management. This may include any further intervention, such as assistance with maintenance and / or administration; re-training; community structure strengthening; or anything relating to legal agreements. The community who purchase their own materials and tools should do system maintenance. Any further social intervention costs deemed necessary would have to be born by the service provider or be paid for be some other funds.

One of the strengths of the implementation model is that it recognises the need for confidence building between the community and the implementing agent, and vice versa. This is given substance in the model by using “milestones”. At the outset of each step a number of goals or

"milestones" are set to be achieved in each step. "Milestones" are set for both community goals as well as implementing agent goals. At the end of each step there is an evaluation phase which evaluates the achievements relating to the "milestones". This in-built process serves to build a strong working relationship between the two parties.

Another feature of the model is that if one observes the implementation steps, it is noticed, that in general the cost of each successive step increases. Another purpose of the milestones is to provide the opportunity for the developer and / or the community to back out of the project before too much expenditure is incurred.

At the "milestones", if both parties have not achieved their objectives then only the following options are available.

- The defaulting party can rectify its default.
- The parties can accept the default, but the consequences of the non-compliance need to be thoroughly understood by both parties.
- The implementing agent must walk away from the project. This may be temporary or permanent.

3.2 The Management Structure for Shallow Sewers

A number of different management structures need to be considered, but broadly they fall into two groups.

- Management of the Implementation.
- Operational Management of the Shallow Sewers.

Special mention also needs to be made about the ideal structure for the local authority.

3.2.1 Management of the Implementation

As the Shallow Sewer technology is community-based and is structured to empower the community, community involvement is imperative. At the start of the project, the main component of the community management structure was the Community Committee for each of the sites. Part of the assessment of step 1 is to determine the strength of this management. This Committee is also the introductory point for the implementing team, and it is assumed by the model that such a structure exists and that it is reasonably functional.

One of the tasks during step 2 of the implementation model is to define the condominium groupings. This effectively introduces another subdivision in the social management structure. This subdivision is not politically based but comes from technical and topographical requirements, and provides the community with an authority which is closer to a personal level.

During the implementation phase the condominium structures are used for all the interaction with the homeowners. The community committee is used as the link between the implementing agent and the condominiums as well as providing fora for communication with the community in general. Specifically, tasks like the health and hygiene education are undertaken at community level whereas the tasks excavating and constructing the sewers are undertaken by condominiums. Part of the objectives of the methodology is to reinforce the power of the condominiums and thus develop a strong independent non-political community structure capable of maintaining the sewer system.

It is important to note that the Shallow Sewers have an interdisciplinary philosophy whereby no single party is more important than another, and the whole is more important than any of the parts. Thus, although there are a number of management structures, the style is very participatory, with the aim of finding compromises which are acceptable to all.

3.2.2 Operational Management of the Shallow Sewers

In the La Paz model, the condominium structure is constituted as a legal entity, headed by and elected chairperson. The chairperson was supposed to be responsible for all the activities of the condominium including the maintenance. The Municipality was then supposed to provide a contact person who could be approached by the condominium leader for support. In the model the contact person ideally should have provided primarily a public liaison role rather than a technical one, as in theory, the members of the condominium should be able to solve all their technical problems themselves.

Thus from an operational point of view there are three parties which need to contract with one another in various permutations. These are the homeowner, the condominium and the local authority.

3.3 Local Authority Structure to Manage Condominial Sewers

Community based service provision, is a philosophy and in the ideal a local authority which wishes to implement community based service provision should adopt this philosophy for all service provision. It then requires to structure itself accordingly.

This entails providing a department dedicated to the management of social structures within the communities, thus it includes not only community liaison personnel but social workers and sociologists. The community liaison personnel need to be in close contact with the communities at all times both during project implementation as well as during the on-going operational phase.

The social department should be identifying the needs of the communities as well as identifying the stability and therefore the “ripeness” of a community for interventions. This implies that the social department should initiate the project and should be involved right from inception all the way through to and including the operation of the service.

4. Overview of the Pilot Areas

4.1 Identification and Selection of Communities

4.1.1 Selection of Communities

The Homeless Peoples Federation, an NGO, were in the process of looking to develop a green fields site of Briardale, using their "self-help" scheme. Through third parties they had approached Water Research Commission with the view to using this site as a pilot to investigate the application of Shallow Sewers in South Africa. At the same time Ethekwini Water Services were interested in finding a cost effective waterborne sewerage system to complement their semi-pressure roof tank water supply system. Simultaneously, but independently, WSSA approached EWS with international donor money to be used to pilot Shallow Sewers in Ethekwini. For administrative reasons EWS approached both WSSA and WRC with the view to combining the two opportunities into one project. This was accepted by all parties.

In addition the Emmaus community had approached EWS to solve their sanitation problem, which was that they had installed a patented pour flush septic tank system that was no longer operational. The Emmaus community had already used their Provincial Housing Board subsidies on their development and toilets, so there were no funds to provide them with an alternative system.

Notwithstanding, the approaches by the Emmaus community, EWS prevailed upon Ethekwini Municipality Department of Housing to shortlist a number of potential housing development sites, which were potentially suited as pilot sites for Shallow Sewers. Criteria such as their proximity to existing sewerage, and whether their development timing suited the envisaged Shallow Sewer project timing were used. Built Environment Support Group (BESG) was employed to undertake a social evaluation of the 5 short-listed communities with the view to choosing the preferred sites.

As it transpired Briardale and Emmaus were found to be the most suitable, and as there were sufficient funds available, projects were initiated at both sites.

The social evaluation undertaken by BESG for the selection of the sites was used as the social status quo evaluation as required in implementation Step 2 Institutional and Community Arrangement of the La Paz Model.

4.1.2 Pilot Communities

Emmaus is situated in the Pinetown area, adjacent to the Westmead Industrial area being hemmed in by the N3 national highway and industries, leaving no room for expansion. The community, which had been developed about 12 previously ago, comprises 95 homes, each on its own plot, with no neighbouring communities. Some houses are made of concrete block and some of a fibreglass type material. Some householders have built informal buildings for extra accommodation. In addition the Emmaus community had already used their housing subsidies and therefore did not have funding available to them for water connection fees and materials that they needed to connect to the Shallow Sewer.

The Emmaus community had water supplied through four standpipes. Sanitation was provided in the form of patented septic tanks, and self dug pit latrines. The septic tanks were unable to be serviced by the community and when full caused considerable discomfort and health related problems to the community. There was a "Redibord" electricity supply as well as roads and drainage that were reported to be in an unsatisfactory condition. The area is very steep and hilly.

Briardale is situated in the Newlands West area bordering the road to KwaMashu. The Briardale community consisted of 155 families who were part of a green fields housing development that was being managed by an NGO, People's Dialogue, in association with the Homeless People's Federation (HPF). People's Dialogue was processing an application to the Provincial Housing Board, through the Ethekwini Municipality Housing Department, for housing subsidies. People's

Dialogue were also to act as the developer, to manage and facilitate the housing project, using the "People's Housing Process" where people build their own houses, thereby enabling larger houses to be built for the subsidy amount. By the end of the research period the subsidy application had not been successfully processed for a variety of legal and land issues. However approximately 65 houses were constructed, even without the subsidy, using the people savings and finances organised by People's Dialogue and the HPF. The pilot study intervention was undertaken in accordance with the overall management by People's Dialogue.

The Briardale community had only one communal standpipe and nine chemical toilets. There was no electricity, roads or drainage. The area is fairly flat with few trees.

Emmaus was selected because of its "willing and energetic committee, newly elected and keen to undertake improvement projects", although it was "difficult to assess the potential of the local organisation on account of the very recent election of the committee". Risks identified were physical isolation from other residential areas and that the "new committee had no track record in development implementation."

According to BESG, (1) who undertook the status quo evaluation at both sites, Briardale was described as having a community "organisation with the experience and the commitment to undertake a collective service development project" and "significant organisational experience in implementing a participatory development project". The only risk identified was "that the physical layout of houses may not fall within plot boundaries".

Briardale and Emmaus "ranked sewerage provision in their top three development priorities", it was noted by BESG, (1) that "the areas were cared for with no refuse lying around" and "community structures saw their role as being to improve the provision of services and quality of life in their areas".

Both communities had expressed great desire and willingness to participate in this pilot study.

4.1.3 Control Communities for Research Comparisons

In order to compare Shallow Sewer with conventional sewers it was necessary to find control communities of similar social background as the test communities, who had been provided with conventional waterborne sewerage, in the same geographical areas. Nazareth near Pinetown was selected as a control for Emmaus, and Riverdene in Newlands West, for Briardale.

The controls selected turned out to be good choices. Nazareth has a mixture of very poor to relatively wealthy occupants, as does Emmaus, while Riverdene's population has average to poor incomes, as does Briardale. Also the length of time the people have lived in their homes is similar, with Briardale and Riverdene inhabitants being fairly new (1-3 years) and Nazareth and Emmaus usually having occupied their homes at least 5 years. The type of home in Riverdene, however, is smaller than in Briardale.

4.2 Management of Ethekwini Shallow Sewers

The Ethekwini Municipality is not structured as a community based service provider, but operates by providing a number of service departments operating under clusters. The provision of sanitation to houses does not fall under one single department or cluster, but requires the services of the Housing, Health and Wastewater Management and Water Departments for different facets of the full water service provision.

Under the provisions of the public/private partnership agreement WSSA were to undertake the implementation phase of the project and the Department of Wastewater Management was to take-on the overall responsibility of retaining the system once the final systemisation and evaluation phase had been completed.

A number of factors are pertinent to the management of the implementation phases of the project.

The Emmaus community had already received their Provincial Housing Board (PHB) grants for housing provision. As the wet cores (water connections and storage, plumbing, toilet systems and sewer connections) are considered part of the house and not part of the water or sanitation system, it was the responsibility of the homeowner to generated the funds or provide their own wet cores.

At Briardale where the housing development had only recently commenced, and the PHB subsidies were being applied for, the housing developer was responsible for providing the wet cores. Funding for these was very slow.

The lack of provision of decent wet cores at both communities had serious bearing on the management of the Shallow Sewers pilot project. At the time of writing the consolidation and final evaluation phase according to the La Paz model had not been completed and EWS had not taken over its responsibility.

In terms of the community management of the system, the communities were organised according to the La Paz model with functioning community committees. The condominium structures were also formed and legal agreements drawn up between the condominiums and its members as well as between the condominiums and the Ethekwini Municipality.

However the legal status and enforceability of the legal issues are questionable. At Emmaus, where the homeowners have title to their individual lots, the legal status of the Shallow Sewer and the necessary requirement that the homeowner must be a member of the condominium is not written into the title deeds and are therefore not enforceable. Briardale has been developed under the Community Property Association Act, and the necessary legal arrangements for the formation of the condominiums have been written into the community property owners' constitution.

Not withstanding the above it is questionable whether it is worth contracting when in the case of default the defaulter has insufficient property of value to make any lawsuit practical.

4.2.1 Social Intervention

The social interventions were conducted in line with the La Paz implementation model. The prime method of communication was by conducting workshops and community meetings.

Educational communication, such as health and hygiene education was conducted in small groups. These groups were generally condominium based. One of the problems associated with this form of communication was finding a time that suited the whole group, as limited time windows were available to those members of the community that worked. It is also important that as many members of the community as possible are exposed to the educational sessions, however it is vital that at least one senior member of each family receives the full education.

Decision-making exercises were usually conducted in formal meetings, either in committee or in general mass meetings depending on the nature of the decision. In general where possible the issues of problem identification and problem resolution/solving techniques were developed under workshop fora.

The dissemination of technical information and skill was generally undertaken in small groups. The modus operandi was to identify a few technically skilled people or champions from each condominium and then to conduct skills training for these people, the idea being that these people would then act as team leaders or mini contractors in the community.

In many community-based interventions, education programs are implemented in the local schools to educate the children. As neither Emmaus nor Briardale have dedicated local schools, this form of education was not used in the Ethekwini Pilot.

During the intervention it was reported that the Emmaus Development Forum suffered from "a critical lack of institutional management capacity" which was adversely impacting on the pilot study.

VISTA Planning Consultants provided institutional development training to remedy the situation. (18)

4.2.2 Technical Intervention

Step 4 of the La Paz implementation model provides the community with the opportunity to be directly involved in the layout design of the Shallow Sewers. A preliminary design is undertaken which is then presented to each householder who then is expected to discuss his/her plans for home improvements and extensions for the future. As the Shallow Sewer is not confined to servitudes or to run along boundaries the homeowner's input has significant bearing on the sewer layout and design.

As the construction is undertaken by the community at condominium level, supervision is critical as the ability of individuals varies considerably. The skills training therefore needs to be "standards" based. Construction supervision needs to ensure that these minimum standards are achieved.

A specific aspect that both highlights the above comment and has bearing on technical design considerations is the relationship of the size of the access chambers to appurtenances such as bends and tees. As the access chambers are small (600 x 600mm square) the positioning of the chamber over appurtenances is critical to allow reasonable radii on bends etc of the appurtenances as well as providing space for radii on the rodding equipment.

The approach of reducing the construction standards has both positive and negative spin-offs. In general most of the spin-offs appear to be positive, such as all of the effects on construction and maintenance and hence cost, due to simply laying the sewer at a shallower depth. However, certain technical disadvantages to this approach were noticed. For instance the grease traps, which were originally constructed from rectangular buckets to save costs were totally unsatisfactory and had to be changed.

4.2.3 Project Management

The main issue that arose in relation to the project management was the mismatch between fixed term contracts, which implies time related management, and community/social management, which implies that the interventions proceed at the rate of community development.

Both the social consultant and the Project Manager were on restricted time and financial contracts. Hence all tasks had to be completed within a certain time frame. Working with communities in this type of project does not lend itself to such restrictions, and both incumbents were frustrated at having to hurry certain aspects instead of doing them thoroughly. When these parties left the site, certain critical interventions had not been completed, necessitating a change in management at a critical time in the project.

These problems would not have occurred if the service provider had the resources to undertake such interventions in-house at a pace more suited to the pace of skills assimilation in the community. Continuity of management is also important in maintaining community commitment.

4.2.4 Operation and Maintenance

Once the project implementation was complete it was intended that the Systems Branch of Ethekwini Water Services would take over the running of the project. It was planned to train the appropriate Ethekwini staff to sensitise them to the project, the agreements and the roles and responsibilities of both the Municipality and the community. Although this training had not taken place at the time of writing, WSSA continued to make the offer available to the EWS staff.

Reasons for Setbacks

At both sites the implementation process has stalled at the "System Consolidation" phase, Step 6 in the La Paz model, in that the connection rate to the sewers has been very poor. At Emmaus, the community did not have sufficient funds available (see section 4.2.5) to develop their wet-cores, and the Steering Committee has adopted a "wait and see" attitude to see if the community do eventually provide their own wet cores and manage the system.

At Briardale the housing developer under-performed and the housing development has not yet been registered and therefore the PHB subsidies are not available. Although monies were made available to the community, through a loan, to install “basic” wet-cores, which have been completed for the existing houses, the community has rejected all development that it associates with the housing developer, including the Shallow Sewers. This has meant that EWS staff have been excluded from the site.

Not withstanding the above, generally in both communities it was found that the condominium (Iqoqo) leaders did not continue to manage the condominiums well over the research period, although there were exceptions to this at Emmaus. These exceptions could, perhaps, be attributed to the fact Emmaus is a well-established community and, therefore, they may be more self-reliant.

4.2.5 Payment

Although it runs against the general philosophy of Shallow Sewers methodology (as per the La Paz Model), payment was made to the communities for installing the sewers. There were a number of reasons for this. Firstly, at the out set of the project it was realized that the majority of homeowners at Emmaus would not be able to afford the cost of their wet cores as they had already received their PHB subsidies. It was the intent that payment for construction would provide the poorer members of the community with start-up capital for their wet cores and water connections. Secondly, the precedent had been set in that the Ethekwini Water Department provides payments for the construction work undertaken by the communities. Thirdly, there was political pressure to pay for this effort.

In the case of Emmaus it had been the original intention that the monies would be held in trust until payment for the wet cores was required. However there was considerable political and community pressure to make this payment on completion of the construction. When monies were required for the wet-cores very few of the members had managed to save any.

To overcome this problem, special provision was made in the accounts branch of the EWS to allow these potential customers to save for their water connections. Unfortunately very few of the homeowners made use of this facility.

5 Milestones and Achievements of Piloting Shallow Sewers

5.1 Implementation Strategy of Shallow Sewers in Ethekwini

Social Mobilization

The Shallow Sewer methodology proposes to create conditions in the intervention to inform the community about their sanitation problems, to encourage and to give them the tools to participate in solving such problems. The intervention provides training in health and hygiene awareness and team building, as well as technical skills.

The social intervention entailed the execution of all the activities described in the "Social Intervention Model For Implementation of Condominial Sewerage Systems" proposed for the Ethekwini Shallow Sewerage Project (16). Besides facilitating agreements with the communities and the social characterisation, tasks included working with the communities to plan and construct the sewers while providing training and capacity building according to the methodology. Once installed, all households were provided with a simple yet comprehensive instruction book in Zulu on how to maintain the system. (Shallow Sewerage System: Instruction Book) (Available on request)

The implementation of the Ethekwini Pilot Study was undertaken according to the La Paz model, as shown in **Table 1: Steps in the Implementation of Shallow Sewers**, in section 3.1.

All went as planned up to the end of Step 5 (Table 1) when by November 2000 the Shallow Sewers had been completed successfully in Briardale and Emmaus (apart from one condominium at Briardale that was delayed while a police station was relocated). The project team connected two 'show houses' to the sewer for demonstration and training purposes.

Seven condominiums (Iqoqos) were planned at Emmaus comprising 96 houses, one of which (Iqoqo A with 17 houses) was excluded from the project because they did not accept the semi-pressure water supply. The sewerage system was completed for all condominiums and all houses, except for Iqoqo A, which had no drainage or water.

At Briardale there were ten condominiums, two of which had no houses built and another two with only one house in each. The sewerage system was completed for all condominiums and all 157 plots.

Various delays (See Section 5.2) prevented the expected numbers of connections to the sewers and the use of the system in a sustainable manner (Step 6, Table1)

Social Intervention

The social intervention has been well documented. Reports written after the social intervention and the construction of sewers record the project issues and dynamics encountered in the implementation and highlight the complexities of community development within a limited project timeframe. They also lay a good foundation for the possible replication of this technology in the South African context. More information can be found in the reports (Appendix J) and by LIMA who produced interim reports at each stage of the intervention and a final report (4), aimed to provide a consolidation of their learning experiences.

5.2 Implementation Problems Encountered Affecting Progress and Delays

The final completion of the project has been delayed considerably. There are three main reasons for the delays.

5.2.1 Management Issues

The contractual arrangements for the Project Manager and the Social Consultants had time restrictions although both contracts were extended. However, both the parties left the project at the end of the works implementation phase when only two houses in each community had been

completed and connected to the sewer and water supply. At this point WSSA appointed a quality control engineer who operated on a part time basis. It was also at this point in the development when serious social issues in both communities surfaced. Due to the delays being experienced in the wet core development and system connections and the accelerating development of these social issues, it is understandable that the Project Manager's stay could not be extended any further. However his ongoing presence and interaction with all parties may have assisted in resolving the developing impasse.

In retrospect, because the project took much longer than anticipated, there were significant personnel changes to the project team during the implementation, which affected the communication with the communities.

5.2.2 Housing Issues and Packaging

Water Supplies for Building.
Both test communities had problems with water supply at the start of this project. At Briardale there was only one standpipe for a whole community where houses were being built and water was needed desperately for building. At Emmaus the number of standpipes had been reduced from four to one or two due to non-payment by some of the bailiffs.

Plumbing and Plumbing Training.
In both cases the communities were expected to install plumbing and connect to the sewer. Communities need skilled resources for plumbing and these did not exist in the communities.

Although some plumbing training was provided at Briardale the initial plumbing training provided did not prepare the community for resolving even minor issues and the community complained that training was insufficient for them to install wet cores and plumbing to a satisfactory standard. After more intensive plumbing training the trainees were still unable to resolve many problems and therefore it is suggested that the education be taken one step further to include troubleshooting.

The Shallow Sewer training cannot be expected to provide adequate plumbing skills for a community to plumb their houses to a satisfactory standard. In subsidised housing projects, funds should be allocated for the services of skilled plumbers to install wet cores and make sewer connections as part of the housing package, even when using the People's Housing Process. The Shallow Sewer training should enable the community to understand and maintain their system. The community should participate in the construction of the sewer but under the guidance of a skilled supervisor.

Ethekwini Health officials identified certain technical problems (Appendix F) in which were causing odours and possible contamination risks for the owners of the houses in question. These were found to be caused by poor plumbing and building rather than to Shallow Sewer defects. Nevertheless, there were faults with inspection chambers and grease traps that were part of the Shallow Sewer design. Increased support and guidance from the joint venture in assisting the community to resolve their issues may have alleviated some of these problems

5.2.3 Housing and Household Issues.
In the pilot study at both communities housing issues complicated matters significantly.

Although the installation of the sewers was completed on schedule at Emmaus to all condominiums except one, which was excluded, the final stages of the intervention were not completed because only 24% of households managed to make their water connections and 11% their sewer connections. The main reasons was an inability to pay for water connection fees and/or materials needed for wet cores and plumbing.

The Briardale project was inextricably linked to the housing process, which suffered great setbacks with only 42% of the 155 houses actually being built. Installation of the sewers for the entire community of 155 plots was completed according to schedule. Nevertheless, 74% of houses built

managed with assistance, to connect to the sewer. WSSA had to step in with financial assistance, delivery of materials and tools, and a plumber to assist the community to make their connections.

The delays in houses being connected at Briardale meant that there was ingress of sand and rubble into the sewer because of temporary measures used to seal the unconnected sewer pipes. Blockages resulted that frustrated the community and WSSA had to hire a contractor to flush out the entire system and to purchase end caps, which the community used to seal the unconnected pipes.

The Emmaus community was offered the same assistance to flush out the system and install end caps but they refused to provide the labour so the work did not take place.

Semi- Pressure Water Supply and Political Promises at Emmaus.
Certain of the more affluent members of the community at Emmaus wanted a full pressure water supply. The majority of the community wanted semi-pressure and the policy of the Ethekwini Water Department was to supply only one level of service into a community. The unhappiness this created led to Condominium A withdrawing from the project.

Local Council elections occurred during the project, and one of the aspirant councilors promised "free water for all". The aspirant councilor and, subsequently the community, undertook this to mean that all water, at all service levels and including all connection costs would be provided by the Council free of charge. This undermined the premise under which the project was undertaken and the community would no longer uphold their side of the agreement and make their water and sewer connections.

As a result the implementation team, after negotiating with the community, withdrew from the project and did not complete the plumbing training and technical support. It was decided to leave the community to their own devices to connect as and when they wanted to. Monitoring was continued and the research program was adjusted to evaluate and quantify the perceptions of the Emmaus community about Shallow Sewers. (Appendix D: Social Evaluation)

Collapse of the Housing Project at Briardale.
The implementing agent for the housing development at Briardale under performed in general. But primarily they failed to get the housing development registered with the Provincial Housing Board, which meant that the housing subsidies were not forthcoming. Initially this caused huge delays with providing funds for the supply of plumbing materials for the wet-cores, which subsequently delayed the plumbing training and plumbing.

This under performance subsequently led to the undermining of the community committee and the collapse of the housing project. With this collapse, the incumbent committee and the community subsequently rejected all development it associated with the previous regime and housing developer. Included in the manifestations of this problem was that the staff associated with the Shallow Sewer project was and still is barred from site.

5.3 Limitations

It was unknown whether there were sufficient sewer connections to properly evaluate the system as a method of conveyance. At Briardale most of the houses that were built were connected to the sewer system, which may be sufficient to draw conclusions about the system in some condominiums. However at Emmaus there were so few connections that it is unlikely that any conclusion could be drawn about the system.

6 Lessons Learned from the Implementation of Shallow Sewers

6.1 Project Management

An essential lesson learned from this experience was that, besides requiring extensive participation by the community in the installation and maintenance of the system, this technology also requires extensive support and participation by the service provider. It was realised that community project management required that sufficient resources be allocated until the community was able to manage. Perhaps this is specific to the South African context where communities require more guidance and motivation than South America, for example. In this instance, it may have been beneficial to have drawn into the team other municipal departments dealing with the housing, treasury and others to ensure an integrated approach to development of the area as a whole.

In South Africa for a project to succeed it is better to spend sufficient time and effort in the early stages on understanding the community needs, getting their commitment and providing the necessary training and capacity. But once that is done it would be better to get in and complete the project as quickly as possible to prevent delays. If the groundwork had been done well, many of the delaying issues would become irrelevant once the system was operational.

6.2 Management Problems

This occurred due to an unfortunate combination of circumstances in the project management, for which no particular party was to blame. It was, however, a major problem for the project that all parties had moved their direct site management off the Shallow Sewer project from November 2001, with ad hoc visits and meetings thereafter, leaving the communities without the ongoing day-to-day support that would have assisted in resolving their problems.

It is recommended that, to minimise problems, the same project team should be maintained throughout, if possible, to provide continuity. As soon as the players change those who take over do not understand exactly what training and education has taken place and to what extent, or what issues the development has been built on. Reports cannot capture or replace the experience in social interventions.

6.3 Lessons learned about Community Participation

The social intervention is a very important component of the Shallow Sewer methodology. It has merit in that it builds capacity in people to enable them to undertake development for themselves. A tentative conclusion drawn from this research was that people had fewer complaints about their services, even when experiencing difficulties, because of the social component of the Shallow Sewer intervention. This was demonstrated in the report on quality of life and customer satisfaction, (Appendix C) where fewer general complaints were received from people living in Shallow Sewer communities than from those in the control areas with conventional waterborne sewerage.

The Shallow Sewer methodology expects that the people involved will provide their “sweat equity” labour free of charge. This does not seem to be feasible in South Africa. An attempt was made to get the communities to work free of charge but this was refused. BESG (1) reports that all five communities, scanned for suitability in the pilot study, indicated that they would expect payment for their labour.

The social intervention failed in many ways due to the management of the project. No matter how good the methodology was in building capacity in people, there were financial and technical limitations that the community could not overcome without support.

6.4 Condominium Management

Generally in both communities it was found that the condominium (Iqoqo) leaders did not continue to manage the condominiums well over the entire research period, although there were exceptions to this at Emmaus.

At the start of the project, immediately after the workshops, it seemed likely that both communities would use the condominium structures to manage not only the Shallow Sewer system but also other affairs, such as community finances at Briardale. However as time progressed and there was little on-going social support, management by condominium seemed to have lost popularity and fade as a mechanism. There was a particular difficulty at Briardale as the entire community was not already settled there and consequently communication and education did not always reach all those concerned.

6.5 Selection of Communities

The choice of community is important. Both communities selected turned out to be poor choices for Shallow Sewers because of interfering circumstances. Shallow Sewers may not be suitable for green fields developments where the full community is not present. The whole community should be available to participate in all stages of the intervention from establishing agreements, planning and design through to maintenance.

Thus for green fields it may be preferable to install the infrastructure through contractors.

6.6 Revise Methodology for Community Dynamics

In this pilot study community issues and dynamics affected the social intervention to such an extent that it was concluded that this aspect requires far more attention in South Africa than it was given. Communities should be investigated in sufficient detail to be able to predict the changes that the intervention will impose on the community. The social scan was insufficient to provide this degree of understanding. The type of changes that occur are additional stresses on the leadership, such as ensuring that roles are allocated to community members and that allocated tasks are undertaken, that any conflict is resolved and that obstructive people who hamper progress can be dealt with.

Community dynamics plays such a significant role that it was suggested that it be catered for, as an additional category that should be developed in the methodology for South African communities. This should address the management of change and deal with the various power plays, leaders and other motivators.

6.7 Political Influences

Certain influences are beyond the control of implementing team. This was highlighted when the project team did not foresee the potential impact of a new councilor who was not made aware of the details and objectives of the Shallow Sewer intervention. In this instance the local government elections, occurred during the project. One of the prospective councilors made promises of providing free water and sanitation that was taken to include the cost of connections and wet cores. This seriously undermined the tenets of the intervention. Even if the project team had foreseen the problem in advance, it is unlikely that they could have done much to influence the impact on the project. This illustrates that there is no mechanism in the political system to deal with political promises that do not align with mainstream understanding or the tenets of the project.

6.8 Housing and Service Delivery Process

The project team anticipated that the Shallow Sewer intervention would be ideal at Briardale because of the background of the people and their willingness to participate in their own development. However the slow housing delivery process thwarted the enthusiasm at Briardale. The subsidies were not approved during the research period and the housing project ran out of funds. Consequently many people who continued to live in shacks on their plots felt marginalised being deprived of housing, water and sanitation. In addition the planning issues had delayed the delivery of roads, street lighting and electricity provision, which caused further dissatisfaction in the community. This background was not conducive to the success of the Shallow Sewer intervention.

6.9 Successes

The part of the intervention dedicated to health and hygiene awareness education provides substantially more than that. The social consultants (LIMA) undertook a series of workshops with

the communities that, in addition to health and hygiene training, also focused on communication, identification and solution of one's own problems, community development and working together to benefit from pooling their skills and intellectual capital.

In spite of all the difficulties, it appeared the system was operating reasonably effectively from a physical point of view and there was evidence that knowledge transfer on the operational approach took place. However, the lack of capacity, knowledge and "understanding gaps" resulted in the approach to management of the scheme being reactionary with residents merely reacting to problems as they arose rather than being pre-emptive.

The study showed that Shallow Sewers can provide all the convenience and benefits of waterborne sanitation at half the capital cost of conventional sewers and that they may even compare favourably with the cost of pit latrines. (See Section 7.1)

The Shallow Sewer System may be an excellent sanitation solution to providing a "water and sanitation package" to South African Communities. However there are legal issues to be resolved before this becomes a viable option for service providers.

One of the features of this technology lies in the social development of the communities. To achieve this, requires knowledge and dedication on the part of the implementing agency. Key issues to the sustainable operation of this technology are community participation, financial and institutional management, as well as clear, consistent political and leadership objectives and policies.

7. Research Findings from the Shallow Sewer Study

7.1 Capital and Installation Costs

Capital cost Comparison with Conventional Sewers and VIPs

Shallow Sewers can be installed at significantly reduced capital costs. The results of the evaluation demonstrated that Shallow Sewers could be installed at approximately 50% of the capital cost of conventional sewers, if the costs are "ring-fenced" to the site of the development (i.e. ignoring the capital costs of the bulk reticulation and treatment works).

The "on development project" capital cost of shallow sewers also compares favourably to that of VIPs: i.e. using the same ring-fencing of the costs as above, then the capital costs per household for shallow sewers is similar to that of a double vault VIP. The cost of the social intervention has been included in the capital cost for the shallow sewers, for the purpose of this comparison.

A breakdown of this exercise is shown in Tables 2 and 3 on the following pages.

Cost Considerations and Cost Comparisons

When considering the installation of sanitation systems to a community, the local authority considers both the capital installation costs and maintenance costs.

It has proved both costly and difficult for the Ethekwini Municipality to maintain pit latrines hence viable alternatives would be welcomed.

Cost comparisons between Shallow Sewers installed in this Pilot Study and a tenderer's price to install conventional sewers to the same communities, as well as two independent contractors' prices to install ventilated pit latrines and conventional sewers to low cost housing projects, have been made in Table 3.

The difficulty in comparing costs for sewers and sewering is that they are very site-specific. This can be seen from Table 2 by comparing the Briardale and Emmaus costs. Emmaus costs were much higher due to the steep and difficult terrain, which is compounded by the low number of sites at each community. The two contractors in low cost housing who gave information on their costs, which have been used in Table 3, would have not considered either Briardale or Emmaus to be economically viable. They both stated that 200 sites was the minimum number for a project to be economically viable.

The site-specific nature of sewering can be demonstrated by comparing the relative costs of Shallow Sewers to conventional sewers at each pilot site giving the result of 33.7% at Emmaus and 36.8% at Brairdale. This shows that the proportional costs are similar while the total costs vary greatly.

In order to compare like with like, the wet core costs have been rationalized for the different sanitation types and a superstructure cost equivalent has been added into the conventional and Shallow Sewer options to compare them with the separately housed pit latrines. However the improved level of service and convenience of having water borne sewerage that is housed inside the dwelling would favour Shallow Sewers over pit latrines.

The following cost comparisons have been extracted from Table 3, demonstrating that the cost to install Shallow Sewers up to the collectors is approximately 48% of the cost of conventional sewers and that Shallow Sewers and ventilated pit latrine costs are approximately equivalent:

- Cost to install Shallow Sewer at Briardale = R2914
- Cost of Conventional Equivalent at Briardale = R5618
- Cost of Conventional, on same basis, by independent contractor = R5198
- Cost of VIP*, on same basis, by independent contractor = R3000

*(The cost of VIPs refers to EWS experience confirmed by an independent Durban contractor, which includes an educational component cost, but excludes the cost of bulk infrastructure provision).

The Ethekwini Municipality pay for the additional off site costs to service areas that they wish to develop and the on-site sanitation costs are taken from the PHB subsidy (with top up if applicable). Hence the Shallow Sewer costs, being approximately 50% less than waterborne, must be attractive in the scheme used by Ethekwini Municipality Housing and Planning departments. The question would be the maintenance costs and any on-going social costs, which, as yet, have not been quantified.

The main cost savings come from lower material costs, savings in plant, labour and supervision and includes the additional social costs. Maintenance costs and any on-going social costs to the service provider have not yet been quantified because the Ethekwini Water Services did not take over the running of the project during the study period.

The pilot study demonstrated that installing Shallow Sewers instead of conventional sewers might save 45% to 50% of the on-site capital costs, and that there is little difference between the capital costs of VIPs and Shallow Sewers, apart from the reticulation costs to remove the effluent from the property.

TABLE 2: SUMMARY OF COST SAVINGS BY INSTALLING SHALLOW SEWERS

Costs as of November 2000

EMMAUS			
No. of Households	**96**		
	Conventional	**Shallow Sewerage**	**Savings**
1) Survey, Design and Drafting	R 58,018	R 58,018	0.00%
2) Contract (*)	R 635,945	R 98,383	84.53%
3) Contract Administration/Supervision	R 60,000	R 24,682	58.86%
4) Social Intervention		R 127,620	
TOTAL	R 753,963	R 308,703	**59.06%**
Collectors			R 356,680
Cost per household (**)	R 11,569	R 6,931	40.09%

(*) Refers to the construction contract for the conventional and material provision for the Shallow Sewerage
(**) Including collectors

BRIARDALE			
No. of Households	**157**		
	Conventional	**Shallow Sewerage**	**Savings**
1) Survey, Design and Drafting	R 47,540	R 47,540	0.00%
2) Contract (*)	R 539,200	R 94,921	82.40%
3) Contract Administration/Supervision	R 55,000	R 24,682	55.12%
4) Social Intervention		R 127,620	
TOTAL	R 641,740	R 294,763	**54.07%**
Collectors			R 243,058
Cost per household (**)	R 5,636	R 3,426	39.22%

(*) Refers to the construction contract for the conventional and material provision for the Shallow Sewerage
(**) Including collectors

TABLE 3: COST PER SITE (RANDS) TO INSTALL SHALLOW SEWERS COMPARED WITH CONVENTIONAL SEWERS AND VENTILATED PIT LATRINES

Data from the table of costs reported by M Vargas **(Table 2)** has been extracted and manipulated to enable a comparison of similar cost elements for the sanitation options shown below:

	Materials, labour and supervision **Rands**	Social intervention **Rands**	Internal reticulation, and wet cores **plus** superstructure equivalent **Rands**	**Total** **Rands**	**Savings by using Shallow Sewers** (Compared with **Briardale** cost)	Comment
Shallow Sewer Briardale (157 sites)	762	819	Allow 800 plus 533	**2914**		Cost excluded wet core costs and internal reticulation costs, hence to compare with independent contractor costs, R800 has been added for internal reticulation, toilet, and shower. At Briardale actually spent R2000 on wet core but this gives an unequal comparison as they purchased superior baths, hand basins and kitchen fittings
Shallow Sewer Emmaus (96 sites)	1281	1329	Allow 800 plus 533	**3943**		
Conventional Sewer Briardale (157 sites)	3785	500	Allow 800 plus 533	**5618**	**48%**	
Conventional Sewer Emmaus (96 sites)	7249	500	Allow 800 plus 533	**9082**	**57%**	
Ventilated Pit Latrine Ethekwini Municipality	2300 (Excludes supervision, transport costs)	500	N/a	**2800**	**-4%**	Includes hole, toilet and top structure (Savings compared with Briardale Shallow Sewer cost)
Ventilated Pit Latrine Independent contractor, (minimum 200 sites)	2500	Not done, allow 500	N/a	**3000**	**3%**	Includes hole, toilet and top structure (Savings compared with Briardale Shallow Sewer cost)
Conventional Sewer Independent contractor (600 sites) (minimum 200 sites)	3365	Not done, allow 500	Allow 800 plus 533	**5198**	**44%**	Includes external sewerage, internal reticulation, toilet and shower (Savings compared with Briardale Shallow Sewer cost)

NOTES:

- Excludes water costs of reticulation and connection; collectors and off-site costs; and survey, design and drafting costs.
- Briardale and Emmaus costs at November 2000, other costs at June2002
- The amount of R800 for internal reticulation and wet core was the amount used in the conventional sewer project shown and the same amount was quoted to install basic wet cores at Briardale, although the community opted to pay extra for more up market products
- The amount of R533 was allocated to give a superstructure equivalent of $2m^2$ used for a toilet of a 30 m^2 dwelling costing R8000 (which is the PHB allocation)
- The social intervention costs for Shallow Sewer were also set up costs to produce the training materials and would be lower if the exercise was replicated.

Costs saving comparisons were made with the Briardale costs because 157 sites is closer to the minimum number of 200 sites needed to make a low cost project economically viable

7.2 Subsidy and it Implications for Shallow Sewers

The Provincial Housing Board (PHB) Housing Subsidy Scheme is the primary housing assistance measure provided by the South African Government to help households to access housing with secure tenure, at a cost they can afford, and of a standard that satisfies the minimum health and safety requirements.

A system of milestones was established in the PHB housing process to ensure that public funds are utilized and paid out only as and when value has been created. However an applicant may propose how to allocate the funds, according to these milestones, in the negotiation stage. Once this is agreed upon the applicant is committed to a contract that is no longer flexible. The Provincial Housing Development Board considers applications with the view to ensuring successful implementations that do not face adverse cash flow consequences.

Flexibility of the Subsidy scheme in relation to the implementation of Shallow Sewers

The results of this research conclude that there is sufficient flexibility in the administration of the subsidy scheme to accommodate the steps of the Shallow Sewer intervention.

Potential risks to the developer, the PHB and the customer

The following risks were identified for consideration:

- Upfront costs of social characterisation would still be incurred in cases where it was decided not to proceed with Shallow Sewers. The PHB subsidy system makes it possible to access an extra R575 per site for social facilitation on the basis of not having to repay this amount in such cases.

- When utilising PHB funding, developers are responsible for ensuring that houses are built to a satisfactory standard, upon which a housing scheme becomes part of the city's responsibility. The same would apply in the case of installing Shallow Sewers as the sanitation option except that the onus would be on the community to maintain the sewers within their own boundaries. If the community did not maintain and take sufficient care of the sewer as agreed, health risks and sewer blockages may occur. Although legal mechanisms exist in the form of agreements, in practice it is difficult to collect payment from a group.

- Developers or subcontractors appointed to undertake housing developments with Shallow Sewers can easily increase their profits by cutting corners on the social and educational intervention, thereby creating potential risks to the homeowner and the local authority. The system needs to be developed to ensure this does not happen.

The cost allocation of PHB funds to waterborne sanitation by using Shallow Sewer system should assist Ethekwini Municipality to install waterborne sewerage in preference to pit latrines to satisfy its health and maintenance policy. By doing this they should save on both capital and maintenance costs.

The findings indicate that the Shallow Sewer System can be implemented within the costs and timing constraints of the PHB subsidy system. There appears to be sufficient flexibility in the administration of the Provincial Housing Board subsidies to accommodate the steps of the Shallow Sewer intervention as described in the methodology used in the Ethekwini Pilot Study.

From this research no major obstacles could be foreseen, either time wise or cost wise, to PHB subsidy funding being used for a project that included Shallow Sewers as an alternative to conventional sewerage or ventilated pit latrines, provided that the Local Authority would foot the bill for the off-site reticulation of the sewage.

7.3 Legal Implications

Legal shortcomings and incompatibility between the Shallow Sewer technology and South African legislation were identified. These relate mainly to land issues, contractual issues and changes to the National Building regulations. In some cases there is legal incompatibility and in other cases

the legal solution would be prohibitively expensive.

Investigations undertaken by the Ethekwini Municipality Legal Department (Appendix E) showed that the legal mechanisms available are the same for both sewer systems and are not cheaper for the Shallow Sewer system. However the risks associated with installing Shallow Sewers are higher.

The situation may arise where the Municipality requires a legal mechanism to intervene and, in this case, it is recommended that "omnibus servitudes", in favour of Ethekwini Municipality, be put into the plan prior to approval. The omnibus servitude allows flexibility and Shallow Sewers may be expected to follow new, unplanned routes over a period of time. Once the area was stable, these could be replaced by fixed servitudes, parallel to boundaries, if required. There are costs to register servitudes but these may be managed if undertaken during the formalisation of lots.

It was proposed that the findings of this report be used as the basis of wider research initiative to find a legal solution for implementing Shallow Sewers and other novel, appropriate technologies in South Africa. So as to be cost effective, this process should be taken forward by a multidisciplinary team through a university. Legal models should be investigated to accommodate the range of "Shallow Sewer type" technologies in terms of ownership and servitudes (or similar). (The interdisciplinary approach would be particularly useful in this regard). The scope of such research could include other technologies with similar legal issues, such as (ventilated) pit latrines.

In light of the high cost of time of people in the legal profession when acting in a commercial basis it was suggested that this team be invited to proceed with further investigations into the aspects mentioned above in terms of the Shallow Sewer system.

7.4 Technical Evaluation

- **Pipe Diameters**

  At the head of a sewer pipe the mechanism of solids transportation is one of "hop and settle" as the slugs of flushing volume passes the gross solids. In essence the solid blocks the sewer allowing the sewer to fill behind the solid. This has two effects, firstly the hydrostatic pressure builds up behind the solid and, secondly, as the solid is submerged it becomes more buoyant reducing the frictional resistance. While the lateral pressure is greater than the frictional resistance the solid will migrate down the sewer until such a time that the flushing fluid has passed the partial obstruction. Therefore from a hydraulic conveyance point of view the smaller pipe diameters used should facilitate the movement of waste through the system, as the volume of water in a smaller pipe will provide more lifting and carrying potential.

  However, there were some concerns raised about the diameters of pipes used. The technical team assured the community that the pipe sizes were adequate provided that the correct wiping materials were used.

  Prior to the intervention, only 50% and 33% of Emmaus and Briardale residents respectively made use of toilet paper only as a wiping material. The balance used a combination of other materials that may be less suited for use in a waterborne system (5). After much emphasis was placed on stressing the use of toilet paper as a wiping material during the implementation of the project, later results showed that most people were using a combination of toilet paper and newspaper. This is the reality for poorer communities in South Africa and all sewers for such people should accommodate the use of newspaper, telephone book paper in addition to soft tissue toilet paper.

- **Inspection Chambers**

  The community complained that when they opened up the chambers there was debris collecting which smelled. However it is normal for sewage not to be evacuated at once causing some temporary sedimentation, which should be washed away with high peak water usage. Normally this would not be evident to the user, as it was in this case, because manhole lids should have been sealed using a weak concrete mix to secure the chamber lids, which would

have prevented residents inspecting the chambers regularly. Inspection chambers should be opened only when there are problems, thus avoiding unnecessary smells and health risks.

- **Grease Traps**
  Complaints of smelling grease traps at Briardale were found to be caused by some construction and plumbing faults with certain grease traps. Some grease traps that were poorly constructed and leaking on to the ground caused bad odours and mosquito breeding. These faults should have been recognised by the implementing team and the community should have been assisted to rectify problems they were unable to solve alone. However EWS and WSSA decided not to intervene in an attempt to evaluate the extent of the social support required.

  During the design phase, the Project Manager insisted that easily accessible grease traps for the collection of oils and fats from the kitchen be installed such that householders could identify and clean blockages with minimum effort. However, the experience suggests that South African residents would prefer a closed system such as that used when building to the National Building Regulations, whose standards include a grease trap in the form of an “S-bend” which normally requires identification and clearing by a plumber

- **Blockages**
  In spite of all the shortcomings of the construction and management of the project there were not many blockages. Most blockages occurred on the condominial lines rather than the household lines. Ten condominial line blockages were recorded in total, five from each community. These were clearly caused by inspection chambers being left open thereby collecting debris, by mud from ingress of storm water and by building materials collecting in the construction process and through the poorly sealed pipe ends.

  The Briardale system had to be flushed out to remove debris consisting of building materials and sand. Once this had been done there were no further reports of blockages at Briardale during the research period, which was a further two months.

  There were only five household line blockages recorded in total, one at Emmaus and four in Briardale. Inappropriate wiping materials probably caused these, although two cases were attributed to steel wool and a facecloth.

- **Other Related Problems**
  Many other problems were raised that were not directly Shallow Sewer issues. These have been separated from the Shallow Sewer problems as they could also relate to other communities. These included internal plumbing faults where p-traps were not installed under kitchen sinks, allowing odours to permeate back up the pipes from the grease traps in the houses. There were several complaints of poor toilet flushing, low water flows as well as cisterns not filling sufficiently for them to flush properly.

  In one of the houses at Emmaus there was very low flow from the kitchen taps. On investigation it was discovered that this was a plumbing design problem related to using roof tanks. The roof tank had been positioned above the cistern for optimal use there but in a big house such as this there was very slow flow to the kitchen that was far away. It was found that communities view all related problems such as plumbing and water issues as part of the Shallow Sewer “package”. People who design Shallow Sewer systems should be aware of this.

- **Water Usage and Operation of the Shallow Sewer System**
  According to WRC Report (13), Shallow Sewer systems can typically be used without blocking due to frequent flushing and small diameter pipes with a low water usage. Successful operation has been observed with an average household usage of 25 litres per capita per day.

At Emmaus and Briardale the Shallow Sewer system has been installed to all houses and sites but the number of actual connections and usage of the system was low. Whether or not there is sufficient water flushing these systems is not known at this stage but it is likely that the condominiums with few houses connected could be at risk of blocking.

However if the number of people estimated to be using the system is related to the total water used by those households, then the approximations available from this research indicate that all condominiums have an average flushing in excess of 25 litres per capita per day. This result implied that blockages would not be caused at Briardale and Emmaus by insufficient flushing with water. However many households who do not have their own water supply, purchase water from those with water meters, hence it is difficult to estimate how much water actually enters the sewers.

It was unknown whether there were sufficient sewer connections to properly evaluate the system as a method of conveyance. At Briardale most of the houses that were built were connected to the sewer system, which may be sufficient to draw conclusions about the system in some condominiums. However at Emmaus there were so few connections that it is unlikely that any conclusion could be drawn about the system.

The results indicate that undue blockages should not occur due to insufficient use of water because the per capita volume use exceeds the requirement of 25 litres per day for the estimated number of people using the system.

The low connection rates prevented the evaluation of surcharges occurring due to the inability of the system to convey water at the flow rates generated by normal domestic use. At the rate of connection in the pilot study surcharging was infrequent and the known cases were attributed to other factors.

The potential for blockages was reported as a result of the use of unconventional designs and methods in the construction in the inspection chambers and grease traps. The condominial line blockages were directly attributed to the construction methods and design where there was ingress of mud, debris and building materials from open inspection chambers, grease traps and inspection chambers that were flush with the ground and unused pipe ends that were not properly sealed.

The designs of grease traps and inspection chambers should be reviewed in the light of the results of this study and community lack of enthusiasm to clean grease traps. Amendments to the design of the system may be necessary, once the quality and functionality of the system at Briardale has been assessed. If it is found that the communities are still dissatisfied with cleaning their grease traps consideration should be given in the design to make the task less onerous.

One of the most significant findings was that the Shallow Sewer methodology provides plumbing training to enable the community members to build their own sewers, fit wet cores and make sewer connections. It is highly unlikely that the standard of plumbing with this type of training could enable the community to undertake these tasks to normal building standards as required by the National Building Regulations. However funding for such projects would normally come from the PHB subsidies, in which process funds will not be released unless certain standards are met. Hence there may be a conflict with the Shallow Sewer methodology, as it stands, and the South African legislation for housing and the funding of housing.

7.5 Ability and Willingness to Pay

The aspiration for communities for high quality water and sanitation services coupled to the inability and unwillingness of people living in low-income areas to pay for these services is of major concern worldwide to service providers. From a potable water perspective, in urban areas, this problem has largely been resolved for Ethekwini's poorer communities where the Ethekwini Municipality is able to provide a semi-pressure system at a reduced cost.

The Shallow Sewer technology is installed as a "package" of water and sanitation services together and it was not attempted to separate them in this evaluation. The communities with Shallow Sewers pay for sanitation as well as for water in their monthly services account. The sewerage tariff for the "test" communities, Briardale and Emmaus was set at 10% less than for conventional sewerage.

Costs that are incurred by the communities supplied with Shallow Sewers include monthly water accounts and sewerage accounts as well as all expenses related to maintaining their system, including hiring outside help if required. Charges are made for water and sewerage only when the volume of water exceeds 6kl per month. Sewerage is calculated at 70% of the volume of water consumption.

Ability to Pay

Miguel Vargas quotes an unconfirmed World Health Organisation benchmark that the water and sewerage service bill should not be more than 8% of income. This benchmark was used to evaluate the ability to pay. 8% of income per each household was calculated, for communities with both shallow and conventional sewers, as a maximum payment for water and sanitation services.

According to another unconfirmed reference provided by EWS Water department, the World Bank proposes that for urban poor, the preferred figure of 4% of the household income be used as the threshold for affordability of water services (excluding sewerage). This figure was also used in the comparisons.

Ability to pay was evaluated using both 8% and 4% of the household income as benchmarks of affordability.

- Based on WHO benchmark of 8% of household income, 98.5% of people were able to pay their water and sewerage accounts
- Based on the World Bank's ceiling of 4% of household income, 92.3% of people were able to pay their accounts. Some of those whose accounts exceeded the 4% were selling water to their neighbours
- The above results demonstrate that, based on the unconfirmed WHO and World Bank benchmarks almost all of the Emmaus and Briardale community using the Shallow Sewer system could afford to pay for the service
- The category at risk of not being able to afford the system was those whose monthly income was less than R300 per month

Running costs, i.e. basic repairs etc, could not be quantified adequately because the system was not fully implemented hence this evaluation should be made later. The average monthly costs are not expected to be high but occasional high, once-off costs may be difficult for individuals to meet.

The amount of water required per capita for the operation of the Shallow Sewer system (25 l per person per day) was also found to be affordable and within the subsidised quota, for an average number of 5 persons per household.

However this position would change dramatically should the 6kl per month subsidy fall away. The actual value of the 6kl subsidy for water and Shallow Sewers was R22.24 and those that used 15kl would be charged R56.79 without the subsidy. In that event the percentage of communities that would not be able to afford the service would increase to 21.5 % and 47.5% respectively.

Willingness to Pay

The actual payments made per household were compared with the ability of that household to pay and by establishing whether the account was in arrears or up to date.

Willingness to pay was evaluated by comparing the ability to pay with actual payments made as well as conducting surveys of the householder's perception of satisfaction and value for money. If the account was in arrears by more than two months but they were able to pay according to the WHO benchmark of 8% then this would provide an indication that they were not willing to pay.

It is recognised that this is a simplistic view of the subject but that further investigations were beyond the scope of the study.

65% of households at Briardale and Emmaus were up to date with payments indicating that most people were willing to pay for the service. Only 6% of all households exceeded R100 in arrears.

There did not appear to be any correlation between non-payment and satisfaction or good value. Most of households were satisfied with their Shallow Sewer sanitation and said it was good value for money. However those that were up to date with payments expressed greater dissatisfaction than those who had not paid. This may indicate that those who have paid feel more free to express their views. It is notable that in the category that was up to date with payments, the 23% that were not satisfied with Shallow Sewers did not say they were not good value for money. Only 2 households out of 48 in both categories said that the system was not good value.

71% of households with Shallow Sewers indicated that they were satisfied with them but only 4% said they were not good value for money, hence it was concluded that non-payment was not due to a negative perception of the value of the system.

Anecdote from an Emmaus resident

A widowed lady, who is able to afford to pay for water, has nevertheless kept her water consumption to below the free limit of six kilolitres per month. Having done this for approximately 16 months, she reported that she has been able to save a substantial amount of money. Prior to having her own water supply she collected water from the standpipe at the prevailing rate of R0.25 per 25 litres, i.e. at a cost of R60 for 6 kl. With these savings she was able to purchase building materials to add on two bedrooms for her sons. She was also able to take driving lessons, which she said she would not have afforded otherwise.

In addition she has persuaded her mother, who lives elsewhere, to use the semi-pressure system instead of the full pressure system that she was using. (We did not delve into this issue but presume that she is now using her roof tank to control her water usage as many people in other people by-pass their roof tanks illegally because they do not like them.) The result has been that the mother, who was previously spending R100 per month on her water bill, has free water and now does not have to keep asking her daughter for money for transport and groceries

The widow has told this to the Emmaus community, encouraging them to make good use of the free water. However some of the community cannot believe this could be true and say that she must have won the lottery!

Water Sellers and Bailiffs

Both test communities had problems with water supply at the start of this project. At Briardale there was only one standpipe for a whole community where houses were being built and water was needed desperately for building. At Emmaus the number of standpipes had been reduced from four to one or two due to non-payment by some of the bailiffs.

The shortage at Briardale was alleviated when water was supplied to approximately fifty houses as part of the intervention. The water bailiff then had financial difficulties when his account did not decrease even though demand and sales dropped. It appears that this hiccup may have been due to estimated usage for preparing the accounts or otherwise may have been due to a financial management error on the part of the bailiff. The community members with their own water supply would probably have been able to offer neighbours water at a reduced price thereby undercutting the official bailiff.

Similarly at Emmaus certain households began to sell water to their neighbours to make a living. One of those at Emmaus is believed to have run into difficulties paying the water account because of the inclusion of the sewerage tariff. This family since appears to have since stopped selling water.

It was concluded that affordability is not an issue based on the WHO and World Bank criteria. Based on WHO benchmark of 8% of income and on the World Bank's ceiling of 4% and the results from this study it appears that virtually all people in these income categories should be able to pay their water and sewerage accounts. Those who earn less than R300 were the only category that may not be able to afford it and these people have the option of free water and sewer supply by limiting their water usage.

It was found that people in all communities were generally satisfied with their sanitation systems. 86% of people with conventional sewers were satisfied with their systems, whereas 71% of those with Shallow Sewers were satisfied. This could, perhaps, be considered as a factor in willingness to pay the monthly Service accounts. However only by re-testing once the system has been in operation for some time will it be clear whether this increase in dissatisfaction was due to teething problems.

At present only the communities with Shallow Sewers actually pay directly for sanitation because those canvassed in the control areas should have been charged through their rates but, as their houses are valued at less the R30 000, they received 100% rebate. 27% of the test communities could not afford 15 kl water per month whereas if they were not paying the Shallow Sewer charge for sanitation, only 19% would not be able to afford it. (A poor household that has internal plumbing may have difficulty managing on the 200 litre free quota per day and would be more likely to use around 500 litres per day (15 kl per month) if they were trying to limit their consumption. This is deemed by Ethekwini Water Services to be a comfortable usage for such households).

It was found that 74% of households in Briardale and Emmaus over the period of study limited their average water usage to 10 kl per month. (45% of households used on average 6 kl or less per month).

It was found also that 78% of households should be able afford running costs but have not connected at Emmaus because of connection and wet core costs.

From an administration point of view the municipality concerned, needs to consider a system that can cope with the small group of people that cannot afford to pay for the Shallow Sewer (or other) system. Within a community there will always be a small group that cannot pay and for whom a management strategy is required.

7.6 Quality of Life and Customer Satisfaction

The results of two surveys that were undertaken to compare the responses of people using Shallow Sewers with those of people using conventional sewers are recorded below.

Conventional and Shallow Sewers were both received favourably by the communities surveyed. 86% of households surveyed in the communities, Nazareth and Riverdene were satisfied with their conventional sewers and 92% said they were easy to maintain. By comparison 71% of households surveyed in the communities, Briardale and Emmaus were satisfied with their Shallow Sewers and 77% said they were easy to maintain.

More people with shallows sewers perceived the benefits of improved status and increased value of property than their counterparts with conventional sewers.

The other satisfaction indicators measured, ease of use, savings in time, improved health, and convenience were similar for both conventional and Shallow Sewer communities. All communities agreed that there were savings in time by having waterborne sanitation but found it difficult to quantify.

100% of people interviewed stated that their health was improved by having the Shallow Sewer system. Only one householder said in the second survey that this was not the case.

After using the Shallow Sewer system for a ten-month period, slightly fewer people said that they were easy to use and maintain or that they were good value for money. This was while they were having teething problems

The following changes in the perceptions of people using the Shallow Sewer system since they first connected (2000-2001) and mid-2002 were recorded.

Positive responses increased from

- Convenience: 82% to 97% and status: 53% to 91%
- Value of property: 71% to 85%
- Savings in time: 94% to 97%

The following minor negative changes were recorded:

- Ease of use: 88% to 85%
- Ease of maintenance: 83% to 79%
- Good value for money: 71% to 67%

Probably the most significant result was that satisfaction of people with the Shallow Sewers, who were re-interviewed, increased from 59% to 76% over the ten-month period in spite of the teething problems that were being experienced at the time of the second survey. During this time the neutral and negative responses dropped from 41% to 24%.

These positive trends may have been influenced be the training and education provided. Throughout the period November 2000 to November 2001, Water and Sanitation Services (WSSA) provided a staff presence for regular liaison and assistance. During this time ten community members were given intensive plumbing training for seven days to provide skills to the community.

It was interesting to note that such high percentages of householders were satisfied with their systems in spite of the teething problems and the general housing problems at Briardale.

Households in Briardale and Emmaus used substantially more water after the Shallow Sewer intervention but paid less for it.

It was notable that significantly more householders with conventional sewers (78%) had additional complaints about water and sanitation than those with Shallow Sewers (38%). This may be a direct consequence of the training and depth of social intervention employed in the Shallow Sewer methodology.

The leading complaints in both controls and test communities were that water/rates/toilets were too expensive and that they had structural problems, such as sewers being too close to the house, that toilets were outside (controls only), that pipes were too small and that they experienced low water pressure and leaks.

The Shallow Sewer system overall appears to be a promising alternative to conventional sewers in terms of providing customer satisfaction and improvement in quality of life, although the indicators

of satisfaction and ease of maintenance should be reviewed to confirm this, once the housing problems have been resolved.

7.7 Social Evaluation

Rules and Agreements

Some understanding of the agreements to maintain the systems existed in both communities and most of the principles of the agreement between the community and EWS were recognised and to a degree were adhered to. It was found that the communities administered the Shallow Sewer system in an extremely informal fashion.

At Briardale there was clearly a widespread lack of understanding regarding legally binding agreements, in particular, the consequences of the scheme being declared a failure. If community members knew that VIPs would be installed as a consequence, the incentive to ensure the success of the scheme may have been greater.

It was verified that there was no understanding of the sewerage tariff. The 90% who said they had not received a bill or were not connected, also had no understanding of the sewerage tariff. There was also extremely limited understanding of the water tariff (5%).

Perceptions at Emmaus

The implementation did not materialise as planned, with few connections being made by residents to the Shallow Sewer. The vast majority of residents surveyed, however, were positive towards the system and that 90% would connect if they had the opportunity. Financial constraints were preventing 75% from doing so.

Although there was disagreement about the water supply at Emmaus, only 10% said the reason for not getting a water connection was that they did not like the semi-pressure system. 69% said they could not afford the connection fee. As far as dealing with faults was concerned it was encouraging that, in spite of the low connection rate, 78% of interviewees had received Shallow Sewer training and 80% understood what was involved.

The overall picture presented by all the data was that the people of Emmaus understood about the system and were capable of installing and maintaining it.

Faults Handling and Maintenance Skills

An important maintenance issue was that the communities were not looking after the inspections chambers satisfactorily, especially at Briardale. There were several cases of lids going missing or being damaged, usually by passing vehicles through sewer areas, which were not designed to accommodate such traffic.

In spite of difficulties that arose, the condominiums were able to identify and solve most problems although in some cases the response time was not acceptable. Communities followed the agreed systems of dealing with faults, but no written reporting or recording was undertaken. No formal management or administration procedures were in place in any condominium, nor did formal meetings of condominiums take place on a regular basis. Recognised chairpersons managed the condominiums by being communication links and ensuring that faults were attended to by means of maintenance equipment that was kept safely in the communities. On occasions external parties were called in and paid for by the community to assist with difficult problems.

The Emmaus community was surprisingly positive and responsible even though there was little intervention after the initial training. The community seemed pro-active in maintaining their system, whereas at Brairdale they gave up on resolving their problems and complained that they no longer were interested in the Shallow Sewer. If access to funds (i.e. micro finance) was made available to the 90% of Emmaus households wanting to connect the Shallow Sewer, the system at Emmaus should prove to be a success.

Tenants

Results indicated that tenants had a very poor understanding of the Shallow Sewer system and that negligible transfer of information had taken place.

Recommendations

In addition it is recommended that future projects consider the following:

- Carefully evaluate the community situation to ensure that the project will be financially viable and sustainable
- Understand the community dynamics in sufficient depth to be confident that the community is truly ready for such a project
- Ensure that external parties with influence over the community are identified, educated and monitored
- Establish an overarching development committee, drawing in all parties involved with the development of housing, services, health, treasury and regulation to co-ordinate and monitor all development of the area, ie a holistic management approach.
- Re-evaluate the Shallow Sewer methodology in terms of community dynamics

8 Discussion on Shallow Sewers and Relevance to the South African Environment and the Ethekwini Experience

The Ethekwini Shallow Sewer Pilot Study produced a wealth of information about the Shallow Sewers and service provision to poorer communities.

8.1 Benefits of Shallow Sewers

Although some aspects were not directly measured in the research, experience on this project has shown:

There are potentially substantial benefits for “Shallow Sewer type” systems.

- Shallow Sewers can be installed at significantly reduced capital costs
- They allow easy access into confined spaces where it is impossible to install conventional sewers and on-site systems are likely to fail
- They are able to deal with wastewater from an unlimited water supply to small sites whilst allowing for a wide range of operational flows
- Their provision ties in well from the PHB subsidy system, both in terms of timing as well as allocation of monies for sanitation.
- From a technical perspective, there is no apparent reason why Shallow Sewers should not function as well as, nor provide the same level of service to the customer as conventional ones. In addition the smaller diameter should provide better solids transportation than conventional.

8.2 Drawbacks of Shallow Sewers

The following primary drawbacks were noted for the South African context:

8.2.1 Social

- There is a mismatch of the Shallow Sewer methodology of community “self help” approach vs. community expectation of “government will provide”
- There is a mismatch of the political expectation of a high service delivery rate which conflicts with community development / upliftment which implies community controlled rate of delivery
- The wide range of affordability and expectation within a single community makes delivery of a uniform service to a community difficult.

8.2.2 Legal

There are legal issues to be resolved before Shallow Sewers can become a viable option for service providers. These include:

- Community ownership of the common sewer line is in conflict with fundamentals of land tenure principles
- There are contractual difficulties with indigent people. Frustration arises from a lack of enforceability of obligations imposed contractually on indigent parties who, due to lack of financial means are unable to fulfill these obligations.
- Conflicts currently exist with the National Building Regulations

8.2.3 Technical

A number of potential technical disadvantages were identified:

- Due to the small dimensions of the access chambers relative to the size of bends and T-junctions. This requires very accurate positioning of the inspection chambers over these appurtenances in order to provide sufficient space for radii. The knock-on effect of this is that should formal blockage clearance equipment be engaged to remove blockages there may not be sufficient space for access
- The transfer of expertise to new homeowners, i.e. those that were not there during the implementation phase, remains a challenge
- A situation may arise in relation to payment for expert help that may be required to remedy occasional problems. The meeting of expenses by the condominium for services to the Shallow Sewers will always present a challenge in an indigent community.

On-going education and liaison with the community is likely to be required to ensure that the service provider's operational standards are met. This could be onerous on the service provider, especially if the service provider is not structured for community service provision

8.3 Plumbing Standards and Appurtenances

Poor plumbing standards in the houses have caused problems, which the communities have perceived to be associated with Shallow Sewers. The National Building Regulations may need to be revised along the lines of a minimum requirement for economic, self-help applications.

Further, when reduced depth and standard sewers reach the point of being implemented on a mass scale it will be necessary to review the menu of appropriate appurtenances, and where necessary redesign the existing appurtenances to accommodate Shallow Sewers. For instance, the depth that the Shallow Sewers are laid precludes the use of standard gullies. It is anticipated that should the production volumes of these appurtenances warrant, the commercial opportunity will fulfil this need.

8.4 Selection of Communities

The choice of community is important. Both communities selected turned out to be poor choices for Shallow Sewers because of interfering circumstances. Shallow Sewers may not be suitable for green-fields developments where the full community is not present. The whole community should be available to participate in all stages of the intervention from establishing agreements, planning and design through to maintenance.

Thus for green fields it may be preferable to install the infrastructure through contractors.

Criteria need to be developed to assist in determining whether communities are "ripe" for development. From the experience gained on this project, it is apparent that better assessment than is generally done at step 1, (Institutional and Community Arrangements), of the La Paz model, is needed. The depth of investigation needs to go down at lest one level below that which is done at present. For instance, it is more valuable to know why a previous intervention was successful than it is to merely know that it was successful.

8.5 Mismatch in Philosophy and Expectation.

The experience on the Ethekwini pilot indicates that there are a number circumstances present:

- In the make up of the communities
- The way the Local Authorities are structured from a service delivery perspective,
- Inconsistencies in the political and community expectations, that suggest that, at present, the implementation of Shallow Sewers according to the full La Paz model are not likely to be accepted or sustainable in the vagaries of community politics.

8.5.1 Community Diversity.

Ideally consideration should be given to the different strata in the customer base and levels of service offered should be appropriate for the customer who is paying for the service, implying different levels of service for each local enclave. However in reality this is uneconomical and impractical as diversity of income and social circumstances within the Ethekwini communities is large.

In societies that have long histories of adequate service provision, communities have naturally evolved to the point where each community has uniform expectations and these are consistent with the services that are provided in that specific community. If an individual's circumstances (affordability and expectations) are different from that standard he/she generally migrates to areas with service levels appropriate to his/her circumstances.

In the Ethekwini communities this uniformity has not developed, and only limited migration occurs. It is surmised that the affluent portion of the community which are dependent on the community for their status (both socio-political and economic) do not migrate from the community. From a social

management perspective this is desirable as it maintains the economic and organisational base of communities, which could otherwise degenerate into abject poverty. However, from the service provision perspective this is problematic as it makes meeting the expectation of this diversity impossible or at least uneconomical. For this reason it is apparent that an autocratic approach to level of service is necessary. In determining this authoritarian "Package" the level of service needs to be affordable and acceptable to the vast majority of the community in order to be sustainable.

8.5.2 Time Basis vs. Community Based Management

The measurement criteria, used to determine the delivery of services, are often based on the rate of delivery. In general, this mode of measurement conflicts with the implied measurement criteria for community based service delivery, which are generally related to issues of community upliftment. The speed at which communities can and are uplifted in community based projects, are generally determined by the community circumstances. Time related contracts therefore tend to be in conflict with community based service delivery.

Authorities should be conscious that time related budgets such as the annual budget structure of local authorities and other government departments, conflict with community based service provision. This also applies to political expectation of a time related backlog catch-up program that includes community and social development.

8.5.3 Institutional Management

The key to success in this technology is the social intervention, which requires knowledge and dedication on the part of the implementing agency. This research may have gone some way to understanding the market, or at least providing guidance for further investigations. It was clear that this type of project requires significant social intervention from the implementing agency on a continuous basis. Technical support and training need to be maintained until the community is capable of running their system with minimal assistance.

Community based management systems and philosophy needs to be embedded in the corporate culture in order to provide community based service provision. Aspects, such as implied by sections 8.6 and 8.7, should form major structures within the management structure. Management should be non-hierarchical encouraging participants from different disciplines to work together on an equal footing. This implies an interdisciplinary approach, as opposed to the multidisciplinary approach, (Appendix J). This approach aims to produce integrated solutions and plans considering the connections and interactions among technical, managerial, political and social elements of the situation. All professional disciplines necessary to undertake community based service provision, including water, wastewater, social, legal, housing and health representatives, should be incorporated to work as an interdisciplinary team. This implies that a single department with all this expertise is necessary, and from this department appropriate teams are constituted for each project.

Most of the established local authorities historically have been structured to undertake rapid contract based service provision. Community based service provision requires not only major changes in management structures but also a change in philosophy. None of the larger local authorities have actually embraced the change in philosophy and structure yet, although some have made token gestures in this direction.

8.6 Shallow Sewer Management Models

From the WRC Report (13) it is apparent that there is a range of implementation and management models for reduced standards Shallow Sewer type system. The technology ranges from traditional Shallow Sewer, as represented by the La Paz model, where the community "own, operate and maintain" the sewer, to what would amount to a reduced standard conventional sewer. The reduced standard sewers allow for reduced diameter, shallower depths and relaxation of other appurtenance standards, but are owned and operated by the local authority.

Assuming that, in the interim, rapid service delivery is the priority, it must be concluded that a "South Africanised" sanitation system must be developed to maximise the benefits and minimise

the drawbacks of Shallow Sewers. This implies a system of reduced standard sewers, which are owned and operated by the local authority rather than the Shallow Sewer system as envisaged by the La Paz implementation model.

If these sewers are laid in “standard width” servitudes, parallel to property borders, and which are registered when the property is registered, a number of the legal and social issues will disappear.

Should circumstances change as implied by section 8.5, then a Shallow Sewers implementation model based on the La Paz model would probably be more appropriate than the reduced standards sewers as discussed here.

8.7 Holistic Approach to Social Interventions

The social aspect is much wider than Shallow Sewers. It is proposed that the lessons learnt from the Shallow Sewer pilot study could equally apply to improve the success of other community development projects.

A more holistic approach to social interventions should be considered. The social implementation of the Shallow Sewer methodology is fairly complex and is certainly not specific to Shallow Sewers or even sanitation. It has become obvious that many departments within the Ethekwini Municipality as well as many Government departments already provide various types of social intervention and upliftment as part of the implementation process of other service provision.

Nationally, social interventions appear to be taking place in an uncoordinated and fragmented manner. Using a service provision intervention to educate and uplift communities is a laudable and achievable ambition. This should hopefully enable them to mobilise and empower themselves to undertake self-development. However a coordinated, holistic approach with a uniform methodology is required. Within these community based service provision methodologies there seems to be a core of similar methodologies of which Shallow Sewers is but one. These need to be evaluated and, if necessary, modified to include the best aspects of all the methodologies to form a single methodology that will form the core for the social intervention for all service provision.

The La Paz model is fundamentally a good one and has some powerful attributes such as:

- The modularized format, and the logical sequence of development interspersed with “milestones” which provide a compulsory check on the process.
- It is robust and flexible in that it can be adapted to any type of development, and has been used for suburb beautification and crime fighting.
- It is educational and empowering and is compatible with self-help poverty alleviation strategies.
- The condominial subdivision is apparently valued by the community.

8.8 Issues Particular to the Ethekwini Pilot.

The small scale and local conditions of the pilot study may have influenced this project. These are highlighted below.

- The small scale of the project did not allow flexibility of timing for communities to resolve their issues.
- There was confusion in the minds of the community about the “package” of the options. In light of the people’s affordability, the full pressure water supply should perhaps not have been offered as an option.
- The training provided to the community was not always sufficient and required follow-up, which should have been done in a more controlled manner.
- Monitoring of the shifts in attitude should have been managed better, in particular the external parties with influence over the communities should have been identified, educated and monitored.
- At Briardale the management of the Shallow Sewers was inextricably linked to the management of the housing project and when that project encountered difficulties the community could not disassociate the two problems.

8.9 Long Term Benefits for South Africa

There is potentially enormous benefit to be gained from the implementation of Shallow Sewers, not only in the field of sanitation and health improvement but could also include poverty alleviation, education and other aspects of social upliftment.

Costs Comparisons with conventional sewers and VIPs

The pilot study demonstrated that installing Shallow Sewers instead of conventional sewers might save 45% to 50% of the on-site capital costs, and that there is little difference between the capital costs of VIPs and Shallow Sewers, provided that the capital cost of the bulk infrastructure is accounted for elsewhere.

Findings indicated that the Shallow Sewer System can be implemented within the costs and timing constraints of the PHB subsidy system. There appears to be sufficient flexibility in the administration of the Provincial Housing Board subsidies to accommodate the steps of the Shallow Sewer intervention as described in the methodology used in the Ethekwini Pilot Study.

From this research no major obstacles could be foreseen, either time wise or cost wise, to PHB subsidy funding being used for a project that included Shallow Sewers as an alternative to conventional sewerage or ventilated pit latrines, provided that the Local Authority would foot the bill for the off-site reticulation of the sewage.

9 Key Conclusions

From the discussion on long term benefits for South Africa it must be concluded that there are major benefits in providing either Shallow Sewers and/or reduced standard sewers. The two main benefits are the saving in capital cost and the provision of access to sanitation in communities where there is insufficient space for conventional sewers or on-site sanitation.

- From the discussion above it must be concluded that at this stage in the socio-political development of the country a shallow type, reduced standards sewerage system, which is owned and operated by the local authority and which is implemented in such a manner as to reduce the social disadvantages that arise due to South Africa's current stage in its historical development, must be developed. This reduced standards Shallow Sewer system should be developed and promoted as the "standard" or norm for low cost and high density subsidised housing systems with access to bulk sewerage systems. From the affordability studies it is apparent that the majority of the community receiving this benefit can afford the operating costs.

- Shallow Sewers methodology provides a systematic structured approach to a general community-based service provision with a number of special attributes such as the "milestones" evaluations. This methodology is compatible with community upliftment, and poverty alleviation. However this methodology can be improved and "South Africanised".

  There are a number of technologies with similar philosophies to the Shallow Sewer being used for service provision implementation in South Africa. The best aspects of these can and should be incorporated into a single methodology / social technology. The Shallow Sewer could provide a sound platform to build this technology on.

- There are two fundamental approaches to service provision: the "helter skelter" rapid construction approach and the community-based (possible "self help") service provision. The two approaches are mutually exclusive. The institutional management structures for the approaches are significantly different and it is extremely difficult to implement community-based service provision under a rapid "construction" based service provision. This implies that local authorities wishing to provide community-based service provision need to radically restructure themselves if they are currently structured for rapid construction, or have a legacy of rapid construction.

- There are currently serious inconsistencies in policies and philosophies in service provision in the country including:
  - Political wish for rapid service provision, but at the same time there is a political demand that there be community upliftment, social development and poverty alleviation.
  - There is a mismatch of the Shallow Sewer methodology of community "self-help" approach vs. community expectation of "government will provide"

  These unclear leadership goals are hampering the service delivery, as the implementing agents cannot easily identify priorities.

- Should the assumption that the priority is for rapid service delivery be incorrect and the priority is assumed to be community upliftment, then it is concluded that a "South Africanised" version of the La Paz model must be developed in accordance with the lessons and experience gained from the Ethekwini Pilot. In conjunction with this development the local authorities need to restructure to accommodate this community service provision. Likewise the political expectation of rapid service delivery needs to be adjusted.

10 Recommendations and Further Investigation

- **Develop clear policies**

Significantly clearer policies which will diminish the conflicts such as “community upliftment” vs. hardware delivery; “self help” vs. “government will provide” etc. needs to be developed, certainly at local authority level, but preferably nationally. In particular the conflict in policy between rapid service provision and community development must be resolved.

- **Development of a reduced Standard Sewer System**

On the assumption that the priority is for rapid service provision, it is recommended that a reduced standard sewer system, based on the technical advantages of Shallow Sewers, be developed and tested as soon as possible. This will provide technical advantages over conventional sewers while the provisions of the previous recommendation are being resolved.

The existing Shallow Sewers at Ethekwini could be used to pilot the system where appropriate.

- **Develop a range of Shallow Sewer Management Models**

Should the priority be to empower communities, then the Shallow Sewer methodology will need modification to accommodate the findings of this study before it can be installed on a mass scale in South Africa. Once the environment has been created interdisciplinary teams can work within that framework to develop a range of “Shallow Sewer type” technologies, using an integrated approach and the findings of this research. The development of the range must accommodate the range of community needs, aspirations and affordabilities.

- **Test the newly developed Management Models**

These proposed technologies that will have been developed especially for the South African social, legal and technical environments would need to be evaluated.

In parallel with the above developmental work further evaluations of Shallow Sewers should be undertaken at the existing pilot communities to provide data to draw conclusions in the longer term:

- Once teething problems have been rectified, an investigation in to the relationship of the quality of workmanship of community-trained “artisans” and the available appurtenances is required. This needs to be undertaken in relation to the National Building Regulations, taking note of whether these are issues relating to plumbing, water or sewers.

- Long-term studies on water requirements and transportation to establish the technical effectiveness in terms of the capacity of the system is required.

- Technological variations and / or legal models, to accommodate the range of “Shallow Sewer type” technologies in terms of ownership and servitudes needs to be developed. The interdisciplinary approach would be particularly useful in this regard.

- The existing Shallow Sewers at Ethekwini may provide pilots for the reduced standard sewer system.

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Appendix A

Capital Cost Comparison with Conventional Sewers and Pit Latrines

INCORPORATING

Provincial Housing Board Subsidy

July 2002

PROVINCIAL HOUSING BOARD HOUSING SUBSIDY

As part of the appraisal of the **acceptability** of the waterborne Shallow Sewer system (WSSS) to the local authority and to the user, the following hypothesis was made:

> ***The costs of the waterborne Shallow Sewer system are within that allowed for in the Provincial Housing Board (PHB) subsidy guidelines, and the timing constraints of implementing the waterborne Shallow Sewer system can be accommodated within the release constraints of the PHB subsidy system.***

1. Introduction to the PHB housing subsidy scheme and levels of sanitation service

The PHB Housing Subsidy Scheme is the primary housing assistance measure provided by the South African Government to help households to access housing with secure tenure, at a cost they can afford, and of a standard that satisfies the minimum health and safety requirements.

The subsidy is a grant made available to people who have not owned fixed residential property previously and who satisfy a range of criteria, including a maximum household income. The value of the subsidy granted depends on the category into which the household income falls. The maximum basic subsidy amount was increased from R16000 to R20300 in April 2002.

The normal subsidy amount may be increased by up to 15% to compensate for abnormal development costs arising from locational, geotechnical and topographical conditions.

The subsidy pays for land that must be serviced to the satisfaction of the local authority, upon which the house is built and transferred to the beneficiary. All costs of providing this package should be taken from the subsidy.

The minimum health and safety standards provided for in the subsidy scheme are gravel roads; v-drains, ventilated improved pit latrines or double vaults pit latrines and one tap per erf. If a higher standard is required then either the people or the council must pay.

Because the basic level of sanitation proposed by the Government, the ventilated pit latrine, is proving to be an inadequate solution to the provision of safe and healthy environments in densely populated areas, the Ethekwini Metro has a policy to eventually install waterborne sanitation to all its areas of jurisdiction, unless this proves to be impractical or too costly.

Hence, in some cases, the Ethekwini Metro planning departments may not accept the minimum standard of services when they are proposed for a housing development project that is to be funded by the housing subsidy scheme, if they fall short of its own minimum requirements, or are not in keeping with its service provision policies.

In such cases Ethekwini Metro may provide extra funds to top up the PHB subsidy when they decide to improve on the engineering services that they feel are inadequate, such as roads and storm water drainage, electricity, street lighting and water and sanitation services.

If Ethekwini Metro does stipulate that improved sanitation services be installed, they motivate for additional funds to cover the shortfall. These may be provided either from the consolidated municipal infrastructure programme (CMIP) or from their internal funds.

The WSSS may provide a favourable solution to this problem as it offers a waterborne sanitation alternative to Ethekwini and other cities in South Africa at a significantly reduced capital cost. The Ethekwini Pilot study reported between 55 and 60% savings in the Briardale and Emmaus communities. (For details see Annexure A1 and Table A3)

2. Timing of the steps to implement the waterborne Shallow Sewer system

The installation of the WSSS in the two pilot communities of Briardale and Emmaus in Ethekwini have been undertaken according to the methodology "Social Intervention Model for the Implementation of a Shallow Sewerage System" provided by Water and Sanitation Services, South Africa. (Appendix K)

(This methodology is based on "Modelo de Intervencion para la Implantacion de Sistemas Condominiales de Agua y Saniamiento ", Lobo, Luiz, Arakaki, Regina. UNDP – World Bank Water and Sanitation Programme, Andean region; September 1998).

The table below shows the steps, according to the methodology, that were taken in the Ethekwini Pilot Study and gives an indication of the time per step.

It is worth noting that these steps serve as a guideline that enables the implementing agent and the community to work together to build an understanding of each other's attitudes to and requirements for the solution of the sanitation problem. Both the community and the implementing agent must evaluate each step of the process before moving on. This allows for work to be undertaken in increments, without too great a risk to either party, and proceeding only once agreed milestones have been reached.

The timing and, perhaps to a lesser extent, the costs are likely to vary with each intervention.

Table A1: Steps in the Implementation of Shallow Sewers

1. Institutional and community arrangements (4 weeks) During which community and institutions agree on the scope, involvement and resources provided by each party
2. Cadastral and social characterisation (5-6 weeks) Make investigations to provide a socio-economic survey report including a list of key issues to be considered during later project stages. Undertake technical and geo-hydrology assessment (if applicable) to define condominium groupings
3. Health and hygiene education and community strengthening (2-4 weeks) Tools and strategies are developed for community interaction. The community is trained in health and hygiene and awareness, using participatory tools that equip them to assess their own sanitary condition. Activities take place to build trust between project team and community. Key people to represent condominiums and institutions are identified and listed.
4. Definitive design, task planning and agreements (8-10 weeks) An agreed layout and design is done in consultation with the community. Community makes an informed decision about the type of services they want and are willing to pay for. Key persons and institutions of supporting community awareness process are trained. A detailed and realistic schedule in developed in agreement with the community. Legal agreements are drafted.
5. Works implementation (10 weeks) The community constructs the condominial branches of the system, has ownership of, and understands the proper use of and implications of abusing the system, having received operation and maintenance training.
6. System consolidation (2-4 weeks) The community starts to use the system in a sustainable manner and evaluates the system. Any problem areas are resolved. This would be the final step requiring funds from the PHB subsidy. At the end of this phase, the houses should have functional wet cores that drain into the Shallow Sewer system. All training would have been completed to enable the people to maintain the system themselves.
7. Systemisation and final evaluation (2 weeks) Results of the implementation of the methodology are analysed. Project experiences are formalized and reported on. Any subsequent modification made to the system would be funded by the community
8. On-going social maintenance (on-going) The cost of this would not be included in the subsidy but would have to be born by the local authority as part of their sanitation services management. This may include any further intervention, such as assistance with maintenance and / or administration; re-training; community structure strengthening; or anything relating to legal agreements. The community who purchase their own materials and tools should do system maintenance. Any further social intervention costs deemed necessary would have to be born by the service provider or be paid for be some other funds.

Steps I to 7 could be expected to take approximately 40 weeks, although it could be undertaken more quickly, i.e. in approximately 22 weeks (five months), depending on resources available, cooperation by the community as well as the experience and organising skills of the implementing agent. It could also take much longer.

The pilot areas selected for this intervention were Briardale in Newlands West and Emmaus adjacent to the Westmead industrial area. Briardale was a green fields development of 156 houses that were applying for the PHB subsidy. The Emmaus community of 95 houses, in contrast, used their subsidies when their houses were built some years ago. The septic tank system that was provided with the houses failed and hence the need for another form of sanitation. Money was granted from the funds available in the Shallow Sewer pilot study to upgrade the sanitation to Shallow Sewers.

A non-government organisation called People's Dialogue has worked as the developer of the Briardale housing project. They have been using People's Housing Process in which the people purchase their own materials to build the houses themselves, under the supervision of the developer. The developer carries out all the other tasks. The project time for green fields developments, such as Briardale, would be expected to take much longer especially when using the People's Housing Process as opposed to, say, a Project-linked subsidy scheme, where the Developer completes the top structure as well and hands over to the beneficiary.

In the two pilot areas, Brairdale and Emmaus, there was pressure to complete the programme within the time frame allocated to the project by the partners. This was because the implementing team had to be set up specifically for the pilot study, the project manager, Miguel Vargas, having to be brought into South Africa from South America, as there was no local expertise.

Steps 1 to 7 in the pilot study for both areas took approximately 40 weeks. Future implementation would take less time for the institutional arrangements and planning, as experience has been acquired for these sections.

However, in this time frame the consolidation step (6) was incomplete with very few houses actually connected to the completed reticulation system. For various reasons the connection rate has been slow and protracted. At the date of this report less than 10% are fully using the system at Emmaus mainly due to lack of funds and community commitment. At Briardale almost all houses that have been built are now connected to the sewer, but 65% of the houses have not yet been built due to the delay in obtaining PHB subsidy funding for the project.

In a situation where the Shallow Sewers were offered as a normal sanitation option the timing of these steps would not be such an issue, for example, if the local authority was implementing on a wide scale then the project team that did the social intervention would simply move elsewhere until the community was ready to proceed to the next step.

3. Cost Considerations and Cost Comparisons

When considering the installation of sanitation systems to a community, the local authority considers both the capital installation costs and maintenance costs. (Steps 1 and 2)

It has proved both costly and difficult for the Ethekwini Metro to maintain pit latrines.

Cost comparisons between Shallow Sewers installed in this Pilot Study and a tenderer's price to install conventional sewers to the same communities as well as two independent contractors' prices to install ventilated pit latrines and conventional sewers to low cost housing projects have been made in Table A2 overleaf.

The difficulty in comparing costs for sewers and sewering is that they are very site-specific. This can be seen from Table A2 by comparing the Briardale and Emmaus costs. Emmaus costs were much higher due to the steep and difficult terrain, which is compounded by the low number of sites at each community. The two contractors in low cost housing who gave information on their costs, which have been used in Table A2, would have not considered either Briardale or Emmaus to be economically viable. They both stated that 200 sites was the minimum number for a project to be economically viable.

The site-specific nature of sewering can be demonstrated by comparing the relative costs of Shallow Sewers to conventional sewers at each pilot site giving the result of 33.7% at Emmaus and 36.8% at Brairdale. This shows that the proportional costs are similar while the total costs vary greatly.

In order to compare like with like, the wet core costs have been rationalized for the different sanitation types and a superstructure cost equivalent has been added into the conventional and Shallow Sewer options to compare them with the separately housed pit latrines. However the improved level of service and convenience of having water borne sewerage that is housed inside the dwelling would favour Shallow Sewers over pit latrines.

It can be seen from Table A2 that the cost to install Shallow Sewers up to the collectors is approximately 48% of the cost of conventional sewers and that Shallow Sewers and ventilated pit latrine costs are approximately equivalent.

The Ethekwini Metro pay for the additional off site costs to service areas that they wish to develop and the on-site sanitation costs are taken from the PHB subsidy (with top up if applicable). Hence the Shallow Sewer costs, being approximately 50% less than waterborne, must be attractive in the scheme used by Ethekwini Metro Housing and Planning departments. The question would be the maintenance costs and any on-going social costs, which, as yet, have not been quantified.

It is noteworthy that the 50% savings include the additional social costs; and that the main cost savings come from lower material costs, plant, labour and supervision.

Table A2

COST PER SITE (RANDS) TO INSTALL SHALLOW SEWERS COMPARED WITH CONVENTIONAL SEWERS AND VENTILATED PIT LATRINES

Data from the table of costs reported by M Vargas (Appendix 1) has been extracted and manipulated to enable a comparison of similar cost elements for the sanitation options shown below:

	Materials, labour and supervision **Rands**	Social intervention **Rands**	Internal reticulation, and wet cores **plus** superstructure equivalent **Rands**	**Total** **Rands**	**Savings by using WSSS** (Compared with **Briardale** cost)	Comment
Shallow Sewer Briardale (157 sites)	762	819	Allow 800 plus 533	**2914**		Cost excluded wet core costs and internal reticulation costs, hence to compare with independent contractor costs, R800 has been added for internal reticulation, toilet, and shower. At Briardale actually spent R2000 on wet core but this gives an unequal comparison as they purchased superior baths, hand basins and kitchen fittings
Shallow Sewer Emmaus (96 sites)	1281	1329	Allow 800 plus 533	**3943**		
Conventional Sewer Briardale (157 sites)	3785	500	Allow 800 plus 533	**5618**	**48%**	
Conventional Sewer Emmaus (96 sites)	7249	500	Allow 800 plus 533	**9082**	**57%**	
Ventilated Pit Latrine Ethekwini Metro	2300 (Excludes supervision, transport costs)	500	N/a	**2800**	**-4%**	Includes hole, toilet and top structure (Savings compared with Briardale WSSS cost)
Ventilated Pit Latrine Independent contractor, (minimum 200 sites)	2500	Not done, allow 500	N/a	**3000**	**3%**	Includes hole, toilet and top structure (Savings compared with Briardale WSSS cost)
Conventional Sewer Independent contractor (600 sites) (minimum 200 sites)	3365	Not done, allow 500	Allow 800 plus 533	**5198**	**44%**	Includes external sewerage, internal reticulation, toilet and shower (Savings compared with Briardale WSSS cost)

NOTES:

- Excludes water costs of reticulation and connection; collectors and off-site costs; and survey, design and drafting costs.
- Briardale and Emmaus costs at November 2000, other costs at June2002
- The amount of R800 for internal reticulation and wet core was the amount used in the conventional sewer project shown and the same amount was quoted to install basic wet cores at Briardale, although the community opted to pay extra for more up market products
- The amount of R533 was allocated to give a superstructure equivalent of $2m^2$ used for a toilet of a 30 m^2 dwelling costing R8000 (which is the PHB allocation)
- The social intervention costs for Shallow Sewer were also set up costs to produce the training materials and would be lower if the exercise was replicated.
- Costs saving comparisons were made with the Briardale costs because 157 sites is closer to the minimum number of 200 sites needed to make a low cost project economically viable

4. The PHB subsidy process, payment milestones and how this would impact on a Shallow Sewer intervention

The PHB subsidy funding would apply in the installation of Shallow Sewers up to the system consolidation stage (Step 6); that is for the installation of the sewer and providing the materials for and installation of the wet cores and all connections to the Shallow Sewer system.

Any on-going social maintenance costs would have to be born by the service provider if they were required. System maintenance costs would be paid by the homeowner / community as is the case with conventional sewerage.

4.1 Different types of subsidy

There are several ways in which the housing subsidy may be granted.

First of all there is an **individual subsidy** for which application is made for a single housing unit and payment is made to an individual upon transfer of the property to the person. This is no longer available in KZN.

There is also the **institutional subsidy** where the property is transferred to a property association and payment only made when transfer is made to the institution. Each participant is part of the institution and owns their share of the development.

The most widely used type is the **project-linked subsidy** where a developer uses the project money to purchase, service and build houses for a community. The sites are transferred to the individual owners in the community.

The People's Housing Process, previously mentioned, where the developer does all but erect the houses, may be used in any type of application.

4.2 Subsidy Milestones

To facilitate the administration of subsidies a system of milestones has been established. These must be completed before payment is made.

A fundamental principle is that public funds are utilized and paid out only as and when value has been created. The PHB guidelines state, "The institution must, in its project application, propose milestones for progress payments. The Provincial Housing Development Board must consider these proposals taking into account the need to ensure that the institution does not face adverse cash flow consequences."

The milestones are often changed around to assist with cash flow, but once they are written into agreement they are fixed. Therefore the applicant will determine how funds will be required to complete the project. The milestones are, therefore, quite flexible in the negotiation stage but once they are agreed upon the applicant is committed to a contract that is not flexible.

Five milestones for progress payments as they have been applied are listed:

P1 Planning: Engineering design and engineering drawings, municipal approval of services design. For this milestone engineering services have to be completed, handed over to the local authority for approval before the next payment is made.
P2 Detailed design: Town planning and acquisition of the land, general plan and layout.
P3 Engineering services: These include roads, water, sanitation and sewer reticulation and storm water drainage. These services must be constructed and completion to the satisfaction of the Local Authority's Engineers.
P4: Registration of transfer of property: The property is legally transferred to the person by registration in the Deeds Office.
P5: Construction of house: There are three stages of top structure development to purchase materials and build the house.

The National Housing Process allocates funds per site (housing unit), as follows: (figures prior to increase)

- ***R7500 to land, legal costs, roads and town planning, water and services out of which sewerage reticulation must be taken***
- R8000 to house of which approximately R1600 would be allocated for the bathroom and kitchen fittings and drainage

There is provision for an extra R575 per site for social facilitation and mobilization of the community, through the People's Housing Process, which can be granted up front. This is given to try to ensure that the project will be successful and is accepted that this money may be lost if the project is not socially viable.

4.3 Accommodation of Social Intervention Costs

The social intervention will have additional costs for the Shallow Sewer methodology to be followed.

There are various ways that this could be accommodated in the PHB subsidy system:

- First of all there is the extra amount of R575 per site, already available for social facilitation that could perhaps be allocated to projects using the Shallow Sewer methodology
- Social facilitation could be also said to fall into a milestone category, such as the town planning and layout
- Alternatively, it could be considered to be part of project management, which can be spread throughout the milestone payments, as long as it appears on approved plan.
- The most probable way to fund the social costs using the subsidy system would be to direct the capital savings gained by installing WSSS into social facilitation. They would have to be clearly itemized as part of the package and payment schedule and, once approved, would be written into contract. From discussions with Ethekwini Metro housing department it appears that this would be acceptable.

4.4 Recent changes to the PHB subsidy scheme

There have been recent changes to PHB housing subsidy scheme but these are not as yet fully implemented. The local government in future will act as the developer for projects and will appoint contractors to do the work on their behalf.

The municipality will apply to the Provincial Department of Housing for a certain number of subsidies for a year. These are put aside for the municipality or regional council and the money is made available to them up front. They will control all funds.

There is also a new system of payments that is still being written into regulations and it not quite clear yet how it will operate. The P1 to P5 system may change but there will be a system of milestones that will be used to ensure work done before payment.

5. Difficulties experienced in implementation of Shallow Sewers at Briardale that relate to the application for the PHB subsidies

The Briardale housing project has made application to the Provincial Housing Board for the housing subsidies for this project, which has provided this research with an appropriate test situation.

The NGO called People's Dialogue has acted as the developer of the Briardale housing project. They have applied for the institutional option of PHB subsidy, using the People's Housing Process.

The people of this community have benefited by getting more of their subsidy to pay for the houses, serviced land and other costs because the sewer system was donated by WSSA as part of the project, which would otherwise have been taken from the subsidy money.

Various obstacles have held up this particular application, which serve as good information for future projects. Problems that are delaying the granting of the subsidy are:

- Transfer of land from Metro to the Briardale Communal Property Association. This is a first time application for Metro Housing
- In Ethekwini a property valued below R30000 that is individually owned is exempt from rates. In the Briardale application a Communal Property Association owns the combined land whose value by far exceeds the zero rating. This has resulted in a ratable value that is not in keeping with low cost housing schemes. There is no precedent of how to deal with this matter and the Council has not decided how to proceed
- Layout and services issues not resolved to the satisfaction of the Metro housing engineers

To provide more detail on the latter, at a meeting with the Ethekwini Metro housing engineers, People Dialogue were convinced that the community would be able to do project themselves without input from the Metro Housing Engineers. When the plan for the development arrived, it was found that roads and lanes had been included in it. The question then arose as to who would maintain roads as, in the original plan, the community would have been responsible, which clearly would have been impossible. The Metro engineers persuaded them to change the plan to include the roads in the City reserve for Ethekwini Metro to maintain.

The storm water drainage also had not been planned satisfactorily. These areas of concern are in the planning stage and, at the time of this research, were still delaying the subsidy application.

The Metro Housing engineers suggested that for any planning applications, which include the Shallow Sewer sanitation system, servitudes invested in council be put in place for problems that may later arise.

6. Flexibility of the Subsidy scheme in relation to the implementation of Shallow Sewers

From discussions held with the Metro Housing Department and The Metro Housing Engineers, there appears to be sufficient flexibility in the administration of the subsidy scheme to accommodate the steps of the Shallow Sewer intervention.

As long as the project developer understands and plans for the costs, timing and cash flows he is able to put forward a viable proposal for discussion with the authorities. If they agree on the viability they will approve the plan and write the details into a contract.

From this research no major obstacles could be foreseen, either time wise or cost wise, to PHB subsidy funding being used for a project that included Shallow Sewers as an alternative to conventional sewerage or ventilated pit latrines, provided that the Metro would foot the bill for the off-site reticulation of the sewage.

7. Potential risks to the developer, the PHB and the customer

- **Cost of Social Characterisation**. In the case of installing Shallow Sewers the question arises as to who would pay for the upfront social characterisation and any costs related to the initial steps of the intervention if it was decided not to proceed with the project? This was discussed in section 4.3. The risk may be minimal if the extra R575 per site for social facilitation can be accessed. If this is not available the risk should be addressed before continuing.

- **Ethekwini Metro Access to community facilities.** In a development using the PHB subsidies, developers would be responsible for ensuring that houses were built on satisfactorily serviced sites to the prescribed standard. Thereafter their responsibility would end and the housing scheme would become part of the city's responsibility. The same would apply in the case of installing Shallow Sewers as the sanitation option except that the onus would be on the community to maintain the sewers within their own boundaries, which is also the homeowner's responsibility with conventional waterborne sewers. If the community did not maintain and take sufficient care of the sewer as agreed, health risks and sewer blockages may occur. Although

legal mechanisms exist in the form of agreements, in practice it is difficult to collect payment from a group.

- **Servitudes.** The situation may arise where the Metro requires a legal mechanism to intervene and, in this case, it is recommended that "omnibus servitudes", in favour of Ethekwini Metro, be put into the plan prior to approval. Metro Housing Engineers suggested that the Briardale project could be used as a model for any such situation. These are blanket servitudes, which are not restricted to a particular boundary on a property. They have been used in other areas in Ethekwini, i.e. Chatsworth, when it is unclear how the development is going to progress. The omnibus servitude would be a good option because it allows flexibility over the years and because Shallow Sewers may be expected to follow new, unplanned routes over a period of time. At a later stage these could be replace by fixed servitudes parallel to boundaries, if required. There are costs to registering servitudes but these may be managed if undertaken during the formalisation of lots.

- **Competent Social Facilitation**. If developers or subcontractors were appointed to undertake the social facilitation by the local authority, it would be easy for them to increase their profit by cutting corners. If they did not do a good job of social intervention then the community may not be provided with the desired skills and knowledge. Therefore the local authority should take care to use only ethical, competent social facilitators, which they control closely.

- **Extra Value to the Beneficiary.** Developers or subcontractors appointed to undertake housing developments by installing Shallow Sewers can easily increase their profits by cutting corners on the social and educational intervention, thereby creating potential risks to the homeowner and the local authority. The system needs to be developed to ensure this does not happen.

8. Conclusions

- It is concluded that the hypothesis made regarding costs and timing constraints of implementing the WSSS within the PHB subsidy system can be supported. There appears to be sufficient flexibility in the administration of the Provincial Housing Board subsidies to accommodate the steps of the SS intervention as described in the methodology used in the Ethekwini Pilot Study.

- From information collected it appears that there is not much difference between the capital costs required to install VIP compared with Shallow Sewers, apart from the reticulation costs to remove the effluent from the property. Installing Shallow Sewers may save 45% to 50% of the on-site capital costs. Therefore the cost allocation of PHB funds to waterborne sanitation by using Shallow Sewer system should assist Ethekwini Metro to install waterborne sewerage in preference to pit latrines to satisfy its health and maintenance policy. By doing this they should save on both capital and maintenance costs.

- From a social perspective, South African communities appear to behave differently to South American communities. It no longer seems to be the norm for South African communities to act for the common good of their people. There are both stable and non-stable communities in Ethekwini Metro area. While social issues may affect the timing of the social intervention, the PHB subsidy system should be flexible enough to accommodate any delays.

9. Way Forward

The research for this report has clearly highlighted that, in South Africa, the provision of services naturally falls into two distinct issues, social and technical. It is possible that municipalities may want to consider splitting the two issues and applying them in a different way to that proposed by the methodology.

Technically the use of Shallow Sewer reduces reticulation costs. The technical benefits of the Shallow Sewer are easy to separate from the social and may be reasonably easy to implement, by adjusting building standards with the associated cost savings. Shallow Sewers could then be offered as a standard alternative to conventional waterborne sewerage or to ventilated pit latrines.

Holistic approach to social interventions

A more holistic approach to social interventions should be considered. The social implementation of the Shallow Sewer methodology is fairly complex and is certainly not specific to Shallow Sewers or even sanitation. It has become obvious that many departments with in the Ethekwini Metro as well as many Government departments already provide various types of social intervention and upliftment and have wide-ranging expertise and experience. Social interventions appear to have taken place in an uncoordinated and fragmented way. The benefits of using a methodology to uplift communities and enable them to mobilise themselves should not be limited to a Shallow Sewer intervention, but should be reviewed and coordinated holistically for the Ethekwini Metro so as to combine knowledge and work together more effectively and efficiently.

Annexure A1

Comparison of Installation Costs

The research programme proposed to research whether Water-borne Shallow Sewers (WSSS) are cost effective to Ethekwini Metro by determining whether the total capital cost of installing the WSSS is less per household then for conventional sewers, as a means of appraising the financial viability of WSSS.

Conclusion
The **Capital Cost** savings of implementing the Shallow Sewer system compared with projected costs for conventional sewerage in the two pilot areas were found to be 59% at Emmaus and 54% at Briardale

Methodology
The task was to demonstrate that the total capital investment by installing the Shallow Sewer system was less than for a conventional water-borne system.

Miguel Vargas of Water and Sanitation Services undertook this work in conjunction with the Ethekwini Metro Wastewater Services engineering and design staff.

There was a capital cost reduction of installing Shallow Sewers in both pilot communities compared with a tenderer's price of installing conventional sewers to the same houses in the communities.

In order to ensure that the two costings were comparable, the actual costs of the Shallow Sewer were related to a bill of quantities price estimate prepared for installing a conventional waterborne system. This was done to ensure that all the aspects of costing were accounted for to make a realistic comparison. I.e. The conventional system bill of quantities was used as a basis for costing the Shallow Sewer system, although the actual costs were used. For example there was no charge for the backfilling and the actual lengths of pipe used were costed.

The following summary is an extract from a report submitted to Ethekwini Metro Wastewater Management by Miguel Vargas of Water and Sanitation Services South Africa (Pty) Ltd., which explains the logic behind the cost comparison.

The cost analysis called for a distinction between collectors and trunk sewers, to isolate factors such as remoteness of the area, that are very intrinsic of the specific communities.

The criteria assumed were to call "Collector" the system component collecting contributions from the condominiums and laid within the community boundaries. "Trunk sewers" denomination was given to the system component transporting sewage from collectors to the Treatment Works and located usually outside the community boundaries.

The following assumptions were taken into consideration to produce the split between collectors and trunk sewers:

Briardale

Contact wq 65 / 1214 Northern Collector Sewer to be 100% Trunk
Contract wq 65 / 1215 Southern Collector Sewer to be 70% Trunk and 30% Collector
Contract 516 / 45246 Southern Sewer Extension to be 100% Collector
All other costs (Preliminary Design, Survey External, Design and contract documentation, Drafting Services and Contract Administration) to be divided equally into the three contracts.

Emmaus

Contact wq 65 / 1210 Southern Collector Sewer to be 100% Trunk
Contract wq 65 / 1211 Southern Sewer Extension to be 100% Trunk
Contract wq 65 / 1212 Emmaus West Sewer Extension to be 100% Collector
Contract wq 65 / 150 Dia Condominium Sewer Extension to be 100% Collector
All other costs (Preliminary Design, Survey External, Design and contract documentation, Drafting Services and Contract Administration) to be divided equally into the four contracts.

LIMA Rural Development, Pietermaritzburg, was contracted to carry out the social intervention on behalf of the project. The total cost of the intervention was split equally between the two communities in preparing this cost comparison. The social intervention cost also included the cost of developing training materials that could be used in future projects.

Substantial savings were demonstrated for both Emmaus and Briardale.

There was a 59% saving at Emmaus and a 54% saving at Briardale. The increased saving at Emmaus was due to the steep gradients which would have been more costly to service using conventional methods of installation. These savings excluded the cost of the collectors. When the collector costs were included, these savings reduced to 40% and 39% respectively.

The tables on the following page show the break down of the capital costs.

Table A3: SUMMARY OF CAPITAL COST SAVINGS BY INSTALLING SHALLOW SEWERS

Costs as of November 2000

EMMAUS No. of Households 96			
	Conventional	**Shallow Sewerage**	**Savings**
1) Survey, Design and Drafting	R 58,018	R 58,018	0.00%
2) Contract (*)	R 635,945	R 98,383	84.53%
3) Contract Administration/Supervision	R 60,000	R 24,682	58.86%
4) Social Intervention		R 127,620	
TOTAL	R 753,963	R 308,703	**59.06%**
Collectors			R 356,680
Cost per household (**)	R 11,569	R 6,931	40.09%

(*) Refers to the construction contract for the conventional and material provision for the Shallow Sewerage
(**) Including collectors

BRIARDALE No. of Households 157			
	Conventional	**Shallow Sewerage**	**Savings**
1) Survey, Design and Drafting	R 47,540	R 47,540	0.00%
2) Contract (*)	R 539,200	R 94,921	82.40%
3) Contract Administration/Supervision	R 55,000	R 24,682	55.12%
4) Social Intervention		R 127,620	
TOTAL	R 641,740	R 294,763	**54.07%**
Collectors			R 243,058
Cost per household (**)	R 5,636	R 3,426	39.22%

(*) Refers to the construction contract for the conventional and material provision for the Shallow Sewerage
(**) Including collectors

Appendix B

Ability and Willingness to Pay

August 2002

ABILITY AND WILLINGNESS TO PAY

1. Introduction

This study aims to investigate the ability and willingness of the homeowner to pay for the waterborne Shallow Sewer System and to this end the following hypotheses were formulated in the research proposal:

Ability to Pay:
As part of the appraisal of the affordability to the user of the waterborne Shallow Sewer system (WSSS), the following hypotheses were made:

> *The community is able to pay the tariff, which is based on an assumed 10% saving in operational cost, and is able to pay all costs imposed by the condominium*
>
> *The total running costs to the customer of the WSSS are less than conventional water-borne systems*

Willingness to pay:
As part of the appraisal of the acceptability of the waterborne Shallow Sewer system (WSSS) to the local authority and to the user, the following hypothesis was made:

> *This proposes to research the community's satisfaction of the system by determining whether the willingness to pay for the system is higher in WSSS communities than in CWSS communities.*

The Shallow Sewer technology is installed as a "package" of water and sanitation services together and it has not been attempted to separate them in this evaluation.

Payments for water and sanitation services are inextricably linked and have been considered together. The Shallow Sewer communities pay for sanitation as well as for water in their monthly Municipal services account whereas the control communities pay only for water.

The ability and willingness of people living in low-income areas to pay for a water and sanitation service is of major concern worldwide to service providers.

In the Ethekwini Municipality area, and South Africa in general, the ability of householders to pay has largely been solved by the government's policy to provide 6kl per month of free water to all households. Although the Ethekwini Municipality does provide this free service, not many other service providers have been able to comply with this policy to date.

In Ethekwini there are three levels of water service. The first is the conventional full pressure service that has no physical restrictions. However connections fees and tariffs are higher than the other levels of service. The second level is a semi-pressure supply, which is provided at a much-reduced cost for connection and tariff, but the house must be fitted with a 200-litre roof tank in order to reduce the operational pressure of the water supplied. The lowest level is the 200-litre ground tank that is filled once daily, ensuring the householder's consumption is limited to 6kl per month. Neither the semi-pressure roof tank system nor the full pressure system restricts the volume of flow to the household. The 6kl free quota of water applies to all three levels of service.

In Ethekwini the level of water supply governs the sanitation service provided. At present where there is unrestricted flow to the site conventional waterborne sanitation has to be supplied. The Shallow Sewer system was investigated as a possible, cost saving alternative to removing the unrestricted water supply from the site.

The sewerage tariff for communities supplied with Shallow Sewers has been set at 10% less than for conventional sewerage.

As part of the pilot study to investigate the applicability of Shallow Sewers in South Africa the two test communities, Briardale and Emmaus, were selected. Two other communities with similar demographics, Riverdene and Nazareth, were chosen as control communities. The ability and willingness to pay for water and sanitation services were evaluated for the communities and comparisons were drawn between the tests and controls. Water and sewerage charges are combined on a single Ethekwini service account and were therefore considered to be a service package.

This research investigates only the running costs and therefore excludes the costs to the community of connecting to the water supply, i.e. connection fees and other installation costs, such as wet cores and pipe work. Such installation costs should be addressed in the housing or services "package" supplied to a community. In the Pilot Study this expense did raise issues for the people at Emmaus who had already received their housing subsidies and in the pilot study were expected to pay water connection and some other installation costs from their own pockets.

Only a small proportion of residents were able or willing to do this, which resulted in the low rate of connection at Emmaus. Only 24 households had obtained water connections of which only 6 had managed to connect to the Shallow Sewer system at May 2002. More information relating to this issue can be found in Appendix I: Perception Survey on the Shallow Sewer System at Emmaus, August 2001, and in Appendix D: Social Evaluation.

2. Methodology

2.1 Methodology: Ability to Pay

The income and expenditure per household was measured through the quality of life surveys on two occasions during the research for both the test and control sites. A third set of data was available from the social survey undertaken at Emmaus and Briardale by LIMA Rural Development at the beginning of this intervention.

Households were also asked to describe and rank their three highest expenses. The results of these were totaled and compared with the total income and expenditure in order to validate the results.

Some of the respondents were either unable or unwilling to answer some of the questions and, in such cases these comparisons often gave insight into the financial status of the household.

Because communities are sensitive to giving out information on income and expenditure care was taken not to request this information too often. When a house was revisited in the second round of surveys, only the household expenditure and not the income was requested.

WHO Benchmark

Miguel Vargas quotes an unconfirmed WHO benchmark that the water and sewerage service bill should not be more than 8% of income. This benchmark was used to evaluate the ability to pay.

8% of income per each household was calculated (for both WSSS and CWSS) as a maximum payment for water and sanitation services.

Judgments on the household's ability to pay were made based on this amount compared with the Ethekwini Municipality water and sewerage account per household for Emmaus and Briardale.

According to another unconfirmed reference provided by EWS Water department, the World Bank proposes that for urban poor, the preferred figure of 4% of the household income be used as the threshold for affordability of water services (excluding sewerage). This figure was also used in the comparisons.

Monthly Water and Sewerage Accounts
Two sets of account data were used to make these judgments.

The Ethekwini Municipality Business Branch provided data of each account holder from the installation of the water service at Emmaus and Briardale until February 2002. The average monthly payment, water usage and arrears position was calculated.

In addition the research team had collected data on meter readings of each house that had a water meter at Briardale and Emmaus. From these readings the average monthly water usage and accounts were calculated for the entire period of the research (December 2000 to May 2002).

Running Costs
The running costs to the householder were compared for the two types of sanitation. In the surveys both the test and control communities were asked to provide details of any running costs associated with their sanitation systems in addition to their monthly Ethekwini service account.

2.2 Methodology: Willingness to Pay

2.2.1 The actual payments made per household were compared with the ability of that household to pay and by establishing whether the account was in arrears or up to date.

If the account was in arrears by more than two months but they were able to pay according to the WHO benchmark of 8% then this would provide an indication that they were not willing to pay.

2.2.2 The community's attitude to payment was also surveyed directly as part of the quality of life / customer satisfaction surveys by posing the question: "The waterborne shallow system is good value for money". The responses to the communities' satisfaction with their sanitation have also been included.

Where available (Shallow Sewer only), the answers given to these questions were correlated with the account position of each household to try to establish whether they were willing to pay.

The attitude to payment data was also compared as a whole between the test and control communities.

It was assumed that the community would understand by this question that they were paying for both water and sanitation services in one account. Should they not believe this then their answers may have been directed to dissatisfaction with water and not sanitation services. However, a survey undertaken earlier in this study, Appendix I: Perception Survey on the Shallow Sewer System at Emmaus, showed that the community believed that the semi pressure water service and the Shallow Sewer sanitation were tightly linked, a perception that had been encouraged during the social intervention training workshops.

3. Discussion of Data:
Income figures often were not provided. Only 65% of households in both test and controls provided income data. This was found to be common, particularly in KwaZulu Natal, by the Department of Development Studies which has evaluated the data for the Urban Strategy Quality of Life Surveys.

The data indicated that incomes were sometimes understated. Therefore judgments were made of the household's income based on all the available data over the period of research. This was called the **"presumed income"** per household. If the income appeared to have changed

substantially then the later figure was taken. In many cases the incomes appeared to have dropped at Briardale between July 2001 and May 2002.

Some families, who did not indicate that they had any income and yet gave their monthly expenditure and rated their highest expenses, were also given a "presumed income". There was only one case where a household (Briardale) had no income and had expenses of only R12 per month. This family had a water supply but limited their usage to an average of 2.5kl per month, which is below the free water limit and therefore did not have to pay for water. This family was fully connected to the sewer system.

Ethekwini Municipal service accounts for test communities, Briardale and Emmaus
(For water and sewerage service)
The water and sewerage accounts were made up as follows: (2001 tariffs)

- Water Charge: First 6kl per month free, thereafter R2.18 per kl (2001 charges)
- Sewerage charge: 70% of water volume over 6kl at R1.42 per kl
- Water loss insurance: R1.74 per month
- VAT at 14%

It is important to note that households with water connections to their houses that had not connected to the sewer system at Emmaus and Briardale still paid the sewerage tariff.

Generally they did not complain about this although it is unclear if that is because they accepted that they would be billed, as explained to them during the social intervention and before signing the agreements, or because they did not understand the accounts sufficiently to know they were paying for something they did not yet have.

By the end of the research period almost all the houses at Briardale that had their own water supply had been connected to the sewerage system whereas at Emmaus there were 24 homes with water connections of which only 6 were fully connected to the sewer.

There was some concern in the planning stage of this project about setting the tariff for the Shallow Sewer system because it was necessary to include sewerage costs on the water bill at the test communities at a time when sewerage had not yet been charged for in this way in the Ethekwini Municipality. Traditionally Ethekwini Municipality recovers its sewerage costs through levying rates on the property, however this policy was about to change and it was decided to use the proposed new system of direct charging in the Pilot Study.

Properties valued at less than R30 000 received 100% rebate on their rates, therefore people living in the control communities did not contribute to their sewerage costs. It must be noted that the control communities that have conventional water-borne sanitation were not charged for their sewerage in their monthly accounts.

The same rate per kl for water charges applied to users in the control communities who were supplied with semi-pressure water through roof tanks.

Ethekwini Municipal service accounts for control communities, Riverdene and Nazareth
(For water service)
The water accounts were made up as follows: (2001 tariffs)

- Water Charge: First 6kl per month free, thereafter R2.18 per kl
- Water loss insurance: R1.74 per month
- VAT at 14%

On examination of the data it was observed that there were many "teething problems" in the service accounts in the first several months, presumably because this was a new community being services and that the deposits had been paid in an unusual way to accommodate the intervention.

These problems included poor estimations of consumptions prior to obtaining actual meter readings and the associated refunds, matching the correct meter with the correct account holder and crediting the deposit of R75.

It was therefore decided to use calculated account data based on the average monthly usage determined by the field team over the entire period of the study.

4. Results:

For both ability and willingness to pay the results have been separated into two types of data, **specific** and **general**.

The **specific** results are for the Shallow Sewered communities only, namely Briardale and Emmaus. These cases constituted all households with their own water supply in both pilot communities. For these 65 cases, specific data is available for each household including income and expenditure, water usage, account and payment data including any arrears. These data are not available for specific cases in the control communities Riverdene and Nazareth.

General results from the quality of life surveys are available for income and expenditure, quality of life, satisfaction with and attitudes to the sanitation systems for all four communities. However these cannot be tied up to specific account details hence they have been treated in general to compare the test communities with the control communities.

4.1 Ability to Pay – Specific Cases

Based on WHO benchmark of 8% of **"presumed income**" 98.5% of people with water supplied were able to pay their accounts. (Note that this includes the free 6kl per month).

Based on the World Bank's ceiling of 4% of **"presumed income"** 92.3% of people with water supplied were able to pay their accounts.

Table B1: Income Range of Test communities: Briardale and Emmaus (N=65)

Income range (Rands per month)	**<R300**	**R301-600**	**R601-900**	**R901-1200**	**>R1200**	**All cases**
Number of households in income group	4	11	17	10	23	65
% Households in income group	6.2	16.9	26.1	15.4	35.4	100
Number (%) of all households whose account **exceeds** 8% of income **(WHO)** (water and sewerage)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 1.5%)	1 (1.5%)
% of all households whose account **exceeds** 4% of income **(World Bank)** (water and sewerage)	1 (1.5%)	(0%)	0 (0%)	3* (4.6%)	1* (1.5%)	5 (7.7%)
				*1 sells water	*Sells water	

Of the 5 cases in the table above that exceed the World Bank benchmark of 4%, two were known to sell water to their neighbours. Neither of these was connected to the sewer system. The person exceeding the WHO benchmark in the high-income group earns R4000 per month with an average account of R542 per month. This person had elected not to connect to the sewer and sells water.

On average 45% of households in Briardale and Emmaus are maintaining their usage to 6kl or less per month to take advantage of the free water option.

Water Sellers and Bailiffs

Both test communities had problems with water supply at the start of this project. At Briardale there was only one standpipe for a whole community where houses were being built and water was

needed desperately for building. At Emmaus the number of standpipes had been reduced from four to one or two due to non-payment by some of the bailiffs.

The shortage at Briardale was alleviated when water was supplied to approximately fifty houses as part of the intervention. The water bailiff then had financial difficulties when his account did not decrease even though demand and sales dropped. It appears that this hiccup may have been due to estimated usage for preparing the accounts or otherwise may have been due to a financial management error on the part of the bailiff. The community members with their own water supply would probably have been able to offer neighbours water at a reduced price thereby undercutting the official bailiff.

Similarly at Emmaus certain households began to sell water to their neighbours to make a living. One of those at Emmaus is believed to have run into difficulties paying the water account because of the inclusion of the sewerage tariff. This family since appears to have since stopped selling water.

Anecdote from an Emmaus resident

A widowed lady, who is able to afford to pay for water, has nevertheless kept her water consumption to below the free limit of six kilolitres per month. Having done this for approximately 16 months, she reported that she has been able to save a substantial amount of money. Prior to having her own water supply she collected water from the standpipe at the prevailing rate of R0.25 per 25 litres, i.e. at a cost of R60 for 6 kl. With these savings she was able to purchase building materials to add on two bedrooms for her sons. She was also able to take driving lessons, which she said she would not have afforded otherwise

In addition she has persuaded her mother, who lives elsewhere, to use the semi-pressure system instead of the full pressure system that she was using. (We did not delve into this issue but presume that she is now using her roof tank to control her water usage as many people in other people by-pass their roof tanks illegally because they do not like them.) The result has been that the mother, who was previously spending R100 per month on her water bill, has free water and now does not have to keep asking her daughter for money for transport and groceries.

The widow has told this to the Emmaus community, encouraging them to make good use of the free water. However some of the community cannot believe this could be true and say that she must have won the lottery!

Running costs for specific cases (other than water and sanitation bills)

Running costs to the customer measured during surveys were extracted for the **specific** cases in the Shallow Sewer communities. The thirty-six responses that were available are summarized in the table below:

Table B2: Estimated Average Running Costs

Running Costs in addition to monthly account (assumed for a 6 month period)	**Test communities Number (%) of households**
Nil	23 (64.0%)
Less than 25	3 (8.3%)
Between 25 and 300	7 (19.4%)
Between 300 and 400	3 (8.3%)
R63	Mean
R380	Maximum
R0	Minimum

The running costs were assumed to have been the amount incurred over a six-month period, although this was difficult to establish.

An exercise was undertaken assuming that the average monthly running cost was R63 divided by 6 months, giving R10.30 per month. This average running cost was added to the monthly accounts and compared again with the WHO and World Bank benchmarks.

Table B3: Test communities: Briardale and Emmaus (N=65)
Average Running Costs of R10.30 Added to Municipal Service Account

Income range (Rands per month)	**<R300**	**R301-600**	**R601-900**	**R901-1200**	**>R1200**	**All cases**
Number of households in income group	4	11	17	10	23	65
% Households in income group	6.2	16.9	26.1	15.4	35.4	100
Number (%) of all households whose account **plus running costs exceeds** 8% of income **(WHO)**	2 (3.1%)	0 (0%)	0 (0%)	1 (1.5%)	1 (1.5%)	4 (6.2%)
% of all households whose account **plus running costs exceeds** 4% of income **(World Bank)**	3 (4.6)	0 (0%)	1 (1.5%)	2 (3.1%)	1 (1.5%)	7 (10.8%)

The position worsened slightly in that 3 out of 4 households in the very low-income group (<R300 per month) could not pay the total costs once the assumed average running costs had been added. Overall 89% would then be able to pay according to the WHO benchmark of 8%. It may be unfair to draw the World bank comparison of 4% as the running costs were determined for sanitation although it is more likely that some of these costs would relate to water as well as sanitation, especially in relation to roof tank problems.

However these results must be treated cautiously as the thirty six results, taken over a short period, too soon after people had connected and when people were still have teething problems, are vague. It is unknown whether these were true running costs or installation costs or whether they would increase or decrease once the system had been running for some time

A better reflection of running costs should be established over a longer period up until a point where one would expect maintenance costs to be a factor. It is expected that it will always be difficult to separate water and sewer system running costs.

Water usage

Water usage and amount spent on water were compared before and after the Shallow Sewer intervention. The table below shows the arithmetic means.

Table B4: Average water usage before and after

	Before Shallow Sewer	**After Shallow Sewer**
Emmaus	**N=16**	
water cost	R42	R40
water usage	4.2kl	19kl
Briardale	**N=49**	
water cost	R28	R7
water usage	2.8kl	7kl
Combined	**N=65**	
water cost	R31	R14
water usage	3.1kl	10kl

The initial data was taken from the social survey undertaken at the beginning of the project (5). These are the costs to buy water prior to intervention when purchasing from community standpipes. The assumption was made that in all cases water was being sold for R0.25 per 25-litre container, which was the norm at the time.

The before data was for the specific houses at Emmaus but for the whole community at Briardale as the specific houses at Briardale could not be distinguished. Hence the Emmaus data is more accurate for this purpose.

The "after" data is the average of water usage and costs since each household connected to their own water supply. Note that many people use but do not pay, hence the means shown in Table B4 may not seem to correlate.

It can be seen that there was an increase in usage but a reduction in what people were paying for water from standpipes to what they pay for the semi-pressure supply.

Table B5 shows a breakdown of average water usage for both pilot communities over the study period, December 2000 to May 2002.

Table B5: Average water usage at Briardale and Emmaus

Monthly Volume kl	Number of households	Percentage of households
Up to 6	29	45%
>6 – 10	19	29%
>10 – 15	15	18%
>15	5	8%
Total	**65**	**100%**

It can be seen that in the pilot areas, Briardale and Emmaus, only 8% of the households use more than the "comfortable" quantity of 500 l per day or 15kl per month.

4.2 Ability to Pay – General Comparisons

Based on WHO benchmark of 8% of income and on the World Bank's ceiling of 4% and the results from this study it appears that virtually all people in these income categories should be able to pay their water and sewerage accounts. Those who earn less than R300 were the only category that may not be able to afford it and these people have the option of free water and sewer supply by limiting their water usage.

Table B6: Income: Shallow Sewer vs. Control Communities

	Test communities (N= 36)	Control communities (N= 100)
Income range (per month)	R0 – R2000	R0 – R8600
Average	R582	R857
8% of average income **(WHO)**	R46	R68
4% of average income **(World Bank)**	R23	R34

Running costs - General

Running costs to the customer were measured for communities with Shallow Sewers and conventional sewers. However the results were too scant for reliable quantification. The following results were obtained:

Table B7: Running costs: Test vs. Control

	Test communities (N=60)			Control communities (N=34)		
	Hiring	**Tools**	**Materials**	**Hiring**	**Tools**	**Materials**
Mean running cost (over 6 months)	R37.76	R1.56	R0.00	R4.18	R0.00	R0.00

In the test communities the only people reporting any running costs were those at Briardale who were busy with their wet core installations and connections to the Shallow Sewer.

The running costs for the control communities would reflect realistic running costs as their systems were installed some time ago. If it were assumed that these costs related to the past six-month period then the running costs would be insignificant cost compared with the monthly service bill and most families would be able to afford this amount.

Thus it can be deduced from the results that at May 2002 when these data were collected that the running costs were negligible in the control areas. (Approximately R1 per month).

In the test areas expenditure had been for installation costs and no conclusions could be drawn about true running costs at that stage. There were no running costs reported by the 19 households giving responses to the questionnaire at Emmaus.

Economic Situation:
The surveys asked whether households were economically better or worse off than the previous year. Communities gave similar answers that their position had worsened.

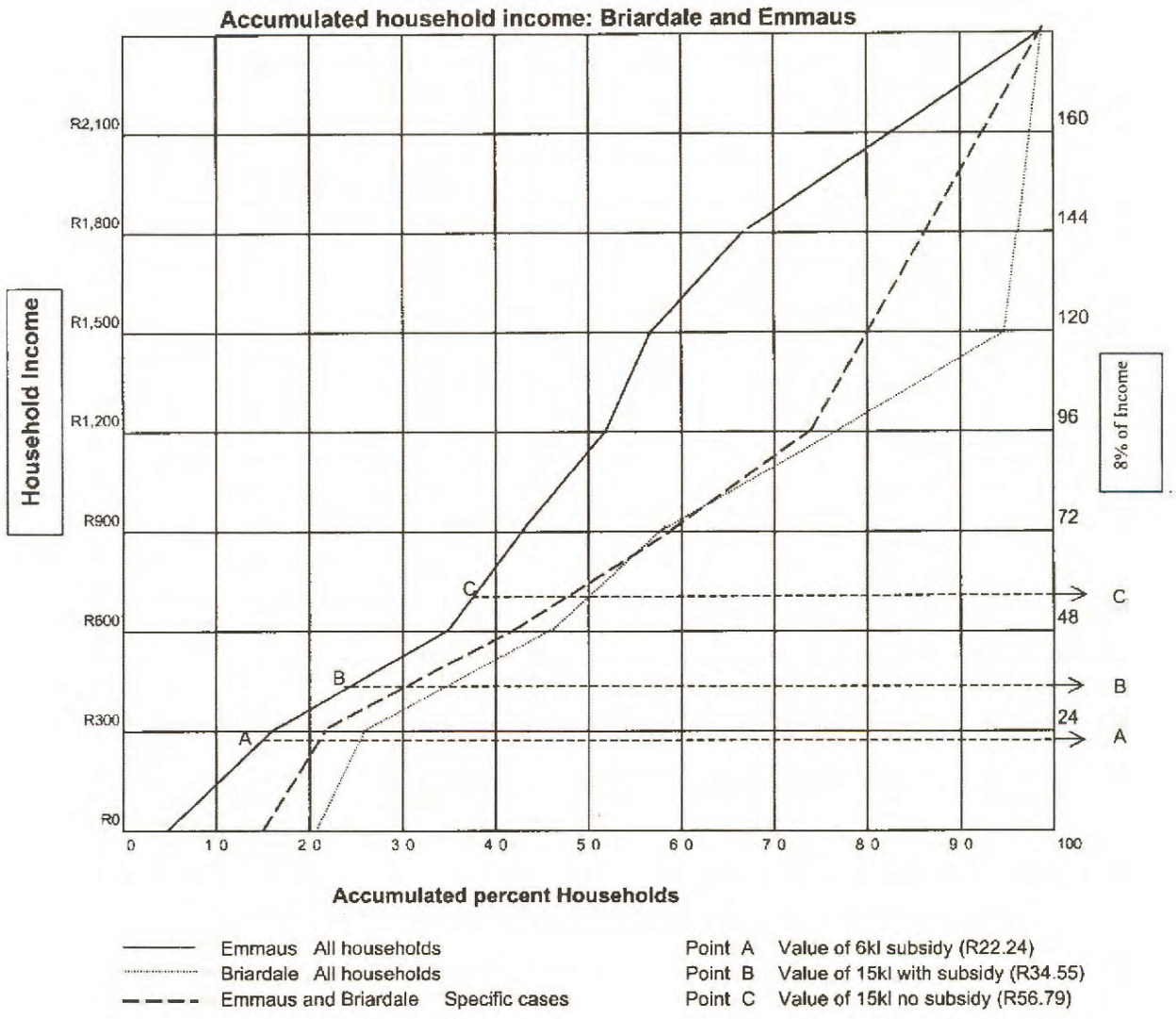
Table B8: Economic Situation

	Test communities (N= 99)	Control communities (N= 36)
Same or better off than last year	27%	28%
Worse off than last year	73%	72%

Other Costs
Water connections fees and the costs of the materials required do the internal plumbing and to connect to the sewer usually form part of the development costs, under which circumstances the community would not be expected to pay this amount. However in the case of Emmaus this cost had to be born by the community members who were largely unable to do it. Even those that they were paid for their work to dig and lay and install the sewers were unable to save sufficient to pay these costs. This resulted in a very poor connection rate at Emmaus. By May 2002, 25 households had paid water connection fees and obtained a supply but only 6 of these had connected to the sewer system.

4.3 Accumulated Household Income Comparisons (Test Communities)
The accumulated household income was plotted against the number of households that earned that income. 8% of the income was shown on the axis opposite income.

Graph 1: Income distribution and ability to pay (WHO) at test communities
This graph is based on incomes of all people in both Emmaus and Briardale (5).



Based on the information on ability to pay data from Tables 1 and 3 it can be assumed that all people should be able to pay for the Shallow Sewer system using the semi pressure water supply. Once again those who may have difficulty paying would be those earning less that R300 per month and in these cases the option of free water and sewerage is available.

However, EWS is of the opinion that a poor household that has internal plumbing may have difficulty managing on 200 litre per day and would be more likely to use around 500 litres per day if they were trying to limit their consumption. The data point **B** on Graph 1 showing R35 indicates the cost of a consumption of 500 litres per day, which is 15kl per month. The income to support this payment (based on 8%) would be R432. The graph indicates that approximately 27% of the people living in the test communities would not be able to afford this.

Table B9: Calculation used to Calculate Monthly Municipal service Accounts:

Semi-pressure supply	Water charge	Sewerage charge	Insurance	Total with VAT
	(15 – 6) x R2.18	0.7 x (15 – 6) x R1.53	R1.74	Plus 14%
Shallow Sewer	**R19.62**	**R8.95**	**R1.74**	**R34.55**
Controls	R19.62	R0.00	R1.74	R24.35

Note that the people living in the control areas are not yet being charged for their sewerage through their Service account but through the rating system for which they receive 100% rebate (for houses valued under R30 000). Hence the affordability for these households, which are effectively receiving free sewerage, based on 8% would be all households with an income of only R304 and only 19% would not be able to afford this more comfortable water usage.

The Real Test of Affordability without the 6kl subsidy

It should be borne in mind that the decision to supply 6 kl free water to all households is a political one and, as such, could change. Municipalities would be well advised to consider how dependent communities would become on the free quota should it be removed.

Table B10: Real Cost of Shallow Sewer Supply in Terms of Monthly Accounts

Semi-pressure supply	Water charge	Sewerage charge	Insurance R1.74	Total with 14% VAT
Value of 6 kl, not subsidised	6 x R2.18 = R13.08	0.7 x 6 x R1.53 = R6.43	nil	R22.24
Value of 15 kl, not subsidised	R19.62 + R13.08 =R32.70	R8.95 + R6.43 =R15.38	R1.74	R56.79

These values were plotted on Graph 1 to estimate how many households would not be able to afford Shallow Sewers if the subsidy was not in place:

- Point **A** is the value of the 6kl subsidy (R22.74)
- Point **B** is the value of the 15kl with the subsidy (R34.55)
- Point **C** is the value of the 15kl without the subsidy (R56.79)

Graph 1 indicates the following sections of the communities would be unable to afford the Shallow Sewer system at each of the situations A, B and C. The results are shown in Table 11 below.

Table B11:Real Cost of Shallow Sewers at Briardale and Emmaus

% Of households that cannot afford the system	A: Using 6kl per month without subsidy	B: Using 15kl per month with subsidy	C: Using 15kl per month without subsidy
Emmaus all households	15.5%	24.5%	37.5%
Briardale all households	27%	36%	55%
Briardale and Emmaus specific cases combined	21.5%	30.5	47.5%

As can be seen the subsidy offers everyone the opportunity to benefit from services, even if it means limiting one's water usage. Without the subsidy substantial sectors of the communities would not be able to participate in such water and sanitation schemes and the municipality would have to plan accordingly.

Water Usage and Householders' Cost to Operate the Shallow Sewer System

> "The Shallow Sewer system can typically be used without blocking due to frequent flushing and small diameter pipes with a low water usage. Successful operation has been observed with an average household usage of 25 litres per capita per day." (13)

At Emmaus and Brairdale the Shallow Sewer system has been installed to all houses but the low connection rate could jeopardise the functioning of the system. Table B12 shows the connection rates and water usage for those houses that are connected. Whether or not there is sufficient water flushing these systems is not known at this stage. The affordability of sustaining the system was estimated by calculating the average cost per household of 25 litres per person for each community, based of the average number of people per household. The results indicate that the volumes required are within the free quota and therefore are affordable. See Table B12 below.

Table B12: Total Water Usage: Briardale and Emmaus

	Briardale	Emmaus
Community population*	730	500
Average number of people per household*	4.7	5.3
Total average water usage per month for whole community	390kl	450kl
Total number of houses for which Shallow Sewer is installed	155	85
Number of houses using system	56	Approx 8 (includes pour flush)
Approx. number of people using sewer system	263	42
Average usage per month for 25 l/capita/day	3.6kl	4.0kl
Cost of average usage per month for 25 l/capita/day	No charge, within 6kl free quota	No charge, within 6kl free quota

* (1).

Table B12 shows household water usage and connections to the sewer but it is unknown how much wastewater enters the sewer.

Affordability at Emmaus: running costs

At Emmaus only 24 out of 85 households have obtained water connections and of those only 6 (7% of the total) have connected to the sewer. Those who have connected to the sewer all earn in excess of R300 per month.

From Graph 1 it can be seen that 15% of households have an income of less than R300 per month, none of which are connected to the Shallow Sewer system. One could assume that these people may have difficulty paying for the running costs associated with this system based on the results in Table 3 of this report whereas all those earning in excess of R300 should be able to pay all costs.

On this assumption, the balance (85%) of all households should be able to pay all running costs. Of these 7% have already connected leaving 78% of the Emmaus community that have not connected but who are able to pay for the running costs associated with the system.

However the people in this community have been expected to also pay R560 water connection fee as well as whatever wet core materials they require to complete their bathrooms, toilets and kitchens and connect to the sewer. They have expressed that this is the main reason why they have not connected to the system. (Appendix I: CAP: *Perception Survey on the Shallow Sewer System at Emmaus, August 2001*)

4.4 Willingness to Pay – Specific Cases

This study is limited to the hypothesis made in the introduction, which is based upon people demonstrating their willingness to pay by actually making payments; by voicing their satisfaction with the sanitation system and by whether or not they agree that it is good value for money.

It is not intended, therefore, to provide a full survey encompassing other documented factors found in a household's willingness to pay.

The results are limited to the criteria selected although some reference is made to other criteria in the conclusions.

The results of specific cases may be found in Table B15: Households **not in arrears** with Payments and Table B16: Households **in arrears** with Payments

Arrears and water cuts for non-payment:

There were no known connections that were cut off due to non-payment of monthly bill.

The data at February 2002 shows that only 3 households (5%) had arrears in excess of R100.00, below which it is not Ethekwini Municipality's policy to cut people off.

The arrears position at February 2002 is shown in Table B13 for various categories of satisfaction vs. arrears position. The survey asked whether they thought the Shallow Sewer system was good value for money. Also those with water but not sewer connections that are also paying the sewerage charge are shown with their arrears. Those that were not connected were not asked whether they were satisfied with the system.

Table B13: Arrears vs. Satisfaction with the System in Shallow Sewer Communities (N= 60)

	Payments up to date (2 months or less in arrears) N= 39 (65%)		Payments at least 3 months in arrears N= 21 (35%)	
Not connected to SS	8 houses		4 houses	
Of those connected:	**Satisfied**	**Good Value**	**Satisfied**	**Good Value**
Yes	61%	61%	70%	65%
No	23%	0%	6%	12%
Neutral / No answer	16%	39%	24%	24%

There are insufficient numbers in each category of this correlation to provide statistical validity; hence these results must be treated with caution.

Attitude of Communities to Payment

Based on the results in Tables B1 and B3 it is presumed that all households are able to pay, as those that earn less than R300 per month have the option of obtaining free water by limiting their consumption.

There does not appear to be any correlation between non-payment and satisfaction or good value. Most of households were satisfied with their Shallow Sewer sanitation and said it was good value for money. However those that were up to date with payments expressed greater dissatisfaction then those who had not paid. This may indicate that those who have paid feel more free to express their views. It is notable that in the category that was up to date with payments, the 23% that were not satisfied with Shallow Sewers did not say they were not good value for money. Only 2 households out of 48 in both categories said that the system was not good value.

4.5 Willingness to Pay – General Comparisons

Table B14: Perception of Sanitation: Shallow Sewer vs. Control Communities

	Test communities (N=49)	**Control communities (N=100)**
Satisfied with waterborne sanitation	71%	86%
Not satisfied with waterborne sanitation	23%	10%
Neutral / No answer	6%	4%
Sanitation good value for money	72%	69%
Sanitation not good value for money	4%	4%
Neutral / No answer	24%	27%

The perceptions in Table B14 show the responses from the Quality of Life surveys.

People in all communities are generally satisfied with their sanitation. (Also see Appendix C: Evaluation of Quality of Life and Customer Satisfaction).

There is no significant difference between “value for money” in the test vs. the control communities.

There is greater dissatisfaction with Shallow Sewers than with conventional sewers and this could be taken as a factor in willingness to pay the monthly service accounts. However this should, perhaps, be re-tested after the system has been in operation for some time and after all teething problems have been dealt with.

Table B15: Households not in arrears with payments (i.e. 2 months or less)

Presumed Income based on all data	Months arrears Feb-02	Satisfied with sanitation	Good value for money	Rands in arrears at Feb-02	Average monthly usage May-02 kl	Average account May-02 R	% of income	Comment
1000	0	v satis	SA	0	3.6	0	0	
1500	0	v satis	SA	0	11.6	22	1	
2000	0	v satis	SA	0	5	0	0	
850	0	v disatis	A	0	1.4	0	0	
850	0	satisfied	SA	0	2.2	0	0	
1200	0	satisfied	SA	0	5.5	0	0	
1500	0	satisfied	SA	0	3.1	0	0	
1500	0	satisfied	SA	0	7.7	8	1	
700	0	satisfied	NAD	0	5.8	0	0	
1000	0	satisfied	NAD	0	6.4	3	0	
1500	0	satisfied	NAD	0	8.2	10	1	
900	0	satisfied	NAD	0	6.0	0	0	bought own wet core
800	0	satisfied	A	0	6.3	3	0	
700	0	satisfied	A	0	3.8	0	0	
1500	0	satisfied	A	0	7.1	6	0	
0	0	satisfied	A	0	2.5	0	0	
2000	0	neutral	no answer	0	7.5	7	0	bought own wet core
1600	0	neutral	no answer	0	4.2	0	0	
300	0	neutral	A	0	6.6	4	1	
600	0	na	na	0	2.1	0	0	not connected to SS
600	0	na	na	0	0	0	0	not connected to SS
ni	0	na	na	0	1.3	0	0	not connected to SS
400	0	na	na	0	6.3	3	1	not connected to SS
900	0	na	na	0	11.3	21	2	not connected to SS
1800	0	na	na	0	6	0	0	not connected to SS
520	0	dissatisfied	NAD	0	6.6	4	1	
500	0	dissatisfied	A	0	1.8	0	0	
1000	1	v satis	SA	34	17.9	45	5	
2000	1	v satis	SA	5	11.2	21	1	
2400	1	satisfied	ni	87	14.5	33	1	
650	1	satisfied	A	3	3.8	0	0	
800	1	dissatisfied	NAD	3	5.5	0	0	
1300	2	neutral	NAD	71	11.1	20	0	
600	2	neutral	A	8	2.8	0	0	
800	2	na	na	35	0	not in use		not connected to SS
1010	2	na	na	245	25.5	73	7	sells water, not connected to SS
900	2	dissatisfied	NAD	11	6.9	5	1	
800	2	dissatisfied	NAD	84	12.2	24	3	
620	2	dissatisfied	A	25	7.0	6	1	

N= 39

Table B16: Households in arrears with payments (i.e. more than 2 months)

Presumed Income based on all data	Months arrears Feb-02	Satisfied with sanitation	Good value for money	Rands in arrears at Feb-02	Average monthly usage May-02 kl	Average account May-02 R	% of income	Comment
ni	4	v satis	SA	184	13.7	30	0	
1200	6	v satis	A	6	9.5	15	1	
450	13	v satis	SA	39	5.6	0	0	
1000	14	v satis	SA	31	0.2	0	0	meter faulty, reading too low
1600	3	v satis	A	110	16.2	39	2	had serious water leak
1500	3	v disatis	RA	60	12.4	25	2	don't use loo as does not flush well due to low pressure
800	4	satisfied	A	30	9.7	15	2	
1500	5	satisfied	SA	15	6.1	2	0	
1200	6	satisfied	SA	80	10.7	19	2	had leak in rt but fixed
1000	8	satisfied	A	69	7.1	6	1	
800	12	satisfied	SA	114	8.6	11	1	
800	14	satisfied	A	31	3.0	0	0	
800	3	satisfied	D	18	9.3	14	2	not connected to SS
1800	4	ni	ni	28	0.9	0	0	
200	4	neutral	NAD	93	8.2	10	5	
600	5	na	na	22	3.8	0	0	not connected to SS
540	8	na	na	20	5.1	0	0	not connected to SS
300	11	na	na	18	1.5	0	0	not connected to SS
1000	4	dissatisfied	NAD	76	ni	59	6	blockage caused by neighbours using system without water
1800	4	dissatisfied	D	42	12.3	25	1	Roof tank fell and broke
1400	9	dissatisfied	NAD	36	9.1	13	1	

N= 21

Codes

SA: Strongly agrees
A: Agrees
NAD: Neither agrees nor disagrees
D: Disagrees
SD: Strongly disagrees
na: Not applicable
ni: No information
RA: Refuses to answer

5. Conclusions

5.1. Ability to Pay

- Affordability does not seem to be a major issue as any household may take advantage of free water by keeping their consumption below 6 kl per month as demonstrated by 45% of the households in the test communities, Brairdale and Emmaus.

- 92% of households in Brairdale and Emmaus were able to pay for their water (and sanitation) service, based on the unconfirmed World Bank benchmark of 4% of the household income.

- 98.5% of households in Brairdale and Emmaus were able to pay for their water and sanitation service, based on the unconfirmed World Health Organisation (WHO) benchmark of 8% of the household income.

- No reliable conclusion could be drawn for total running costs to the customer for their sanitation service. From the data collected on running costs in addition to the monthly accounts (or rates), people in the Shallow Sewer communities paid more in running costs. However, it was noted that these costs were mostly related to the installation of their wet cores and hence this data does not represent true running costs.

- At present only the communities with Shallow Sewers actually pay for sanitation because those in the controls would have been charged through their rates but, as their houses are valued at less the R30 000, they received 100% rebate. 27% of the test communities could not afford 15 kl water per month whereas if they were not paying the Shallow Sewer charge for sanitation, only 19% would not be able to afford it. (A poor household that has internal plumbing may have difficulty managing on the 200 litre free quota per day and would be more likely to use around 500 litres per day (15 kl per month) if they were trying to limit their consumption. This is deemed by EWS to be a comfortable usage for such households).

- Households in Briardale and Emmaus used substantially more water after to the Shallow Sewer intervention but paid less for it.

- 74% of households in Briardale and Emmaus over the period of study limited their average water usage to 10 kl per month. (45% of households used on average 6 kl or less per month).

- Running costs were found to be affordable for sewerage if wet core and connections fees were paid or subsidised. Water connections fees and materials required to make connections to the Shallow Sewers would usually be funded from housing subsidies and should not present an issue in such projects. At Emmaus the community was expected to pay these costs as there were no housing subsidies available and at Briardale the subsidies were not received in time to avoid financial issues. This caused some interference regarding affordability and willingness to pay for the Shallow Sewer system.

- From an administration point of view the municipality concerned, in this case Ethekwini Municipality needs a system that can cope with the small group of people that cannot pay for the Shallow Sewer (or other) system. Within a community there will always be a small group that cannot pay and for whom a management strategy is required.

- 78% of households should be able afford running costs but have not connected at Emmaus because of connection and wet core costs.

- If the 6kl subsidy did not apply 15.5% of households at Emmaus and 27% of households at Briardale could not afford the running costs of the Shallow Sewer system based on a water use of **6kl** per month.

- If the 6kl subsidy did not apply 37.5% of households at Emmaus and 55% of households at Briardale could not afford the Shallow Sewer system based on a water use of **15kl** per month.

- The average cost per household to purchase sufficient water for adequate flushing of the Shallow Sewer system falls within the free quota and, therefore, is affordable to all households.

5.2 Willingness to Pay

- In Briardale and Emmaus 65% of households were up to date with their payments at February 2002. According to our hypothesis this indicates that the majority of people with water connections in the pilot areas are willing to pay for their water and sanitation services.

- In Briardale and Emmaus 35% of households were in arrears at February 2002. It is Ethekwini Municipality's policy only to cut of the water supply once the arrears amount in excess of R100. Only 2 of these had arrears amounts in excess of R100. No incidents of water cuts were expressed.

- There did not appear to be any correlation between non-payment and satisfaction with the system. The only notable differences were:
    - Of those who were up to date with payments and were not satisfied with the system did not say it was not good value and
    - Those who were up to date voiced dissatisfaction rather than neutrality with the system compared with those who were in arrears.

- Non-willingness to pay could not be ascribed to the perceptions about Shallow Sewers. Only 2 households out of 48 households said that the Shallow Sewer system was not good value for money. Hence it could be concluded that non-payment was not due to a negative perception of the value of the system.

- 70% of people in both the Shallow Sewer and control communities were satisfied that their sanitation systems were good value for money and there was no statistical difference between them.

- People in all communities were generally satisfied with their sanitation systems. 86% of people with conventional sewers were satisfied with their systems, whereas 71% of those with Shallow Sewers were satisfied. This could, perhaps, be considered as a factor in willingness to pay the monthly service accounts. However only by re-testing after the system has been in operation for some time will it be clear whether the marginal increase in dissatisfaction was due to teething problems.

The subject of "willingness to pay" is complex and although this research may provide some insight, other researchers have found that there are many other contributing factors to non-payment for water such as:
According to McDonald and Pape (8)

- "Ignorance" of how the system works: (pages 54, 106)
- "Culture of non-payment" (pages 54, 167)
- "Non-employment": those who are unemployed expect to receive water as a basic right without having to pay as they say they are unable to pay and municipalities should understand this. (page 106) and
- Flat rate vs. water meters: some are opposed to meters because they cannot budget for a variable amount. (page 106)
- Sotshogaye and Miller (15) explain "Entitlement culture": "water is free in nature and traditionally people did not expect to have to pay for it having always obtained it from rivers. Rural people also expect to live a better life like their counterparts who have gone to the cities yet they do not expect to pay for services like water"

Some of the literature studied states that the greatest factor in non-payment for water services is affordability, which may contradict the findings of this research.

The results in this report convey preliminary results on the Shallow Sewer system that may change once the system is entrenched and once all the teething problems have been dealt with.

6. Way Forward

If more detail is required about community perceptions then “focus groups” should be used a research tool, in addition to surveys. The “focus group” method is a participatory method that investigates deeper-seated attitudes through community dynamics. Small groups of people are selected from the community to discuss issues being researched. (8)

A study on running costs should be undertaken over a longer period of time in both Shallow Sewered and conventional sewered communities. This would best be done once the EWS has instituted collection of sewerage payments on the same basis as the Shallow Sewered communities are charged.

If a more complete investigation of willingness to pay were required it would be helpful to do a literature search and expand the scope of the investigation.

For confirmation of these preliminary results further studies should be undertaken at least one year after the system has been entrenched.

Appendix C

Evaluation of

Quality of Life

AND

Customer satisfaction

November 2002

QUALITY OF LIFE AND CUSTOMER SATISFACTION

1. Introduction

As part of the appraisal of the **acceptability** of the waterborne Shallow Sewer system (WSSS) to the local authority and to the user, the following hypothesis was made:

> *The WSSS owners are equally or more satisfied with their systems than people from similar communities who have been supplied with conventional water-borne sanitation*

The intention was to compare the Shallow Sewer system, installed in the pilot study areas of Emmaus and Briardale, with the conventional waterborne sanitation that had been installed in similar communities in Ethekwini. If it could be shown that the communities accepted the Shallow Sewer system as well as they did the conventional type then the Municipality could more confidently offer Shallow Sewers as an alternative system.

It was also planned to measure any changes in the Shallow Sewered communities' levels of satisfaction and improvement in quality of life over a two-year period in order to investigate what the longer-term effects of using the system were. However, the project faced a number of delays that restricted the time available to achieve this, and consequently the time between the 'before' and 'after' evaluations was ten months.

Selection of Control Communities
Control communities of similar social background as the test communities, who had been provided with conventional waterborne sewerage, had to be found in the same geographical areas to compare the acceptance of the two sanitation systems.

There appeared to be little detailed information on the communities in Ethekwini and even on the exact levels of service, but, with the help of Urban Strategy, Municipality Planning Engineers, Ethekwini Municipality Enviro-Health and the Inner West Health Department, Nazareth near Pinetown was selected as a control for Emmaus, and Riverdene in Newlands West, for Briardale.

Background on Pilot Communities
The Briardale community consisted of 155 families who were part of a green fields housing development that was being managed by an NGO (People's Dialogue) in association with The Homeless People's Federation. The NGO was processing an application to the Provincial Housing Board, through the Ethekwini Municipality Housing Department, for housing subsidies. For the duration of this research the application had not been successfully processed for a variety of legal and land issues. In the meantime approximately 65 houses were built using the proceeds of loans to the community and their savings. The People's Housing Process was used where people build their own houses thereby enabling larger houses to be built for the subsidy amount. During the research period 55of the houses built had been supplied with their own water connections. However, those in the community who had not received houses or water were highly dissatisfied with the situation and the community as a whole was unhappy with the management of the housing process, which was long overdue for completion. The pilot study intervention was undertaken in accordance with the overall management by People's Dialogue.

In Ethekwini there are three levels of water service. The first is the conventional full pressure service that has no physical restrictions. The second level is a semi-pressure supply, which is provided at a much-reduced cost for connection and tariff, but the house must be fitted with a 200-litre roof tank in order to reduce the operational pressure of the water supplied. The lowest level is the 200-litre ground tank that is filled once daily thus limiting consumption to 6kl/month.

The Emmaus community was divided in their acceptance of the level of water supply. There was a significant section (approximately 33%) that was far more affluent than the rest, who wanted full pressure water and who tried to influence the poorer people to use the full-pressure water supply. The poorer sector could not afford full pressure and, by a majority vote, it was agreed that the

entire community would be supplied with semi-pressure water and roof tanks. Ethekwini Municipality had a policy that, for technical and financial reasons, only one type of water supply could be provided to a community. As a result those who could afford full pressure were unhappy and did not support the Shallow Sewer system, which had been linked as a service package to the semi-pressure water supply. In addition the Emmaus community had already used their housing subsidies and therefore did not have funding available to them for water connection fees and materials that they needed to connect to the Shallow Sewer.

Hence in both communities there were some feelings of discontent, however both communities had expressed great desire and willingness to participate in this pilot study. A social scan (1) undertaken prior to the intervention indicated that these two communities were the most suitable choices for the study.

2. Methodology

The steering committee, representing the partners of the pilot study and interested parties, put forward the following indicators of satisfaction, which were included as direct questions in the quality of life survey questionnaire.

It was investigated whether the community perceived upliftment and improvement in lifestyle from the Shallow Sewer system with respect to:

- Satisfaction with the sanitation service provided
- Ease of use and ease of maintenance
- Value for money
- Number of hours saved per day
- Perceived benefits such as health, convenience, status, value of property

The Urban Strategy Department of the Ethekwini Municipality was conducting an intensive long-term research programme to assess the quality of life in all communities in its area of jurisdiction. In order to evaluate customer satisfaction and quality of life in the test communities, Urban Strategy was consulted and their well-developed questionnaire and data analysis was modified where necessary for this purpose.

General satisfaction of the Briardale and Emmaus communities were compared with results obtained by Urban Strategy for similar communities in Ethekwini. Results from the controls were compared with those from the test communities.

Development of Questionnaire

The quality of life questionnaire was adapted by the research manager in liaison with Urban Strategy and the data analysis specialist from the University of Natal, Ethekwini who was involved with the Urban Strategy research. Irrelevant sections were discarded and specific questions relating to sanitation were added. Certain health-related questions were included to satisfy the research programme. The resulting questionnaire was revisited by the data analysis specialist who made the required modifications to the questionnaire and to the Access database provided by Urban Strategy.

Collection of Data

Data was collected by various means, the prime source being through two surveys that were undertaken in 2001 and 2002. The surveys were undertaken at the two test communities, Emmaus and Briardale, and at the two controls, Nazareth and Riverdene.

The field survey work was outsourced to Community Awareness and Promotions (CAP) who provided suitably qualified and experienced field staff, data capture resources, supervisors and trainers.

The research field assistants also visited the test sites on a regular basis throughout the period of the research, November 2000 to May 2002 to obtain feedback, by observation and interview, from the residents on their progress, problems and issues.

The first quality of life survey was undertaken 2001. The questionnaire used in the first survey (Appended in Annexure C1) was modified slightly to avoid the same field errors when conducting the 2002 survey. An abbreviated questionnaire was also produced for use at households that were being revisited in 2002. The abridged survey intended to follow up on specific data related to the use of the Shallow Sewer system whilst eliminating the general details that had already been provided the previous year in an effort to reduce survey fatigue to the community members. The question asking for income, which people do not like to divulge, was omitted.

In the first survey, houses were sampled at random in both the control and test areas. However, as the number of households using the Shallow Sewer system was limited, data had to be collected from each house with a water or Shallow Sewer connection in the second survey to provide the maximum data available.

The first batch of results did not have enough data on those connected to the sewer to give statistically valid results due to the low connection rate to the system. During March - April 2002 substantially more connections were made. The second survey served to collect as much data as possible on newly connected houses to combine with the first set to give valid comparisons.

The same sample sizes were used in the test and control areas in order that overall the results could be compared, “test” vs. “control”, with similar exposure of two communities per group. However, because not all those surveyed in the test areas had connected to the Shallow Sewers and because some of them were repeated, there are fewer ‘test connected’ than ‘control connected’. Houses in the control communities were not revisited.

Bonisiwe Mkhize, an independent social facilitator used by LIMA in the Shallow Sewer intervention, visited the community leaders to prepare the way for the Community Awareness and Promotions (CAP) staff to undertake the survey. CAP, in addition to their own staff, used the research field assistants in order for them to gain valuable experience in formal surveys.

3. Results:

By November 2000 the Shallow Sewers had been completed in Briardale and Emmaus (apart from one condominium at Briardale that was delayed while a police station was removed). The project team connected two ‘show houses’ to the sewer for demonstration and training purposes.

The period of study of satisfaction and quality of life ran from November 2000 until May 2002. However due to the slow connection rate to the sewers, only a few households were connected early in the programme and the majority were connected between July 2001 and April 2002. A large batch that had difficulty with their plumbing and wet cores were given assistance by WSSA to connect in April 2002.

The controls selected turned out to be good choices. Nazareth has a mixture of very poor to relatively wealthy occupants, as does Emmaus, while Riverdene’s population has average to poor incomes, as does Briardale. Also the length of time the people have lived in their homes is similar, with Briardale and Riverdene inhabitants being fairly new (1-3 years) and Nazareth and Emmaus usually having occupied their homes at least 5 years. The type of home in Riverdene, however, is smaller than in Briardale.

However, the general impression from the research field assistants about Nazareth was that it is much better quality than Emmaus and the area is cleaner inside and outside the houses. Even the outside toilets are kept clean. They described it as “the best standard of living”.

It was found at Riverdene that, although they are supposed to be using roof tanks, many people had bypassed them because they had problems with them.

3.1 Satisfaction Indicators through Surveys

The results from the quality of life surveys were compared to evaluate the difference in satisfaction levels between people using Shallow Sewer and those using conventional sewers.

In order to obtain statistically reliable results, categories of responses were combined. Hence, in Table C1, the positive responses 'strongly agree' and 'agree' have been combined, as have the neutral and negative responses. Where it was useful to do so, the separate categories have been discussed later.

Table C1: Satisfaction Indicators: Test communities vs. control communities

		Conventional sewers (N=100)	Shallow Sewers (N=53)
Are you **satisfied** with your sanitation system?	**Yes**	**86%**	**71%**
	No / don't know	14%	29%
The system is **easy to use**	**Yes**	**96%**	**91%**
	No / don't know	4%	9%
The system is **easy to maintain**	**Yes**	**92%**	**77%**
	No / don't know	8%	23%
The system is **good value** for money	**Yes**	**70%**	**72%**
	No / don't know	30%	28%
Do you notice **savings in time**?	**Yes**	**94%**	**96%**
	No / don't know	6%	4%
Is **improved health** a benefit of using the system	**Yes**	**93%**	**96%**
	No / don't know	7%	4%
Is **convenience** a benefit of having the system	**Yes**	**92%**	**96%**
	No / don't know	8%	4%
Is **improved status** a benefit of having the system	**Yes**	**79%**	**85%**
	No / don't know	21%	15%
Does the system increase **value** of the property?	**Yes**	**70%**	**87%**
	No / don't know	30%	13%

Table C1 shows that the majority of households were satisfied with their sanitation systems whether they were Shallow Sewers or conventional. Positive responses were received for all the indicators measured.

When comparing how that Shallow Sewers fared against conventional, all responses except four were similar. The differences measured were:

- 86% of people were satisfied with conventional sewers compared with 71% who had Shallow Sewers
- 92% with conventional sewers compared to 77% with Shallow Sewers said they were easy to maintain
- More people with shallows sewers perceived the benefits of improved status and increased value of property than their counterparts with conventional sewers.

The latter observation could perhaps be due to the extremely poor background of the Briardale people who were previously homeless, being more appreciative or perhaps because those with conventional sewers have had less intervention and do not consider sanitation to be such an issue.

Although the community noticed savings in time by having waterborne sanitation, they found it difficult to give the numbers of hours saved. Quantification was therefore not possible.

It is understandable that fewer people were happy with Shallow Sewers because they were still experiencing teething problems with the system. It was also too early to know how easy Shallow Sewers will be to maintain in the longer term, as few blockages had occurred since the system was cleaned out in April before the hand-over to the Ethekwini Municipality. As part of this pilot study design the householders were required to clean their grease traps regularly, which people with conventional sewers did not seem to do. Perhaps this indicates that Shallow Sewers with grease traps, although more onerous, may cause fewer blockages in the Municipality's sewerage system.

The design of the grease traps could, perhaps, be altered to reduce the workload on the householder.

It was interesting to note that such high percentages of householders were satisfied with their systems in spite of the teething problems and the general housing problems at Briardale.

Comparison with Other Ethekwini Communities

A comparison was made using Urban Strategy's 2001-2002 data on 632 households from 19 similar communities (settlements). The table below indicates levels of satisfaction with the various types of sanitation in these communities.

Table C2: Satisfaction with Sanitation in other Ethekwini Communities (2001-2)

Sanitation Type	% with Type	% Satisfied	% Neutral	% Dissatisfied
Full Flush	59.7%	74.5	5.5	20.0
Septic Tank	16.9%	85.4	4.9	9.7
Improved Pit Latrine	2.1	40.0	20.0	40.0
Basic Pit Latrine	16.0	51.3	5.1	43.6
Chemical Toilet	2.9	85.7	0.0	14.3
None	0.8	50.0	50.0	0.0
Other	1.6	50.0	0.0	50.0
All Types	**100.0%**	**71.7**	**5.8**	**22.5**

When compared with other communities, the pilot study controls were more satisfied (86%) with their sanitation than was found in the wider perspective, demonstrated above (74.5%). The Shallow Sewer communities' satisfaction (71%) was almost on a par with this finding. Overall satisfaction with all types of sanitation was 71.7%.

3.2 Changes in Attitude after using Shallow Sewers for Ten Months

To evaluate any changes in satisfaction with the Shallow Sewer system, the same households were interviewed at Briardale and Emmaus to find out how their perception of the system had changed over time. Because of the slow connection rate to the sewers this evaluation was done over a ten-month period instead of over a two-year period, as intended.

Of the 37 cases available, 32 were in Briardale and 5 were in Emmaus.

Table C3: Satisfaction Indicators: Test communities 'before' and 'after'

	(N=37)	Shallow Sewers 2001 'before'	Shallow Sewers 2002 'after'
Are you **satisfied** with the Shallow Sewer waterborne system?	**Very satisfied**	**6%**	**20%**
	Satisfied	**53%**	**56%**
	Neutral	18%	9%
	Dissatisfied	23%	15%
The system is **easy to use**	**Strongly agree**	**17%**	**39%**
	Agree	**71%**	**46%**
	No / don't know	12%	15%
The system is **easy to maintain**	**Strongly agree**	**6%**	**39%**
	Agree	**77%**	**39%**
	No / don't know	17%	21%
The system is **good value for money**	**Strongly agree**	**12%**	**39%**
	Agree	**59%**	**27%**
	No / don't know	29%	33%
Do you notice **savings in time**?	**Yes**	**94%**	**97%**
	No / don't know	6%	3%
Is **improved health** a benefit of using the system	**Yes**	**100%**	**97%**
	No / don't know	0%	3%
Is **convenience** a benefit of having the system	**Yes**	**82%**	**97%**
	No / don't know	18%	3%
Is improved **status** a benefit of having the system	**Yes**	**53%**	**91%**
	No / don't know	47%	9%
Does the system increase **value** of the property?	**Yes**	**71%**	**85%**
	No / don't know	29%	15%

Some results that are statistically not valid have been included to show trends

Probably the most significant result was that satisfaction with the system increased from 59% to 76% over the ten-month period in spite of the teething problems that were being experienced at the time of the second survey. During this time the neutral and negative responses dropped from 41% to 24%.

100% of respondents using the Shallow Sewer system stated that their health was improved by having the system. Only one respondent said in the second survey that this was not the case.

The following changes in the perceptions of people using the Shallow Sewer system since they first connected (2000-2001) and mid-2002 were recorded.
Positive responses increased from

- Convenience: 82% to 97% and status: 53% to 91%
- Value of property: 71% to 85%
- Savings in time: 94% to 97%

After using the system for a ten-month the following minor negative changes were recorded:

- Ease of use: 88% to 85%
- Ease of maintenance: 83% to 79%
- Good value for money: 71% to 67%

These positive trends may have been influenced be the training and education provided. Throughout the period November 2000 to November 2001, Water and Sanitation Services (WSSA) provided a staff presence for regular liaison and assistance. (Natasha Khumalo for technical assistance and Bonisiwe Mkhize for social issues). During this time ten community members were given intensive plumbing training for seven days to provide skills to the community.

Other benefits

The only other benefit that was given was by a respondent in Briardale who said that the yard was cleaner after the waterborne sewerage was installed.

3.3 Other Problems with Sanitation

All householders were asked of they had encountered any other problems with their sanitation system. If they had problems they were asked to describe them.

Table C4: Sanitation problems: Test communities vs. control communities

		Conventional sewers	Shallow Sewers
Did you have a drain **blockage**?	**Yes**	**14% (N=14)**	**14% (N=7)**
	No	86% (N=86)	86% (N=46)
Any **other problems** with your sanitation system?	**Yes**	**18% (N=17)**	**27% (N=10)**
	No	82% (N=80)	73% (N=43)

The frequencies of blockages in the systems were reported to be identical for both conventional and Shallow Sewer systems.

Those with Shallow Sewers complained of leaking roof tanks or pipes (2 cases); low water pressure (6 cases); and broken parts (3 cases).

Those with conventional sewers complained of leaking roof tanks or pipes (12 cases, 71%); low water pressure (2 cases); water disconnection (2 cases); tenants abuse (1 case); blockage (1 case) and broken parts (1 case).

At the end of the survey all respondents were asked whether any other important issues about sanitation or water had been left out. The results given are shown below

Table C5: Other important water or sanitation issues

		Conventional sewers	Shallow Sewers
Other water or sanitation issues	**Yes**	**78%**	**38%**
	No	24%	62%

There was a surprising difference in the number of households in the control communities (78%) that had other related issues compared with those in the Shallow Sewer communities (38%). This may be a direct consequence of the training and depth of social intervention employed in the Shallow Sewer methodology.

In the control communities, 91% of the complaints related to toilets, water or rates being too expensive; 8% were structural problems such as sewers being too close to the house and toilets being outside; and 1 case regarding ‘compensation’ but in regard to what is not known.

In the Shallow Sewer communities 30% of the complaints related to toilets or water being too expensive, 35% to structural problems such a complaints that the pipes were too small, 25% to low water pressure and 2 cases (10%) to unhealthy smells with the system.

High water bills were sometimes reported as being related to leaks that were not dealt with.

3.4 General Satisfaction in Shallow Sewer Communities in relation to similar Communities in Ethekwini

> *"Good community services and facilities improve the quality of life of everyone in the community"* (10):

Reference has been made to the publication by Jillian Nicholson: *Quality of Life of Ethekwini's People:* Urban Strategy, 2000 (10) which identifies the important factors that determine the satisfaction of Ethekwini's residents. The following extracts apply to Ethekwini's population as a whole:

- Living in formal housing plays major role although only 55% were satisfied with their houses built using Provincial Housing Board subsidy funds
- Employment is one of the most key issues to general satisfaction with life
- 52% of household heads were unemployed
- Only 54% of people had access to sanitation
- Out of 32 services, people ranked water supply second in terms of satisfaction

In the Shallow Sewer pilot study sanitation and housing were available to all those who were surveyed. Both test and control communities had good access to health facilities but not to infrastructure. Significant differences that would impact of the general satisfaction of communities were noted as follows:

- Public telephones, electricity, street lighting, road surfaces, traffic flow, storm water drains, signposting, pedestrian safety / pavements were perceived as causes of general dissatisfaction in the Shallow Sewer communities. This was due to the housing development and infrastructure delays experienced in Briardale.

- Minibus transport was good in both test and control areas, while bus transport was better in the test areas. Crèches and sports facilities were required in both test and control communities.

General Satisfaction with Life

Satisfaction with life in general was compared for the pilot study communities vs. 19 settlements: Table C2 (Urban Strategy data 2001-2002):

- 19 communities with various types of sanitation: 20%
- Communities using Shallow Sewers: 39%
- Pilot study controls with conventional sewers: 42%

3.5 Results obtained by means other than Surveys

Surveys should not be taken as the only indication of the community's response.

On the last day of the 2002 survey, the field team supervisor was prevented from going to the final two households. Two community members approached him and asked him to stop the surveys as they said the surveys were not helping development in the area. They said the surveys did not help the project to move forward and that they were concerned about people giving negative feedback about the development committee that would also hinder progress in the area.

Undertaking of surveys for the research was a condition of the intervention. The hidden meanings and agendas of these people are unknown but this action shows mistrust and non-cooperation. These people were part of the plumbing team and as far as was known there was no development or other committee operating in Briardale.

In the same week these two community members with one other approached Ethekwini Water Services asking them to remove the Shallow Sewers as they were not working. The Municipality official asked them what authority they had to represent the Briardale community and referred them onto their councilor.

In October 2002 certain members of the Briardale community reported to the Municipality Health officials that they were highly dissatisfied with the Shallow Sewers. Representatives of the project partners EWS and WSSA went to investigate after a report from the health officials that, in its present state, they felt the system had failed.

On examination it was felt that the complaints were largely housing plumbing problems, rather that Shallow Sewer issues, which urgently needed to be resolved.

It was interesting to note that when people were interviewed individually they did not usually support what was being given as the community's point of view expressed by leaders at community meetings.

4. Conclusions

- Conventional and Shallow Sewers were both received favourably by the communities surveyed.
- 86% of households surveyed in the communities, Nazareth and Riverdene were satisfied with their conventional sewers and 92% said they were easy to maintain.
- By comparison 71% of households surveyed in the communities, Briardale and Emmaus were satisfied with their Shallow Sewers and 77% said they were easy to maintain.
- More people with shallows sewers perceived the benefits of improved status and increased value of property than their counterparts with conventional sewers.
- The other satisfaction indicators measured, ease of use, savings in time, improved health, and convenience were similar for both conventional and Shallow Sewer communities.
- All communities agreed that there were savings in time by having waterborne sanitation but found it difficult to quantify.
- The households that were re-visited after ten more months of using the system expressed an increase in satisfaction with the system from 59% to 76%, in spite of the teething problems that were being experienced at the time of the second survey. During this time the neutral and negative responses dropped from 41% to 24%.
- Over a ten-month period there were positive changes in the perceptions of the people who were using the Shallow Sewer system in respect of convenience, savings in time, status and value of property.
- After using the Shallow Sewer system for a ten-month period, slightly fewer people said that they were easy to use and maintain or that they were good value for money.
- 100% of people interviewed stated that their health was improved by having the Shallow Sewer system. Only one householder said in the second survey that this was not the case.
- Blockages were reported to have occurred in 14% of households in both the test and control communities.
- It was notable that significantly more householders with conventional sewers (78%) had additional complaints about water and sanitation than those with Shallow Sewers (38%). This may be a direct consequence of the training and depth of social intervention employed in the Shallow Sewer methodology.

- The leading complaints in both controls and test communities were that water/rates/toilets were too expensive and that they had structural problems, such as sewers being too close to the house, that toilets were outside (controls only), that pipes were too small and that they experienced low water pressure and leaks.

- Access to health services was good in both the control and test communities but access to infrastructure such as electricity, street lighting, road surfaces, traffic flow, storm water drains, signposting, pedestrian safety / pavements and public telephones was not available to people in the Briardale community thereby causing general dissatisfaction in the Shallow Sewer communities.

- Satisfaction with life in general was higher in the control communities with conventional sewers (42%) and in the Shallow Sewered communities (39%) than in the broader perspective in 19 other communities in Ethekwini (20%)

- Satisfaction with sanitation in the pilot study (Shallow Sewers 71% and conventional sewers 86%) compared favourably with that in the broader perspective of 72% in 19 other communities.

- The Shallow Sewer system overall appears to be a promising alternative to conventional sewers in terms of providing customer satisfaction and improvement in quality of life, although the indicators of satisfaction and ease of maintenance should be reviewed to confirm this, once the housing problems have been resolved.

5. Way Forward

It is recommended that the following steps be taken:

5.1 The communities at Emmaus and Briardale should be revisited to ask whether they are satisfied with their Shallow Sewers and whether they are easy to maintain after a settling in period and once the housing problems have been resolved at Briardale. (It would be preferable to evaluate the communities annually to confirm their sustained support).

5.2 Request that Urban Strategy includes Briardale and Emmaus in one of its annual surveys that take place each November. Evaluate the results in terms of other similar communities.

5.3 If it is found that the communities are still dissatisfied with cleaning their grease traps that a change of design be considered to make the task less onerous.

5.4 Undertake further studies on comparing blockages that occur in Shallow Sewered and conventionally sewered communities to evaluate whether the design of Shallow Sewers with their grease traps is more effective in preventing blockages in the community's sewers as well as protecting the city's sewers.

ANNEXURE C1

Questionnaire used to collect community data

For Quality of Life Surveys

THIS QUESTIONNAIRE WAS ADAPTED FOR THE SHALLOW SEWER PILOT FROM A QUESTIONNAIRE DEVELOPED BY URBAN STRATEGY, A DEPARTMENT OF ETHEKWINI MUNICIPALITY, WHICH IS USED FOR THEIR QUALITY OF LIFE SURVEYS.

THE RESEARCH TEAM WISHES TO ACKNOWLEDGE AND THANK URBAN STRATEGY FOR THEIR ASSISTANCE AND SUPPORT.

Durban Shallow Sewer Pilot Project

QUALITY OF LIFE SURVEY 2
QUESTIONNAIRE - MAY 2002

IN THE

PILOT STUDY COMMUNITIES: BRIARDALE AND EMMAUS
AND CONTROL AREAS RIVERDENE AND NAZARETH

OF THE
DURBAN METROPOLITAN AREA

A JOINT VENTURE BETWEEN

DURBAN METROPOLITAN WASTEWATER SERVICES, WATER AND SANITATION SERVICES (SOUTH AFRICA) AND THE WATER RESEARCH COMMISSON

Introduction

Hello. Your household has been selected to participate in the Shallow Sewer Quality of Life survey. The survey aims to obtain your views on the performance of the services provided and how this affects the quality of your life.

Your assistance in this survey would be appreciated. A report will be compiled in such a manner that it cannot be traced back to any individual. The completed report will be made available so that you will be informed of the results.

Interviewer Name:								
A) **Record Number**. To be completed by Data Capture								
B) Settlement								
C) No of households at this visiting point								
D) Number of people at the selected household (fill in this after the roster is complete)								

Visiting Point address and telephone number (House number or street address)

_____

At Emmaus or Briardale: Surname and water meter number

_____

Record of visits to selected household:

	Date	No one at home	Refusal	Respondent not at Home	Interview Complete
First Visit		1	2	3	4
Second Visit		1	2	3	4
Third Visit		1	2	3	4

Back check	Yes 1	No 2	Date
Quality check	Yes 1	No 2	
Supervisor's Name			

For Fieldwork Company use Date

Prepared for data capture	Yes 1	No 2	
Data captured	Yes 1	No 2	

Acknowledgements:
This questionnaire was derived from the Urban Strategy Quality of Life Survey.

E) Which type of dwelling does this household occupy? (Interviewer mark from observation)
All answers should be 1, houses

House or formal structure on a separate stand **DO HOUSES ONLY**	1
Other: please specify	10

AT EMMAUS AND BRIARDALE ONLY:

E1: Is your house fully connected to the Shallow Sewer?	YES	PARTLY	NO
E2: If they do not have a direct connection to the sewer from bathroom or kitchen do they still use the sewerage system? I.e. Do they put anything into the inspection chambers etc.		YES	NO
E3: If yes give details.			
E4: If E2 is YES what is causing the delay in connecting to the Shallow Sewer system?			

K) Economic Household Roster ONLY DO THIS IF NOT DONE PREVIOUSLY- see list

	Name	A	B	C	D	E	F	G	H	H.1	I
Roster no		Age in years	Gender M=1, F=2	Relationship to head of household (CODE)	Employment status (CODE)	What work do you do? (print)	Work Code **(for office use)**	Do you do any other work? (print)	Monthly Income brought into home (Rands)	Income Refused To Answer	Highest level of education (CODE)
1										1	
2										1	
3										1	
4										1	
5										1	
6										1	
7										1	
8										1	
9										1	
10										1	
11										1	
12										1	
13										1	
14										1	
15										1	

(Note here the roster number of any members of the household who were over 18 but were too ill to be interviewed_____, _____)

L) Total Monthly Income for this household (calculated by Research Team)

R

La) What was the total household expenditure in the last month? **ASK FOR EVERYONE**
Include everything that the household and its members spent money on, including food, clothing, transport, rent and rates, alcohol and tobacco, school fees, entertainment and any other expenses.

1	R0 – R199
2	R200 – R399
3	R400 – R599
4	R600 – R799
5	R800 – R999
6	R1 000 – R1 499
7	R1 500 – R1 999
8	R2 000 – R2 499
9	R2 500 – R2 999
10	R3 000 – R3 999
11	R4 000 – R4 999
12	R5 000 – R9 999
13	R10 000 or more
14	Don't know
15	Refuse

Biographical information

(INTERVIEWER PLEASE OBSERVE AND MARK THE ANSWERS TO QUESTIONS 1 AND 2 . FOR QUESTIONS 3 AND 4 COPY THE DETAILS FROM THE HOUSEHOLD ROSTER. THEN ASK THE RESPONDENT FROM QUESTION 5 AND MARK THE RESULTS)

1 To which group does the respondent belong? Q* 1onlyNOT NECESSARY

1	Black	2	Asian	3	Coloured	4	White

2 What is the respondents' gender

Male	1	Female	2

3 What is the respondents' age in years._____

4 What is the respondents' household roster number?_____
4.1 What is the respondents' Education?_____
4.2 What is the respondents' Income?_____

ASK THE RESPONDENT FROM QUESTION 81 overleaf

Health

81. When someone is sick in this house what <u>usually</u> happens? Go to…

Public hospital	1
Public clinic	2
Public other	3
Private hospital	4
Private clinic	5
Private doctor/specialist	6
Traditional healer (e.g. Sangoma, Inyanga)	7
Pharmacy/chemist	8
Health facility provided by employer	9
Alternative medicine (e.g. homeopathist)	10
Other	11
Don't know	12

82. Is anyone sick at the moment?

Yes	1
No	2

82a. If yes, then give details:

				Symptoms				
Roster #	Name	Age	Sex	Coughing	Vomiting	Stomach pains / diarrhoea	Not eating	Other, specify
				1	2	3	4	5
				1	2	3	4	5
				1	2	3	4	5
				1	2	3	4	5
				1	2	3	4	5

83. If there are babies living on the property, who baths them?

Roster #	Name of person bathing the babies	Age	Sex

84. How are the babies bathed?

		Yes	No	Give details
A	Is clean, fresh water used for bathing the baby	1	2	
B	Is the water disposed of after the bath?	1	2	
C	Is more than one baby bathed in the same water?	1	2	
D	Is the bath water used for anything else i.e. for washing cloths, dishes, vegetables?	1	2	
E	What type of soap is used?			

Household Services

53. What type of toilet facility is available in this house?
Except at Emmaus all ANSWERS SHOULD BE 1 OR 8 – ELSE THIS IS THE WRONG HOUSE

Full Waterborne Flush toilet (off site disposal)	1	Chemical Toilet	5
Septic Tank (on site disposal)	2	None	6
Ventilated Improved Pit Latrine	3	Other, specify:	7
Basic Pit Latrine	4	Shallow Sewer Waterborne Flush Toilet (off site disposal)	8

If the answer to 53 is 1 (Full Waterborne Flush toilet), please answer 53a, 53b and 53c.
If the answer to 53 is 8 (Shallow Sewer Waterborne Flush Toilet), please answer 53a, 53b and 53c.

53 a. How satisfied are you with this water-borne sewerage system?

Very satisfied	1
Satisfied	2
Neither satisfied nor	3
Dissatisfied	4
Very dissatisfied	5

53 b. Consider the following statements related to the water-borne sewerage system and indicate your level of agreement or disagreement.
SA Strongly agree; A Agree; NAD Neither agree nor disagree; D Disagree; SD Stongly Disagree; RA Refuse

		SA	A	NAD	D	SD	RA
1	The water-borne sewerage system is easy to use.	1	2	3	4	5	6
2	The water-borne sewerage system is easy to maintain.	1	2	3	4	5	6
3	The water-borne sewerage system is good value for money.	1	2	3	4	5	6

53 c. Do any of the benefits listed in the table below apply to you subsequent to having water-borne sanitation?

	YES	NO	Don't know		Record all comments made
1. Savings in time	1	2	3	If yes now many hours per day?	
2. Improved health	1	2	3		
3. Convenience	1	2	3		
4. Status	1	2	3		
5. Value of property	1	2	3		
6. Other, please specify	1	2	3		

53 d. Are there any running costs associated with the Shallow Sewer system other than the monthly Metro account? GET ANSWERS DO NOT PUT N/A. IF NOTHING SPENT PUT ZEROS

Running Costs		**Amount (R)**
Maintenance Costs	Hiring outside services, ie plumber, builder, Metro If yes list:	
	Tools, equipment: If yes list	
	Materials	
	Other (specify)	
Other Costs (specify)		

53 e. Who cleans the toilet?

	No-one *(circle 1 if no-one cleans toilet)*	1	
	If people in hh clean toilet please give details below		
Roster #	Name of person cleaning the toilet	Age	Sex

53 f. Can you remember when you last had a drain blockage?

Can't remember	-1
Number of days ago	
Never had any	0

53 g. If you had a drain blockage who cleared the blockage?

Roster #	Name of person clearing the blockage	Age	Sex

53 h. Have you encountered any other problems with your water-borne sanitation?

Yes	1
No	2

If you answered YES please list all problems and give details:

54. How is the refuse or rubbish of this household disposed of?

Refuse bags removed from the house by local authority at least once a week	1
Refuse bags removed from the house by local authority, less often	2
Removal by local authority from community refuse container	3
Placed on communal refuse dump but not collected by local authority	4
Placed on own refuse dump but not collected by local authority	5
Other means of removal: specify: (ie burnt in pit)	6
No refuse removal	7

55. What is the main water source for this household?
ALL SHOULD HAVE OWN METERS

Piped water from own meter	1
Ground tanks next to the house (bailiff operated)	3
Community standpipe	4
Borehole / rainwater tank / well	5
Dam / river / stream / spring	6
Other: (describe)	7
Water collected from neighbours house	8

55 a Does anyone in the family have responsibility of regularly cleaning the tap handles and spouts?

Yes	1
No	2

56. What type of electrical supply does this house have?

Dwelling has electricity (with conventional meters)	1
Dwelling has electricity (with prepaid card)	2
Dwelling does NOT have electricity	3

56 a. Who does the cooking?

Roster #	Name of person who does the cooking	Age	Sex

Services in your Community/Suburb

8 How satisfied are you with these services in your community/suburb?

First indicate if the respondent has access to the service. If they do have access then indicate satisfaction. Very satisfied (VS), satisfied (S), neither satisfied nor dissatisfied (NSD), dissatisfied (D), very dissatisfied (VD), Refuse to answer (RA)?

	ACCESS YES/NO		VS	S	NSD	D	VD	RA
1. Public telephones	Y	N	1	2	3	4	5	6
2. Postal deliveries	Y	N	1	2	3	4	5	6
3. Post office	Y	N	1	2	3	4	5	6
4. Police services	Y	N	1	2	3	4	5	6
5. Hospital	Y	N	1	2	3	4	5	6
6. Private health services	Y	N	1	2	3	4	5	6
7. Clinic	Y	N	1	2	3	4	5	6
8. Ambulance	Y	N	1	2	3	4	5	6
9. Fire Department	Y	N	1	2	3	4	5	6
10. New Low Cost Housing	Y	N	1	2	3	4	5	6
11. New High Cost Houses	Y	N	1	2	3	4	5	6
12. Water supply	Y	N	1	2	3	4	5	6
13. Electricity supply	Y	N	1	2	3	4	5	6
14. Street lighting	Y	N	1	2	3	4	5	6
15. Road surfaces	Y	N	1	2	3	4	5	6
16. Traffic flow	Y	N	1	2	3	4	5	6
17. Storm water drains	Y	N	1	2	3	4	5	6
18. Signposting of roads	Y	N	1	2	3	4	5	6
19. Pedestrian safety	Y	N	1	2	3	4	5	6
20. Pavements	Y	N	1	2	3	4	5	6
21. Parks or recreational open space	Y	N	1	2	3	4	5	6
22. Sports facilities	Y	N	1	2	3	4	5	6
23. Libraries	Y	N	1	2	3	4	5	6
24. Education facilities	Y	N	1	2	3	4	5	6
25. Community Halls	Y	N	1	2	3	4	5	6
26. Bus transport	Y	N	1	2	3	4	5	6
27. Train service	Y	N	1	2	3	4	5	6
28. Mini bus taxis	Y	N	1	2	3	4	5	6
29. Noise pollution control	Y	N	1	2	3	4	5	6
30. Air pollution control	Y	N	1	2	3	4	5	6
31. Refuse removal	Y	N	1	2	3	4	5	6
32. Sanitation	Y	N	1	2	3	4	5	6
33. Crèches	Y	N	1	2	3	4	5	6
34. Pension payout point	Y	N	1	2	3	4	5	6

9. What new services would be most important for this community/suburb? (Start with the most important service)

Service (write response below)	Service Code
1)	
2)	
3)	
4)	
5)	

10. All things considered would you say there have been any improvements or deteriorations in this community during the past year?

Improvement	1
Deterioration	2
Unchanged	3

11. Please specify the most important improvements AND deteriorations

11.1 Deterioration/s_____

11.2 Improvement/s_____

13. Please name the centre/complex and the place where you most often shop and do business.

_____***in***_____(use place name code below)

Personal well-being

1. In general how satisfied have you been with your life over the past year?

Very satisfied	1
Satisfied	2
Neither satisfied nor dissatisfied	3
Dissatisfied	4
Very dissatisfied	5

2. If you are employed how satisfied are you with your job?

Very satisfied	1
Satisfied	2
Neither satisfied nor dissatisfied	3
Dissatisfied	4
Very dissatisfied	5
Not applicable - not employed	6

3. If unemployed or on pension what is the type of work that you have done previously?

_____

4. Do you think that women and men have equal opportunities in Durban?

Yes	1
No	2

5. Compared to one year ago how is your economic situation?

Better	1
Same	2
Worse	3

21. Are you a member of any of the following clubs or organisations?

	Yes	No
1. Ratepayers Association	1	2
2. Sports club	1	2
3. Civic Associations	1	2
4. Woman's club/organisation	1	2
6 Church, religious club, choir	1	2
8 Community service organisation,	1	2
9 Neighbourhood Watch	1	2
10 Book club, library	1	2
11 Social or recreational club	1	2
12 Youth Organisation	1	2
15 Savings club (stokvel)	1	2
16 Burial society	1	2
17 Other, please specify	1	2

22. Please rank the following monthly household expenses and how much is spent on the top three expenses. (Start by writing 1 next to the item on which most money is spent per month. Then enter the amounts for the top three expenses only. Please note that this is not intended to cover all expenses. If the respondent is not aware of these expenses you may need to consult the head of the household to get these details)
IF WATER AND ELECTRICITY NOT IN FIRST THREE, GET THAT AMOUNT ALSO

Rank A	Expense	Amount B	Rank A	Expense	Amount B
	1) Housing (rent, bond)			6) Food	
	2) Education			7) Transport	
	3) Rates			8) Telephone	
	4) Water and electricity			9) Support of family outside Durban	
	5) Health Care			10) Other expenses more than the above, specify:	

22. Do you save any money after all expenses excluding investments or pension?

Yes	1
No	2

24. If you are saving what will you use your savings for? _____

26. Does this household have a:

	Yes	No		Yes	No
1. Car	1	2	8. Micro wave oven	1	2
2. Telephone or cellphone	1	2	9. Polisher/ Vacuum cleaner	1	2
3. Television set	1	2	10. Washing Machine	1	2
4. Radio	1	2	11. Use dishwashing liquid	1	2
5. Electric stove	1	2	12. Credit card	1	2
6. Fridge	1	2	13. Bank overdraft facilities	1	2
7. Piped hot water	1	2	14. Insurance policy	1	2

Housing

Tenure

30. Type of tenure?

Type of tenure		Code A	Monthly Amount (R) B
Ownership	Purchased (paid off)	1a	NA
	Purchasing (paying off)	1b	
	Acquired from Government	1c	NA
Tenancy	Private rental	2a	
	Public Rental	2b	
	Sub-tenant	2c	
	Rent free	2d	NA
Informal Settlement	With rent	3a	
	Own and do not pay rent	3b	NA
Tribal tenure		4	
Other		5	

31. How satisfied are you with the dwelling you are currently living in?:

Very Satisfied	1
Satisfied	2
Neither satisfied nor dissatisfied	3
Dissatisfied	4
Very dissatisfied	5

33. Why are you satisfied/dissatisfied with the dwelling?

_____

48. Do you have any further plans for improving your dwelling?

Yes	1
No	2

49. If yes what do you consider as a priority in extending or improving your dwelling or property?

_____

Migration history

57. Where was your family living at the time you were born?
Town_____Province_____

59. How many years have you lived in this dwelling?_____

62. Do you support a second homestead outside the Durban Area?

Yes	1
No	2

65. Did you move to this residence in Durban for any of these reasons?

	YES	NO
1 Not applicable (always lived here)	1	2
2 Employment, business	1	2
3 Schooling	1	2
4 Health reasons	1	2
5 Retirement	1	2
6 To escape violence, safety and security reasons	1	2
7 Family and personal reasons	1	2
8 To live in a better, more suitable dwelling	1	2
9 Other, please specify	1	2
10 Don't know	1	2

66. Have you ever thought of moving out of this neighbourhood?

Yes	1
No	2

67. (If yes in Q66) Why would you want to move out of this neighbourhood? Which of the following reasons comes closest to yours and which are the most important?
(Circle Yes next to all the reasons that the respondent identifies and rank the yes answers starting with '1' next to the most important)

	YES	NO	Rank
1. Not applicable (always lived here)	1	2	
2. Employment, business	1	2	
3. Schooling	1	2	
4. Health reasons	1	2	
5. Retirement	1	2	
6. To escape violence, safety and security reasons	1	2	
7. Family and personal reasons	1	2	
8. To live in a better, more suitable dwelling	1	2	
9. Other, please specify	1	2	
10. Don't know	1	2	

77. Have any important water or sanitation issues been left out of the questionnaire?

_____

Thank you.

Appendix D

Social Evaluation

INCORPORATING:

Faults Management,

Maintenance and

Compliance with Legal Agreements

November 2002

SOCIAL EVALUATION: INCORPORATING FAULTS MANAGEMENT, MAINTENANCE AND COMPLIANCE WITH LEGAL AGREEMENTS

1. Introduction

This study aims to investigate whether the waterborne Shallow Sewer system (WSSS) is socially appropriate for communities in Ethekwini as stated in the research proposal:

> "This proposes to research the capacity of the community to administer the WSSS by assessing whether the governing and reporting structures established at the inception of the project are workable and are maintained by the community, that faults are handled through the reporting structure, and to assess whether the community has the skills to undertake the physical maintenance of the system, as a means of the appropriateness of the WSSS."

The following specific hypotheses were formulated in the research proposal:

Faults Handling:
A sewer faults handling system, established during the inception of the project, has been improved by the community and faults are being successfully and expediently dealt with through the system

Maintenance Skills:
The community has the ability and skills to maintain the system

Rules and Agreements
The community is able to administer the system according to the rules of the condominial structure and in accordance with the legal agreements set up between the property owners and / or tenants, the EWS and the condominiums

1.1 Social Involvement

The Shallow Sewer technology requires a strong involvement of the community at every stage of the intervention: from identifying the needs, planning the solutions, input to the design of the sewer system, construction of the system as well as maintaining it in good order.

According to the Shallow Sewer methodology "Social Intervention Model For Implementation of Condominial Sewerage Systems" (M Vargas, Appendix J), conditions are created in the intervention to inform the community about their sanitation problems, to encourage and to give them the tools to participate in solving such problems. The intervention provides training in health and hygiene awareness and team building. Condominiums are groups of households that, from their geographic positions, share a common sewer line. They participate in the design and construction of the sewers and are required to work together to resolve social and operational issues for their condominium.

The service provider may opt to maintain the sewerage system, however, it is generally expected that the community would be able to do this and would call for external assistance only when necessary. In this pilot study it was agreed that the communities would maintain their systems.

To this end it was important that a well-defined contractual partnership be set up between the local authority (Ethekwini Water Services) and the community. In turn the condominiums set up agreements of how their members would cooperate to maintain the Shallow Sewer system in good working order. This included the reporting of faults and either undertaking repairs or blockage clearances or ensuring that an external party was called in to solve the problem. The community would have to pay for any services which they did not undertake themselves.

1.2 Selection of Communities

Based on a social scan of five possible communities, undertaken by BESG (1) on behalf of the project, Briardale in Newlands and Emmaus, near Westmead were selected as the most suitable communities for the Shallow Sewer pilot study.

Briardale was described as having a community "organisation with the experience and the commitment to undertake a collective service development project" and "significant organisational experience in implementing a participatory development project". The only risk identified was "that the physical layout of houses may not fall with in plot boundaries"

Emmaus was selected because of its "willing and energetic committee, newly elected and keen to undertake improvement projects", although it was "difficult to assess the potential of the local organisation on account of the very recent election of the committee". Risks identified were physical isolation from other residential areas and that the "new committee had no track record in development implementation."

Briardale and Emmaus "ranked sewerage provision in their top three development priorities", "the areas were cared for with no refuse lying around" and "community structures saw their role as being to improve the provision of services and quality of life in their areas".

All above extracts were taken from the Social Scan Report by BESG (1).

The communities selected were highly motivated to participate in the Shallow Sewer project.

1.3 Social Intervention Methodology

LIMA Rural Development Foundation was selected to undertake the social intervention under the capable guidance of WSSA's project manager, who was experienced in other Shallow Sewer projects such as the one in La Paz, Bolivia.

Prior to commencement of the intervention written commitment was obtained from households in the selected pilot communities, Briardale and Emmaus, in respect of their willingness to proceed. Once this had been obtained a survey was undertaken on all households in the pilot communities (no sampling of households was undertaken) to evaluate the current status of the communities. The output of this survey was a document entitled " Socio-economic Characterisation: Briardale and Emmaus, June 2000". (5)

The social intervention entailed the execution of all the activities described in the "Social Intervention Model For Implementation of Condominial Sewerage Systems" proposed for the Ethekwini Shallow Sewerage Project. (Appendix J) Besides the social compacts and the social characterisation, tasks included working with the communities to plan and construct the sewers while providing training and capacity building according to the methodology. Once installed, all households were provided with a simple yet comprehensive instruction book in Zulu on how to maintain the system. (Shallow Sewerage System: Instruction Book)

The social intervention has been well documented by M Vargas (Appendix J) and by LIMA who produced interim reports at each stage of the intervention and a final report, aimed to provide a consolidation of their learning experiences. LIMA also produced a report on their health and hygiene awareness training of eighty participants in Emmaus and Briardale.

During the intervention LIMA reported that the Emmaus Development Forum suffered from "a critical lack of institutional management capacity" which was adversely impacting on the pilot study. VISTA Planning Consultants, a 'sister' company to LIMA provided institutional development training to remedy the situation. (18)

2. Social Evaluation Methodology

An organisation called Community Awareness and Promotions (CAP) was selected as the social consultant to evaluate and report on the way the community handled faults and complied with agreements that had been put in place.

CAP's methodology entailed interviewing key people, undertaking surveys and site observations and inspections over a two-week period.

2.1 Faults Handling

CAP evaluated the ability of the community structures to identify and manage problems. Their task was to record what procedures were in place to deal with faults, how they were carried out and how effective they were at dealing with problems.

This was to be done after the installation had been completed and again near the end of the research period, however delays in implementation at Briardale prevented the evaluation being repeated during the research period. For details see Appendix H: CAP: Social Evaluation at Briardale, January 2002.

Performance indicators used included:

- Availability and storage of maintenance equipment, distribution of labour, existence and content of maintenance records,
- Interviews regarding maintenance systems and reporting thereof,
- Fault systems and procedures, records of action taken and response times
- Observations of maintenance and faults management

At Emmaus the implementation was halted due to the community's inability to perform according to the agreement. As so few people had connected to the water or sewerage system the project team withdrew their support to the community in May 2001.

In place of the evaluation CAP undertook an investigation to establish the reasons for this failure. Appendix A: CAP: Perception Survey on the Shallow Sewer System at Emmaus, August 2001.

In addition to the surveys and inspections by CAP at Briardale in December 2001-January 2002, the research field staff regularly visited Brairdale and Emmaus to collect various data.

2.2 Maintenance Skills

Data for the evaluation of the community's maintenance skills should have been provided by the quality control engineer from WSSA and, thereafter, by the Ethekwini Municipality Systems Branch staff on all observed faults and their probable causes, with some assistance from the research field assistants. Once the project implementation was complete it was intended that the Systems Branch of Ethekwini Water Services would take over the running of the project. It was planned to train the appropriate Ethekwini staff to sensitise them to the project, the agreements and the roles and responsibilities of the Municipality and the community. Although this training had not taken place at the time of writing, WSSA continued to make the offer available to the EWS staff.

Without Municipality Systems Branch staff to assist, the research field team did their best to collect the data, although they were not trained or experienced in the provision of water and sewerage. WSSA staff assisted with both technical and social data although they did not keep records of all faults and maintenance issues.

Details of blockages and surcharges as well as what was done about them; other maintenance problems, including the state of inspection chambers, general housekeeping and availability of materials needed for maintenance, were recorded. Where possible the causes or probable causes of blockages were ascertained. An attempt was made to record all problems but it is not known how successful this was.

Regular liaison with communities helped to avoid memory errors. The questions about faults were intended for the condominium leaders but it was found that they did not have all the information; hence the research field assistants regularly visited all households with occupants at home.

This was undertaken from the installation of the first two show houses in each community (November 2000) and for the duration of the research period (until May 2002). In both communities households were connecting to the sewer as and when they could.

All research field team data was captured on to MS Excel per household and per condominium (Iqoqo). The data were summarised for each Iqoqo to enable managers to evaluate how the condominiums were operating and how many faults had been recorded. See Tables B1 and B2 below on the following pages.

The field assistants made approximately 700 house visits at Briardale, and 350 at Emmaus, during the research period.

2.3 Rules and Agreements

CAP evaluated whether the condominial structures were doing their jobs based on rules from all agreements set up between Ethekwini Water Services, the homeowner or tenant and the condominium.

Performance indicators used were:

- Content of community or condominium meetings with respect to: content of discussions and relevance to WSSS, interpretations of agreements and adherence to constitutions
- Interviews with key individuals regarding their understanding of the Shallow Sewer system and the legal agreements

For details see Appendix H: CAP: Social Evaluation at Briardale, January 2002.

In addition the field research team collected data routinely from all houses where there were occupants. It was discovered early in the programme that there was insufficient management by the condominium (Iqoqo) leaders for the field staff to visit them alone, although in some cases the leaders were well informed.

Because the connections to the sewer at Emmaus were very slow and the project team had withdrawn, it was assumed that too few houses were connected for the condominial structures to be operating successfully. Ethekwini Municipality took the stance to “wait and see” if the community members would connect and manage the system at their own pace. Consequently, CAP were not asked to undertake the evaluation at Emmaus but the field research team still collected data routinely, albeit less frequently than at Briardale.

2.4 Deviations from the Model Methodology

An analysis was made of how the Ethekwini pilot study deviated from the methodology proposed by WSSA in an attempt to collate all the reports and understandings of the project team in to a single reference. (Appendix G: Record of Experience gained during the Project incorporating Deviations from the Model Methodology) The steps of the proposed methodology have been described and discussed in terms of how the pilot study deviated from them.

TABLE D1: SUMMARY OF FINDINGS PER IQOQO AT BRIARDALE											
BRIARDALE IQOQO	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**TOTAL**
No of plots in Iqoqo	5	29	21	16	10	20	16	23	10	5	155
No of houses in Iqoqo	1	15	11	7	1	11	0	0	7	1	54
Houses with water	1	16	11	8	1	11	0	0	6	1	55
Houses connected to SS	1	12	11	7	1	11	0	0	4	1	48
Average total water (kl/m)	4	91	74	61	12	76	0	0	35	6	359
Assumption: 70% to sewer (kl/m)	3	64	52	42	8	53	0	0	25	4	251
Number of:											
Installation problems	1	4	1	0	0	4	0	2	5	0	17
Blockages at connected houses	0	2	1	0	0	0	0	0	1	0	4
Other blockages in Iqoqo line	2	2	0	Regularly at confluence C,E,F,D until cleared finally Apr-02**	0	1	Same confluence which is nearest to shack 128	0	2	0	7
Other maintenance problems	1	0	0	3	1	3	0	4	1	0	13
Equipment problems*	1	1	0	0	0		0	0	0	0	2
Municipality water problems	0	2	1	3	0	3	0	0	1	0	10
Grease trap complaints	0	0	2	1	1	4	0	0	1	0	9
Roof tank problems	1	1	0	2	1	0	0	0	1	0	6
General Iqoqo issues							***	***			
Approx. no. people using SS (houses connected to sewer X 4.7	5	56	52	33	5	52	0	0	19	5	226

SS: Shallow Sewer
* such as: toilet fills slowly, does not flush well, etc.
** The community could not clear these blockages, even with WSSA's help. Mainly building materials were removed.
WSSA had to hire external contractors 3 times to clear blockages at this point: Oct-01, Nov-01, and finally Apr-02 when system was flushed out by WSSA.
*** major health problem at shack 128 and with vegetables grown near confluence.
**** Several sewer installation issues had not been resolved, see body of report.
When the number of water connections exceeds the number of houses in the Iqoqo water has been supplied to shacks (2 cases)

The data above has been summarised from the regular site visits made by the research field assistants
(approximately 700 house visits were made between November 2000 and May 2002)

TABLE D2: SUMMARY OF FINDINGS PER IQOQO AT EMMAUS								
EMMAUS IQOQO	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**TOTAL**
No of houses in Iqoqo	17	8	21	14	18	10	6	94
Houses with water	0	2	4	7	4	4	2	23
Houses connected to SS	0	2	2	1	2	2	1	10
Average total water (kl/m)	0	13	25	48	33	27	20	165
Assumption: 70% to sewer (kl/m)	0	9	18	33	23	19	14	116
Number of:								
Installation problems	N/A	3	2	2	2	3	1	13
Blockages at connected houses	N/A	0	0	0	1	0	0	1
Other blockages in Iqoqo line	N/A	0	2, one of which caused by some pipe connection being made by unknown Municipality staff	0	3	0	0	5
Other maintenance problems	N/A	1	0	0	1**	5***	0	7
Equipment problems*	N/A	0	0	0	0	0	0	0
Municipality water problems	N/A	3	1	1	0	1	0	6
Grease trap complaints	N/A	0	0	0	0***	0	0	0
Roof tank problems	N/A	2	1	1	1	1	1	7
General Iqoqo issues	Excluded from project						Toilet built over EWS manhole	0
Approx. no. people using SS (houses connected to sewer X 5.3)	0	11	11	5	11	11	5	54

SS: Shallow Sewer
* such as: toilet fills slowly, does not flush well, etc.
** Durban Municipality manhole lid missing. Iqoqo leader keeps reporting it to various people but no-one comes to assist. He has been clearing the manhole.
*** There have been no grease trap complaints but Iqoqo leader helped one woman to connect to inspection chamber bypassing the grease trap saying it was not needed.
**** One of which solved by community digging channels around Inspection chambers that were being covered with soil to prevent ingress of mud

The data above has been summarised from the regular site visits made by the research field assistants
(approximately 350 house visits were made between November 2000 and May 2002)

2.5 Evaluation of Emmaus Intervention (March 2001)

When it was realised that the implementation was not going as planned at Emmaus the project team held a workshop to evaluate what went wrong and what lessons had been learned that could assist future projects. A set of recommendations was made. The findings of this workshop have been reported in Appendix G: Record of Experience gained during the Project incorporating Deviations from the Model Methodology and Lessons Learned from Events at Emmaus.

3. Results:

Generally in both communities it was found that the condominium (Iqoqo) leaders did not continue to manage the condominiums well over the entire research period, although there were exceptions to this at Emmaus.

At the start of the project, immediately after the LIMA workshops, it seemed likely that both communities would use the condominial structures to manage not only the Shallow Sewer system but also other affairs, such as finances at Briardale. However as time progressed and there was little on-going social support, management by condominium seemed to have lost popularity and fade as a mechanism. There was a particular difficulty at Briardale as the community was not already settled there and consequently communication and education did not always reach all those concerned.

3.1 Briardale

The project team anticipated that the Shallow Sewer intervention would be ideal at Brairdale because of the background of the people and their willingness to participate in their own development. However the enthusiasm at Briardale was thwarted by the housing delivery process that was being managed by People's Dialogue, as the developer. By May 2002 approximately 65-70 houses had been built using the community's savings and loans facilitated by People's Dialogue. The application for the housing subsidies proved to be difficult for both the developer and Ethekwini Housing because of planning and land issues and that the land was to be transferred to a communal property organisation. The subsidies were not approved during the research period and the housing project ran out of funds. Consequently many people who continued to live in shacks on their plots felt marginalised being deprived of housing, water and sanitation. In addition the planning issues had delayed the delivery of roads, street lighting and electricity provision, which caused further dissatisfaction in the community. This background was not conducive to the success of the Shallow Sewer intervention.

In July 2001 it was reported that the Briardale community was very excited that the materials were at last being provided for their wet cores and connections to the Shallow Sewer. It was a slow process and most of the community trainees were not very competent in their newly found plumbing skills. There appeared to be only one team of four that were able to do a good job. (This picture was formed from the field assistants' reports over more that a year.) There were many teething and quality problems that were not addressed as there was no one for the community to call on for help because WSSA had removed their support from the project in November 2001, and the Ethekwini Municipality did not take over supporting the project, as planned.

By May 2002 the Briardale community said they were no longer happy with system because when they opened up the inspection chambers they could see debris collecting and some complained of smelling grease traps. It is normal for sewage not to be evacuated at once causing some temporary sedimentation, which should be washed away with high peak water usage. Normally this would not be evident to the user, as it was in this case, because manhole lids should have been sealed using a weak concrete mix to secure the chamber lids, which would have prevented residents inspecting the chambers regularly. Inspection chambers should be opened only when there are problems, thus avoiding unnecessary smells and health risks. Certain grease traps that were inadequately built and plumbed required attention.

The turn of events and loss of community support for Shallow Sewers at Briardale provides a clear demonstration that this type of project requires significant social intervention from the implementing agency on a continual basis. Training and education need to be maintained until a community is capable of running their system with minimal assistance. Ethekwini Municipality did not have the resources at their disposal nor were they geared to provide this type of social support function.

3.1.1 Faults Handling: The effectiveness of the condominium to identify and solve problems

The task was to evaluate the establishment and successful management of an effective faults system in the Briardale Community. Key findings have been extracted from the report by CAP: Social Evaluation at Briardale, January 2002. (Appendix H) These results have been supplemented with research field team findings.

It was shown that no regular Iqoqo or community meetings took place although Iqoqo members made claims to the contrary. Only one community meeting took place during the research period. This meeting illustrated the following:

- Discussions were relevant to the WSSS although there was a general focus on the problems of the system
- There was no focus on proactive management of the system for example
    - No reporting of specific faults
    - No adherence to a particular meeting structure
    - No reporting on how faults were attended to and what labour and materials were required
- The meeting only took place due to the request by the field researcher to attend a community meeting
- The chairperson was able to obtain good attendance at the meeting

Understanding levels of the Shallow Sewer system varied. For example, certain respondents believed that when more houses were connected to the system more blockages would result (which is not necessarily the case). All respondents appeared to be aware that they needed to clean out their grease traps regularly and the kinds of items that caused blockages. No regular maintenance was recorded although this will require further investigation as the project progresses.

One of the key indicators of the administration of the WSSS by the Iqoqo was the regular Iqoqo meeting. Although many respondents stated that regular meetings took place, the field researcher was not able to obtain a date or attend an Iqoqo meeting over a 4-week period.

An especially convened meeting held was attended by approximately 30 community members, the majority of whom were woman. The field researcher explained that he was there as an observer. However, the meeting appeared to have been called especially for him. The community members then gave their impression of the Shallow Sewer system. A summary of the issues raised is recorded below.

- Toilets were not used by some people as they were concerned that they would become blocked
- Iqoqo members who did not have toilets were reluctant to clear blockages
- There was a general belief that the system was inferior
- The housing subsidy scheme was not progressing
- Blocked inspection chambers were not always attended to

It was clear that no regular Iqoqo or community meetings have taken place and thus no regular discussion on the management of the Shallow Sewer had taken place.

3.1.2 Faults Reporting System

Interviews indicated that the response time varied from an acceptable 2 hours to an unacceptable 2 days. The system of blockage removal was stated in interviews to be working in most cases. The faults system involved the following:

- Overflowing chamber observed by Iqoqo member
- Chairperson of Iqoqo informed
- Chairperson gets equipment and calls available members of Iqoqo together
- Blockage is removed

No faults action records were evident, nor were any fault response times recorded. No written records of blockages or repairs were in existence. All information on faults was provided verbally to the field researcher.

Minimal blockage reporting was evident but this was due mainly to few residents experiencing blockages on their lines. Interviews illustrated that in almost all cases (82%) a rod belonging to the Iqoqo was used to remove blockage, which had been reported to the Iqoqo Chairperson. It was also stated that in 50% of the cases the blockage was cleared in a few hours, which is satisfactory. However, in 50% of the cases it took up to 2 days to clear the blockage which, could have resulted in serious health hazards

A summary of the key findings is provided below:
(Half of the respondents interviewed were chairpersons or leaders of Iqoqos)

- 55% of respondents stated that they had experienced some form of problem on their Iqoqo line
- 82% of the respondents stated that a rod belonging to the Iqoqo had been used to remove the blockage or repair
- Only 9% said they did nothing about the blockage or repair
- 65% of respondents stated that their repair equipment was stored by a member or the chairperson of the Iqoqo
- Of the respondents who had experienced blockages (50% of cases)
    - 50% of respondents stated that the blockage removal took place in under 2 hours
    - 50% of respondents stated that the blockage removal took place in under 2 days
    - 90% of respondents stated that faults are reported to the Iqoqo leader
    - No one (0%) stated that the faults were recorded on paper
- 65% of respondents stated that their Iqoqo met regularly and a further 35% stated that there was “no fixed time” when their Iqoqo met
- Respondents showed a clear understanding of items that cause blockages
- 10% of respondents cleaned their grease trap daily while others varied from weekly to every three weeks
- 100% of respondents felt that the members of the Iqoqo were aware of their responsibilities
- 85% of respondents felt that their Iqoqo was managing the sewerage system well.

Ten random interviews showed that:

- Understanding of the consequences of the system being declared a failure were virtually non-existent
- Most people were generally positive about the community spirit but tended to have negative feelings towards the scheme

3.1.3 Disposal of Waste Removed

It was found that most residents dispose of solid substances from the grease trap correctly at Briardale. Disposal was mainly to the refuse system collected weekly. (For further details, see Appendix H).

Very little information was collected on what happened to waste that was removed from blocked inspection chambers. The major blockages at Briardale were caused by building materials (sand, bricks etc) and were removed by outside contractors who left the waste that was removed on the

premises close to the inspection chambers. Based on what the residents did with the grease trap waste at Briardale, it was probable that solid material was similarly disposed of to the refuse collected weekly.

3.1.4 State of Repair of Equipment

Equipment to deal with blockages was evident at each Iqoqo and general maintenance equipment was in the possession of the maintenance committee. Each Iqoqo was in possession of a rodding pipe while the technical team of the community had in its possession general repair equipment.

3.1.5 Training Manuals

CAP and WSSA conducted two minor surveys at Briardale. The training manuals had been supplied indicating clearly how to maintain the Shallow Sewer. CAP found that five out of ten households had the manual but only one had received the training. As mentioned previously the entire community was not present from the beginning of the intervention and may have missed the training for that reason. Although not quantified, WSSA found that few people could produce theirs.

3.1.6 Maintenance Skills

A summary of connections to water and sewer per Iqoqo and numbers of installation problems, blockages and other maintenance problems or faults recorded between November 2000 and May 2002 can be found in Tables D1 and D2.

Observations made by CAP in November 2001 showed that a high percentage of chambers appear to be blocked and no action was being taken. However, during a subsequent 3-week observation period only one chamber was observed to be blocked and overflowing illustrating a general improvement in the situation between November 2001 and January 2002. This general problem at that time was caused by a major blockage at the confluence of Iqoqos C, D, E and F. WSSA hired an external contractor who removed building materials such as sand, bricks and cement on 28th November 2001. Prior to this the community together with the WSSA engineer had tried unsuccessfully to dislodge the blockage with the community's equipment.

Table D3: Operational Observations by CAP

This fieldwork included observing the system in operation as well as comments on operational issues from leaders and members of the Iqoqo for the period 26 November to 11 December 2001.

Iqoqo	Comment
A	Only one household was connected to the system. An inspection chamber A next to House number 9 often overflows. The chairperson stated that her toilet was unable to flush away toilet paper.
B	A member claimed that they had an inspection chamber that was always overflowing. However, when checked, it was found to be clear. The chairperson felt that the flat alignment of pipes (limited fall) was the cause of many of the blockages. The same person stated that they were waiting for Bonisiwe of Ethekwini Municipality to sort out a blocked chamber.
C	Had not experienced blockages. It was felt that the reason for this is that most members were not connected. A member stated that the smell of the grease trap permeated the house and that the toilet did not flush properly.
D	Chairperson felt that the main problem was the grease trap which was unhygienic and had to be cleaned twice a day. She also listed various inspection chambers which were often blocked.
E	Chairperson stated that they had been unable to remove a blockage and had to obtain the services of a private contractor.
F	An inspection chamber was found blocked with the lid off. A facecloth was blocking the outlet pipe. Chairperson stated that many of the blockages were due to negligence on the part of the community members. A member stated that the low pressure causes problems when flushing
G	No water or sewer connections. Nothing reported.
H	No water or sewer connections. The chairperson stated that various promised services had not been received. These included water, electricity and housing subsidies.
I	Nothing reported.
J	Leader felt that children throwing soil or rubbish into the chambers caused blockages. He also stated that the low water pressure resulted in toilet paper not being flushed away.

These results may differ slightly from those in Tables D1 and D2, which included information up until the end of May 2002 when there were substantially more sewer connections.

3.1.7 Rules and Agreements

CAP evaluated whether the condominial structures were doing their jobs based on rules from all agreements set up between Ethekwini Water Services, the homeowner or tenant and the condominium. Investigations took place of how meetings related to the Shallow Sewer system were conducted, content of discussions and its relevance to WSSS, interpretations of agreements, how they abide by the terms of reference or the constitution

A summary of the key findings is provided below:
(Half of the respondents interviewed were chairpersons or leaders of Iqoqos)

- Only 24% of respondents stated that they knew of a legal agreement. This figure could be low due to the people giving a negative answer to this if they did not know the contents of the agreement
- Community members showed a clear understanding of who was responsible for repairing blockages (100% said Iqoqo or community)
- 65% of respondents stated that the Iqoqo or the community would be charged if the Municipality were called in to attend to a blockage or repair

The knowledge of the existence of the legal agreements was low (24%) and consequently the understanding should also be low. When answering specific questions pertaining to the contents of the agreement such as responsibilities and charges to the Municipality and the community, the understanding levels were relatively high. There was no understanding of the consequences of

failure of the scheme. 100% of people questioned were unaware that VIPs would be installed by the Ethekwini Municipality should the Shallow Sewer system be declared a failure.

One misunderstanding was evident at Iqoqo B, where the chairperson stated that they were waiting for Bonisiwe of the Municipality to sort out a blocked chamber. In fact Bonisiwe was part of the LIMA social team, later retained by WSSA for social assistance.

It was verified that there was no understanding of the sewerage tariff. The 90% who said they had not received a bill or were not connected, also had no understanding of the sewerage tariff. There was also extremely limited understanding of the water tariff (5%)

3.2 Emmaus

The Emmaus community was divided prior to them settling at the Emmaus site. The significance of this was only brought to light once VISTA was commissioned by the project team to provide institutional strengthening for the Emmaus community. (18) The relatively wealthy one-third sector was always opposed to the semi-pressure water supply and did not abide by the community's majority vote to accept semi-pressure. Iqoqo A in particular refused to cooperate. Eventually Iqoqo A was excluded from the Shallow Sewer project and were told by Ethekwini Water Services that they would therefore not receive water or sanitation as a priority but would wait their normal turn, which could be many years later.

There were many powerful people in the wealthy sector who also appeared to have the support of the councilor. Many residents at Emmaus said that one leader had told them that Ethekwini Municipality would supply full pressure water to those who insisted upon it, as it was their right. Leaders have told the community that by accepting semi-pressure water they are accepting that they will always be poor. It was noted that shortly after this, in March 2002, many people made water connections before the cost increased. The councilor is also reported to have told the Emmaus community that roof tanks were not acceptable. The project team made a serious mistake when they did not realise the potential impact of a new councilor who was not made aware of the details and objectives of the Shallow Sewer intervention.

In spite of the community issues the results below may still provide hope for the future success of Shallow Sewers in South Africa.

The following case study puts some of the Emmaus issues in perspective.

Real Shallow Sewer issues - from one Emmaus resident's viewpoint……
Mr Zuma (not his real name) was one of the first people at Emmaus to pay his water connection fees because he believed that those who paid first would have their Shallow Sewer pipes and connections provided free by the project. He was disappointed to find that his was not the case.

He complained that his roof tank was not delivered when everyone else got theirs and had to wait a long time for it. When, eventually, it did arrive there was a problem because the fittings were a different size on some tanks and the engineer said that he must buy a reducer from the hardware store. Although he tried he never managed to get the correct one that fitted and anyway the newly trained plumbers in the community could not figure out how to make the connections. So he continued to use the water with out the roof tank.

Mr Zuma decided to sell water to his neighbours to make some money. He was most confused and questioned why he never received a water bill for months. Then one day the bill arrived. It was R800 for 127 kl. He did not agree with Ethekwini Municipality calculations then, to this horror, he discovered that there was a charge for the Shallow Sewer system, which he was not even using because he could not afford to pay for the fittings!

After some time he managed to pay the water bill but there was very little profit left for him.

But at least he now had his water delivered into his house. One day, when he could afford

3.2.1 Perceptions at Emmaus

The Shallow Sewer system was installed in all condominiums at Emmaus except Iqoqo A, but the implementation did not materialise as planned, with few connections being made by residents to the sewer. The Perception Survey, undertaken by CAP in June 2001, indicated that the vast majority of residents were positive towards the system and that 90% would connect if they had the opportunity. Financial constraints were preventing 75% from doing so. (Appendix I)

Although there was disagreement about the water supply at Emmaus, only 10% of the 51 residents interviewed said the reason for not getting a water connection was that they did not like the semi-pressure system. 69% said they could not afford the connection fee.

As far as dealing with faults was concerned it was encouraging that, in spite of the low connection rate, 78% of interviewees had received Shallow Sewer training and 80% understood what was involved. 88% knew which Iqoqo they belonged to and who their leader was. 36% gave pro-active answers with regard to what they would do for their Iqoqo, while 38% were not able to help or did not know what to do. When asked how to connect to the sewer system, most respondents stated that they would use a plumber or do it themselves.

The overall picture presented by all the data was that the people of Emmaus understood about the system and were capable of installing and maintaining it but that they were either unable to afford it (69%), or otherwise were not in favour of Shallow Sewers (4%), or would prefer full pressure water supply (4%).

3.2.2 Faults Reporting and Maintenance

A summary of connections to water and sewer per Iqoqo and numbers of installation problems, blockages and other maintenance problems or faults recorded between November 2000 and May 2002 can be found in Tables D1 and D2.

There was less intervention at Emmaus than at Briardale and the plumbing training was not completed; yet the residents at Emmaus seemed to be more resourceful and were able to solve most of their problems alone. One issue that presented difficulties was the roof tanks that were supplied by the project team whose inlet/outlet pipe diameters did not conform to those that were used in the demonstration houses, where the initial training of community plumbers was done. Some households seemed to have resolved this issue but others had never managed to connect properly. In one case the roof tank was installed on the floor and when they could not get the cistern to fill they resorted to using the "pour flush" method. In general, when people at Emmaus could not get all their plumbing connected for technical or financial reasons they used "pour flush".

Blockages

A total of six cases of blockages were recorded at Emmaus, two in Iqoqo C and four in E. It is not known if there were others.

Those in Iqoqo E seem to have been caused in some cases by ingress of mud and in others by paper and stones thrown in by children when the lids were left off. Iqoqo members seemed to have cleared all blockages themselves within five-days periods. In one case an Iqoqo member cleared mud on the same day by flushing it away with water, and children cleared another, probably at risk to their own health. Blockages seemed to occur in the communal line rather than in individual house lines.

One blockage at Iqoqo C in March 2002 was reported to have been caused by an inspection chamber being left open by Ethekwini Municipality staff who were connecting a new pipe. They left it improperly connected in such a way that a blockage resulted at house number 59. They returned to repair the damage but it is not known how Ethekwini Municipality staff came to be involved with the Shallow Sewer system. One of residents cleared another blockage at Iqoqo C in April 2002.

Other maintenance issues

Some people were not willing to pay the community plumbers who were trained as part of the project and preferred to be trained themselves, however the project team removed its support and more extensive training that had been planned did not take place at Emmaus.

Normally community members identified their own problems but sometimes the field assistants pointed them out. In all known cases at Emmaus the community members solved their own problems, although on one or two occasions they were known to have called in external help.

One inspection chamber that was broken by a passing car was not replaced. There was a general installation problem of inspection chambers not being raised sufficiently to prevent ingress of storm water. In some cases community members dug trenches around the chambers to channel the water away. WSSA took responsibility and provided bricks for the community to raise the chambers by one course, but not everyone received theirs as some were stolen.

Interestingly, there were no grease traps complaints or known problems using them at Emmaus. One leader who helped an elderly lady in his Iqoqo to connect to the sewer bypassed the grease trap saying that she would not need it and told her to fill it with stones. She did this and reported the incident to the field assistants.

Another Iqoqo leader repeatedly reported to anyone from the project team that visited the site that the Ethekwini Municipality manhole cover at Iqoqo E had gone missing and that he did not know what had happened to it. He was frustrated that nobody took any action, but nevertheless kept clearing the manhole even though it was not really his responsibility.

It was noted that someone had built a toilet over the Ethekwini Municipality manhole at Iqoqo G. On enquiring the Iqoqo leader said she knew about it but dared not speak to the man concerned, as he was too aggressive.

In March 2002, when several new water connections were made, one person was found to be in the process of making his sewer connection and was testing that the water was flowing from all outlets in his house to the inspection chamber and right up to the Municipality manhole. This clearly indicated that he understood the system.

The above detail illustrates that, in spite of so little intervention after the initial training, the Emmaus community was surprisingly positive and responsible. It could be expected that if funds were made available to those 90% wishing to connect, that the system may yet prove to be a success at Emmaus.

3.2.3 Rules and Agreements

Although the majority of residents had agreed to the semi-pressure water supply and had signed legally binding agreements, this did not mean that they would abide by them. Feedback from various sources during the research seemed to indicate that politically powerful elements at Emmaus had lead the people to believe that they need not accept semi-pressure water and that they would be able to get Ethekwini Municipality to overrule these agreements and the to provide full pressure water to Emmaus. In January-February 2002 several residents stated that they did not know what was happening because they had been told that Ethekwini Municipality had agreed to supply full pressure.

Tenants

Six surveys indicated that tenants had a very poor understanding of the Shallow Sewer system and that negligible transfer of information had taken place. Although the training was done in the community with all residents at the time it was unknown if the Shallow Sewer information would be passed on to any new tenants. (Mentioned in the hypothesis for rules and agreements). This result indicates that tenants do not receive the information.

3.3 Both Communities

Results from the quality of life surveys showed that the incidence of using outside expertise was low in communities with both conventional and Shallow Sewers.

An important maintenance issue was that the communities were not looking after the inspections chambers satisfactorily, especially at Briardale. There were several cases of lids going missing or being damaged, usually by passing vehicles.

It was noted that, through the collection of data, too much intervention may make the community more aware of their maintenance obligations than replicated installations and, hence, the conclusions drawn on the ability of the community to maintain the system may be skewed.

By January 2001, it was apparent in Briardale that the initial plumbing training provided had not prepares the community for resolving minor issues. More intensive plumbing training was undertaken in July 2001, however the trainees were still unable to resolve many problems and therefore it is suggested that the education be taken one step further to include troubleshooting.

Difficulties with Social Assessment

It was difficult to ascertain the true position of the communities towards the Shallow Sewer system. It was noted that different methodologies used presented differing responses. For example, in May 2002 the quality of life survey results indicated that people who had been using the system for some time were more satisfied with the system than they were previously. There was an increase in satisfaction from 59% to 76%.

However shortly after this certain community members from Briardale approached Ethekwini Water Services asking for the system to be removed, as the community was unhappy with it. When project team members visited Briardale some very vocal residents angrily complained about certain problems they were having with the system. Once order had been restored it seemed that simple technical faults had been causing great distress to a few people, who had then gathered support for removing the system.

Their main complaint was smelly grease traps, which had not been properly installed. Some of them were leaking due to poor construction and others did not have a water seal to prevent odours going back up into the kitchen. The other problem was caused by the uncovered inspection chambers that should have been lightly sealed to be opened only in the case of blockages. Both these technical issues could not be resolved by the community and would have been recognised and remedied with better management.

3.4 Deviations from the Methodology and Evaluation of the Emmaus Intervention

The results of the analysis was made of how the Ethekwini pilot study deviated from the proposed methodology and the analysis of the Emmaus intervention are reported in detail in Appendix G. The main findings were that although there were deviations, the methodology is intended not so much to prescribe, but to guide an approach that can be tailored to a specific situation.

It was concluded that, in the Ethekwini Pilot Project, the following deviations from the methodology might have adversely affected the implementation:

- The small scale of the project did not allow flexibility of timing for communities to resolve their issues
- The community at Emmaus may not have been sufficiently committed to the project to warrant its selection. This should have been recognized in the diagnosis and planning stage
- There was confusion about the “packaging” of the project. In light of the people’s ability to pay, the full pressure water supply should perhaps not have been offered as an option
- The methods of communication were not always effective. However, this could happen with any project depending on the personalities involved
- Payment for labour may have restricted the development of a self-help attitude
- The training provided to the community was not always sufficient and required follow up, which should have been done in a more controlled manner
- The evaluation process could have been monitored and managed better with respect to shifts in attitude of the people and the appropriate interventions made timeously

In their evaluation of events at Emmaus, the project team findings were the following:

- More consideration should have been given to ensure that the project would be financially viable and sustainable in the Emmaus situation
- More in-depth analysis may have revealed that the community was not truly ready for such a project
- Mistakes were made by not ensuring that external parties with influence over the community had been satisfactorily identified, educated and monitored

4. Conclusions

4.1 Faults Handling and Maintenance Skills

- The Iqoqos were able to identify and solve problems in most cases. However, the response time in some cases was not acceptable.
- Communities followed the agreed systems of dealing with faults, but no written reporting or recording was undertaken.
- No formal management and administration procedures were in place in any Iqoqo.
- No formal meeting of Iqoqos took place on a regular basis
- A recognised chairperson existed in all Iqoqo
- The chairperson managed the Iqoqo by being a communication link and ensuring that faults were attended to by means of maintenance equipment

Overall, it appeared the scheme was operating reasonably effectively from a physical point of view and there was evidence that knowledge transfer on the operational approach took place. However, the lack of capacity, knowledge and “understanding gaps” resulted in the approach to

management of the scheme being reactionary with residents merely reacting to problems as they arose rather than being pre-emptive, and unstructured from a data capturing perspective.

4.2 Compliance with Rules and Agreements

- Some understanding of the agreements between EWS and the community existed
- The community administered the Shallow Sewer System in an extremely informal fashion. However, most of the principles of the agreement between the community and EWS were recognised and to a degree were adhered to.
- A key agreement principle, which was not understood, was the consequences of the scheme being declared a failure. If community members knew that VIPs would be installed as a consequence, the incentive to ensure the success of the scheme may have been greater.
- There was a clearly a widespread lack of understanding regarding legally binding agreements in general. Some members treated agreements that did not suit them with a certain amount of contempt and believed that they could demand that Shallow Sewers be replaced with conventional ones. Even the instruction manuals did not seem to have been treated seriously by looking after them carefully.
- The majority of residents at Emmaus were in favour of the Shallow Sewer system, but as they could not afford to make the water and sewer connections, there were unable to honour their agreement to do so. The main reason for negativity towards the system was the link to the semi pressure water supply and certain residents perceived that the semi pressure system would cause their toilets to operate inefficiently.

4.3 Conclusions on the Social Intervention and Methodology

The social intervention is a very important component of the Shallow Sewer methodology. It has merit in that it builds capacity in people to enable them to undertake development for themselves. A tentative conclusion drawn from this research was that people had fewer complaints about their services, even when experiencing difficulties, because of the social component of the Shallow Sewer intervention. This was demonstrated in the report in this series on quality of life and customer satisfaction, (10) where fewer general complaints were received from people living in Shallow Sewer communities than from those in the control areas with conventional waterborne sewerage.

The Shallow Sewer methodology expects that the people involved will provide their “sweat equity” labour fee of charge. This does not seem to be feasible in South Africa. An attempt was made to get the communities to work free of charge but this was refused. BESG (1) reports that all five communities, scanned for suitability in the pilot study, indicated that they would expect payment for their labour.

Selection of Communities

The choice of community is important. Both communities selected turned out to be poor choices for Shallow Sewers because of interfering circumstances. Shallow Sewers may not be suitable for green fields developments because the whole community should be available to participate in all stages of the intervention from establishing agreements, planning and design through to maintenance.

In this pilot study community issues and dynamics affected the social intervention to such an extent that it was concluded that this aspect requires far more attention in South Africa than it was given. Communities should be investigated in sufficient detail to be able to predict the changes that the intervention will impose on the community. The social scan was insufficient to provide this degree of understanding. If this type of intervention is to be successful in South Africa, perhaps an additional category should be developed in the methodology, which addresses the management of change in community dynamics. This should deal with the various power plays leaders and other motivators.

Housing Issue Complications and Training

In the pilot study at both communities housing issues complicated matters significantly. In both cases the communities were expected to install plumbing and connect to the sewer. Communities

need skilled resources for plumbing and these may not already exist in some communities. The Shallow Sewer training cannot be expected to provide adequate plumbing skills for a community to plumb their houses to a satisfactory standard. In subsidised housing projects, funds should allocated to the services of skilled plumbers to install wet cores and make sewer connections as part of the housing package, even when using the People's Housing Process. The Shallow Sewer training should enable the community to understand and maintain their system. The community should participate in the construction of the sewer but under the guidance of a skilled supervisor.

The training at Brairdale did not adequately provide sufficient plumbing skills for the community to resolve their teething problems. Some problems related to plumbing and housing rather than Shallow Sewers, although there were also faults with inspection chambers and grease traps that were part of the Shallow Sewer design. The management of the project fell down when it did not provide the help and guidance for the community to resolve their issues.

Management Problems

This occurred due to an unfortunate combination of circumstances in the project management, for which no particular party was to blame. It was, however, a major problem for the project that all parties had moved their direct site management off the Shallow Sewer project from November 2001, with ad hoc visits and meetings thereafter, leaving the communities without the ongoing day to day support that would have assisted in resolving their problems.

The social intervention failed in many ways due to the management of the project. No matter how good the methodology was in building capacity in people, there were financial and technical limitations that the community could not overcome without support.

It is recommended that to minimise problems the same project team should be maintained throughout, if possible, to provide continuity. As soon as the players change those who take over do not understand exactly what training and education has taken place and to what extent, or what issues the development has been built on. Reports can never capture or replace the experience in social interventions.

Project Management

The main issue that arose in relation to the project management was the mismatch between fixed term contracts, which implies time related management, and community/social management, which implies that the interventions proceed at the rate of community development.

Both the social consultant and the Project Manager were on restricted time and financial contracts. Hence all tasks had to be completed within a certain time frame. Working with communities in this type of project does not lend itself to such restrictions, and both incumbents were frustrated at having to hurry certain aspects instead of doing them thoroughly. When these parties left the site, certain critical interventions had not been completed, necessitating a change in management at a critical time in the project.

These problems would not have occurred if the service provider had the resources to undertake such interventions in-house at a pace more suited to the pace of skills assimilation in the community. Continuity of management is also important in maintaining community commitment.

Shortage of Funds

People at Emmaus were expected to make financial commitments that they were unable to do, in respect of water connection fees and materials to install wet cores and sewer connections. Under these circumstances people could connected only when they could afford to, which did not fit in with the agreements set up with Ethekwini Municipality. The Perception Survey at Emmaus (Appendix I) substantiated that the people wanted to connect as agreed, but had financial constraints.

On the other hand funds from the housing process paid for these materials and connections fees at Briardale, as would be expected. However the delay in obtaining the Provincial Housing Board

subsidies caused substantial problems for those who did not receive housing, and for the whole community, which was waiting for electricity, street lighting, roads and storm water drainage.

Water Supply

The most contentious issue facing the Shallow Sewer pilot study was that of water supply levels of service. Ethekwini Municipality policy states that a community may receive only one level of service. Although it is appreciated that this is for cost and technical reasons and that the excellent levels of service provided are well conceived, they are not appropriate for all the people living in the same community. In two of the four communities studied, Nazareth and Emmaus, have populations with a wide range of incomes. The fact is that the wealthy will not accept roof tanks and low pressure and the poor cannot afford full pressure. Because water and waterborne sanitation are an integral package, water issues become Shallow Sewer issues.

4.4 Final Conclusions

- In both Emmaus and Briardale effective faults systems had been established and the communities were maintaining the Shallow Sewers in a very informal and reactionary manner.

- Although the social intervention failed in some ways neither the Briardale nor the Emmaus system need be doomed to failure. With better management and further intervention to put things back on track it should be possible for Shallow Sewers to succeed at both areas.

- Service provision management needs to be vigilant in order to understand when the community cannot proceed without further intervention, and then take appropriate action.

- It is proposed that the lessons learnt from the Shallow Sewer pilot study could equally apply to improve the success of other community development projects.

5. Way Forward and Recommendations

Lessons learned from this pilot study should be used to provide better management at Emmaus and Briardale and for any further Shallow Sewer projects.

Once the Shallow Sewer pilot communities have settled and are more fully utilising their systems, arrange further research on blockages, surcharges and water usage to evaluate the longer-term maintenance and capacity issues.

Levels of service should be appropriate for the customer who is paying for the service. It would be preferable for future interventions if the Ethekwini Municipality could find a way to offer both full pressure and semi-pressure water supplies within a community in order to accommodate all customers

Consider further Shallow Sewer projects utilising the lessons learned from this pilot study.

In addition it is recommended that future projects consider the following:

- Carefully evaluate the community situation to ensure that the project will be financially viable and sustainable
- Understand the community dynamics in sufficient depth to be confident that the community is truly ready for such a project
- Ensure that external parties with influence over the community are identified, educated and monitored
- Re-evaluate the methodology in terms of community dynamics

Appendix E

Legal Evaluation

August 2001

1. Introduction

Shallow Sewers are a technology that was invented to provide low-cost waterborne sanitation in Brazil. This technology has spread worldwide and in an attempt to evaluate this technology for the South African Conditions, a public private partnership was established between Water and Sanitation Services South Africa, the Water Research Commission and Ethekwini Municipality.

One of the requirements of the research issue was to determine whether the Shallow Sewers technology was compatible with South African law. Although Shallow Sewer technology has not yet been fully implemented in South Africa, shortcomings and incompatibility between Shallow Sewers technology and South African law have already been identified. The project has already realised large cost savings which could potentially be passed on to other projects. Consequently, it is intended that the restrictions in the law should be addressed as expediently as possible.

In order to accelerate this process, the findings of this section of the research were to be published ahead of the main research findings. As such it was necessary to write it as a stand alone document, which has now been incorporated into this final research report.

As this document will also form part of the main research findings, it is anticipated that its main readership will be lay people. It also needs a guide for the legal fraternity who will be continuing the research. It is, therefore, intended that the document will be written in non legal English, will explain the point of the law where necessary, but will have legal references.

2. Introduction to Shallow Sewers Technology

The fundamental of the Shallow Sewer concept is that a group of citizens who live in a common micro drainage catchment for a sewer will come together and install, manage and operate a sewer which is collectively owned by this collection of citizens. The local authority then only supplies one connection to the group of citizens. This group of citizens is collectively known as the “Condominium” or “Iqoqo” (Zulu). The sewer network consists of three sections each with different owners. The local authority owns the collector sewer which is a conventional sewer draining the collective condominium sewer. The condominium or collective sewer is owned jointly by the members of the condominium. Each member of the condominium then has his own connection to the condominium pipe. The local authority owns, installs, maintains and operates the collector pipes. The condominium pipe is collectively owned, operated, installed and maintained by the condominium. The section of pipe that connects the house to the condominial sewer is owned operated and maintained by the individual house owner. The Shallow Sewer system is a gravity system which provides exactly the same level of comfort and health security as a conventional waterborne sanitation system. The collector mains are designed and constructed to conventional full waterborne standards. The condominial sewers on the other hand are designed to be laid in un-trafficked areas. Because they are un-trafficked they are laid a lot shallower than conventional sewers. The pipe diameters are also smaller than conventional sewage pipes.

Because condominial sewers are laid shallower than conventional sewers it is not necessary to have manholes in order to gain access, as everything can be reached from the surface. Small access chambers are then provided instead of large conventional manholes.

There are three options for the positions of the condominial sewer. They can either be laid down the mid block in the back yards of the houses, or in the properties of the houses but in their front yards, or they can be laid under the pavements in the local authorities property.

The technology was developed to service the poorer elements of the community, however in some parts of the world it has been developed as the standard option. It is expected that in South Africa it will, certainly initially, be used for the poorer communities.

3. Legal Aspects to be Addressed

The legal aspects fall broadly into three categories: contractual issues, changes to the National Building Regulations and land issues.

3.1 Contractual Issues

There are three parties: The local authorities, the condominium or Iqoqo and the individual homeowner who need contract with one another in various permutations.

The biggest problem is that the condominium or Iqoqo needs recognition as a legal entity. There are several options.

The condominium or Iqoqo has legal status as a joint or co-ownership i.e. It is comprised of the individuals constituting it. In the event of legal action being instituted, action is taken jointly against the individuals comprising the condominium or Iqoqo. The maintenance of records as to the individuals would be a necessity. The practicalities of a shifting community would need to be addressed, should this option be considered.

The obvious vehicle for making the Iqoqo a legal entity is a Section 21 Company. This however has two drawbacks. Firstly it is very expensive to set up a Section 21 Company and secondly the legal requirements in terms of bookkeeping and auditing are prohibitive for the type of community that it is anticipated will require these services. Further it is intended in law that Section 21 Companies will only exist for limited defined duration. As the average number of households in a condominium in the Ethekwini pilot project is fifteen, it is anticipated that at least R3 000 per household would be required to register the company. Set up, bookkeeping and auditing requirements of other vehicles such as CC companies are also considered well beyond the means of the communities that they are meant to service in terms of the auditing and other legal requirements.

Similar prohibitions exist in regard to the condominium or Iqoqo in the form of a trust.

A further requirement that may be necessary is a mechanism whereby disputes could be resolved very cheaply.

3.2 Transgression of the National Building Regulations (NBR)

The NBR were drafted primarily to protect homeowners from unscrupulous developers. The regulations cover a number of issues and are based on what was considered best practice at the time. Shallow Sewer technology transgresses the NBR in a number of cases. The two prime ones being the pipe diameter and unauthorised drainage work. In addition comments on the depth of cover over the pipe and the manholes or access chambers are included as these are common inclusions in bylaws.

3.2.1 Pipe Diameter

The historic reasons for setting the minimum sewer pipe diameter at a 100mm was not a hydraulic consideration but rather a construction one. The early sewer pipes were constructed of vitrified clay and the vitrification process was done by hand and therefore the pipe had to be of a diameter that a man could reach inside the pipe barrel with his arm to apply the vitrifying solution. This fact was lost on the regulators who drew up the NBR. However, at this time the optimum pipe diameter for a sewer pipe is not yet known. It seems reasonable that the NBR should be relaxed in terms of the diameter of the pipe.

3.2.2 Unauthorised Drainage Work

The NBR prohibits people from undertaking work on the drainage system unless they are licensed appropriately. One of the tenets of the Shallow Sewer system is that the home owners undertake the servicing and maintenance of the system. The homeowners who install the system will receive a certain amount of training, but probably not sufficient to licence them. Furthermore, with the passage of time the original homeowner may leave and new untrained owners may be required to undertake the maintenance of the system.

The reasons for prohibiting unauthorised drainage are not stated in the NBR but are probably twofold. Firstly, it is expected that there was concern about the health risks to the workers and secondly, there is concern for the integrity of the network. In terms of concern for the integrity of the network, the area of the network that will be worked on by the homeowners belongs to them, so there is incentive to maintain the integrity of the system. In terms of the health risks to the people working on the system, people who were homeowners when the system was installed should in theory have received good general health and hygiene education. In spite of the statements recorded here, if Shallow Sewers, as the system is applied internationally, are to be implemented on a large scale in South Africa, then some means of licensing owners of Shallow Sewers is required.

3.2.3 Depth of Cover

Shallow Sewers are designed and constructed specifically to be away from trafficked areas, therefore no over burden is anticipated on the sewer pipes. In addition the reduction of the pipe diameter does increase the structural strength of the pipes significantly. Therefore, from a technical perspective the depth of cover in the case of Shallow Sewers can be reduced.

3.2.4 Manholes or Access Points

Due to the fact that the NRB anticipated that the pipes would be deeper than those required for Shallow Sewers the access points were in the form of a manhole large enough for a man to climb inside and to work in. In terms of the Shallow Sewer, because of the reduced depth to the pipe, it is no longer required that a man needs to climb into a manhole because everything can be accessed from the surface. It is therefore considered from a technical viewpoint that it is no longer necessary for the manhole to be of a large enough diameter for a man to climb inside. From a technical perspective it is therefore considered that the NRB are unnecessarily onerous in terms of their application to the Shallow Sewer system.

3.3 Land Issues

One of the fundamental principles underlying the land issues in South Africa is that the land cannot be encumbered by agreement. All encumbrances on the land have to be registered in the title deed. This principle is another form of the principle whereby two parties cannot agree to bind a third party. In terms of the condominium sewer technology, the sewer which is owned jointly by the community runs through individually owned lots or under the side walk in property owned by the local authority. In a large number of cases Shallow Sewers will be used to upgrade existing lots. The cost of surveying and registering servitudes negates the cost effectiveness of the Shallow Sewer system, and legal mechanisms are required to overcome this problem.

Land in South Africa may be owned and / or developed under five acts relating to land issues. These are; Freehold, Sectional Title, Property Developed Under the Communal Property Association Act, Ingayama Trust land and Property Developed Under the Less Than Formal Township Establishment (LeFTE) Act.

Of these, Shallow Sewers are absolutely compatible with only the sectional title developments. In fact the sewer systems on these developments are Shallow Sewers from a legal perspective.

Property developed under the Communal Property Association Act may in some cases be totally compatible with the Shallow Sewer system. However where the sewers are required to be laid deep such as under a road within the communal property boundaries then the sewer needs to be constructed to conventional designs. In these circumstances the community is unable to construct the pipe or maintain it and the pipe is then held and controlled by the local authority and as such has to be placed in a registered servitude.

In terms of the Ingayama Trust Land, the situation with regard to condominial sewers is not clear at all. In terms of traditional law, a homeowner only owns the home and has only a right to occupy the site. It is not clear whether this right to occupy is also extended to the right to occupy the land

that carries a sewer. If not it is assumed that permission to occupy land to carry a sewer can be granted by the Ingayama or one of his trustees.

In terms of Freehold or property developed under the Less Than Formal Township Establishment Act, the condominial sewer principle is totally repugnant to the fundamental principle noted above unless a servitude is registered. A further consideration is the situation where the Shallow Sewer is laid in the pavement in property belonging to the local authority. In this situation in KwaZulu-Natal a servitude would be required. This however may differ from province to province as it is governed by the Provincial Ordinances.

From the analysis above it is clear that in most circumstances servitudes are required in one situation or another. As mentioned earlier, the surveying and registering of servitudes is an expensive process and these costs need to be avoided in the Shallow Sewers system.

3.4 Opportunities for Regularising the Shallow Sewer System

Some of the issues raised may be solved within the Bylaws, others within the Provincial Ordinances and some at National Act level. As it is intended that the Shallow Sewers should be implemented nationally it is suggested that all these transgressions of the law be addressed at the level of Acts, but providing for each province and local authority to adjust the act in terms of their Ordinances and Bylaws.

Further, flexibility is written into the Water Services Act in terms of a clause allowing for technologies that had not been anticipated when the Act was written. It is not clear whether this holds sway over other acts such as the various acts relating to land tenure.

4. The Way Forward

Considerable legal debate has occurred in Ethekwini in terms of Shallow Sewers and other aspects relating to the provision of access to water services. This has been undertaken by various legal advisors to the Ethekwini Municipality and academics from the University of Natal / Ethekwini Westville. In light of the high cost of time of people in the legal profession when acting in a commercial basis it is suggested that this team be invited to proceed with further investigations into the aspects mentioned above in terms of the Shallow Sewer system.

Further, in accordance with the Shallow Sewer philosophy, a multi-disciplinary approach, which encompasses the skills from a number of disciplines, is proposed. It is suggested that by modifying both the technology and the law a compromise solution may be achieved that is better than either a pure legal or pure technical solution.

5. Conclusion

As it is anticipated that solutions to the legal problems mentioned above will take some time to be resolved and that it could still be some considerable time before the findings of the full research on the Shallow Sewers are published, in order to expedite the process, it was considered necessary to publish this report as a stand alone report separate from the main research findings.

As the NBR are regulations put out by the Minister in terms of the National Building Regulations and Building Standards Act 103 of 1977 it is anticipated that changes to these regulations ought to be relatively simple in terms of procedural matters requiring that they only be published in a Government Gazette. The contractual issues referred to above require considerable efforts and innovations to come up with a solution that will provide the right sought of protection to the contracting parties. Considerable work and international experience may be required to find a solution.

It is anticipated that a holistic, multi-disciplinary approach will be required to find solutions for the problems of the land issues relating to the Shallow Sewer system. A holistic approach is suggested in the hope that a single uniform solution can be found to cover all situations relating to

land issues. This will alleviate problems with developers who may not be familiar with the law. A multi-disciplinary approach is suggested in that it broadens the scope of possible solutions.

6. Recommendation

It is recommended that:

1. Water Research Commission make funds available to research and find solution to the legal problems identified above.
2. As Shallow Sewers have the potential to reduce the cost of sanitation in South Africa it is recommended that this research is undertaken urgently.
3. A multi-disciplinary approach to finding these solutions is recommended. The ideal team would comprise of members who could make contribution in the social sciences, technology and legal fields, as it is perceived that the solutions must encompass all disciplines rather than being purely a legal one.

Appendix F

Technical Evaluation

November 2002

TECHNICAL EVALUATION OF SHALLOW SEWERS INSTALLED AT BRIARDALE AND EMMAUS

1. Introduction

This study aims to investigate the technical effectiveness of the Waterborne Shallow Sewer System (WSSS). For this purpose three hypotheses relating to the effectiveness of Shallow Sewers as a method of conveyance were formulated in the research proposal.

In addition this report includes two other related aspects of the research, each with its own hypothesis. These are the legal implications and the environmental health risk conditions.

Structure of the Report
For simplicity, each aspect is reported as a separate sub section in terms of its research hypothesis, methodology and results. Combined conclusions are drawn, followed by suggestions for a way forward with a few recommendations.

Technical Overview
According to Vargas (Appendix J)
"The technology relaxes many design characteristics of conventional sewerage and in the process allows for shallow depths, smaller diameter pipes, flatter gradients and community based construction, operation and maintenance. The concept has been successfully implemented in Brazil, Greece, Australia, USA, Bolivia, India and has become the norm in Pakistan.

This model allows for savings in different items, such as length and diameters in pipes, excavation, materials, shuttering, etc. It permits not only to reduce costs for the population served, but also to increase the water and sanitation coverage without increasing projected investment."

Background to the installation at Briardale and Emmaus
A comprehensive report was produced for Ethekwini Water Services; November 2000) by the Project Manager, Miguel Vargas, once the installation of the sewer up to the connection stage had been completed. At this point only two demonstration "show houses" in each community had been connected to the Shallow Sewer as a training exercise by the project team. This report gives details of all the technical aspects of the installation as well as sections on the methodology, installation costs, social, institutional and construction.

Emmaus is situated adjacent to the Westmead Industrial area. The community, which was developed about 12 years ago, comprises 94 houses, each on its own plot, with no neighbouring communities. Some houses are made of concrete block and others of a fibreglass type material. The community had four standpipes, patented septic tank toilets that were full, causing great discomfort and self dug pit latrines. There was "Redibord" electricity as well as roads and drainage that were reported to be in an unsatisfactory condition. The topography is very steep and hilly.

In Ethekwini there are three levels of water service. The first is the conventional full pressure service that has no physical restrictions. The second level is a semi-pressure supply, which is provided at a much-reduced cost for connection and tariff, but the house must be fitted with a 200-litre roof tank in order to reduce the operational pressure of the water supplied. The lowest level is the 200-litre ground tank that is filled once daily thus limiting consumption to 6kl/month. Ethekwini Municipality's policy is that, for technical and financial reasons, only one type of water supply could be provided to a community and it was their intention to link Shallow Sewers to the semi-pressure water supply, as an appropriate service level to densely populated, poorer areas.

However in the negotiation stages, when the Emmaus community was given the option of full pressure or semi-pressure water, they were divided in their acceptance of the level of water supply. There was a significant section (approximately 33%) that was far more affluent than the rest, who wanted full pressure water and who tried to influence the poorer people to use the full-pressure

water supply. The poorer sector could not afford full pressure and, by a majority vote, it was agreed that the entire community would be supplied with semi-pressure water and roof tanks.

There are seven condominiums (Iqoqos), comprising 94 houses at Emmaus, one of which (Iqoqo A with 17 houses) was excluded from the project because they did not accept the semi-pressure water supply. The sewerage system was completed for all condominiums and all houses, except for Iqoqo A, which had no drainage or water.

Briardale is situated in the Newlands West area bordering the road to KwaMashu. The Briardale community consists of 155 beneficiaries with plots. The community, using the Peoples Housing Process, had fully or partly constructed approximately 65 houses, of which 54 were completed at the time of the study. The PHB subsidy funding had not yet been obtained. The community only had one communal standpipe and nine chemical toilets. There was no electricity, roads or drainage. The area is fairly flat with few trees.

At Briardale there are ten condominiums, two of which had no houses built and another two with only one house in each. The sewerage system was completed for all condominiums and all 155 plots.

2. Effective Conveyance:

As part of the technical appraisal of the waterborne Shallow Sewer system (WSSS), the following hypotheses were made:

This proposes to research whether Water-borne Shallow Sewers are an effective sewage conveyance method by determining whether no undue blockages occur due to insufficient flushing water use, or the use of unconventional construction materials and methods, and whether surcharges occur due to insufficient conveyance or capacity within the system, as a means of determining how effective the WSSS is at removing sewage

2.1 Methodology

An attempt was made to record all faults, blockages and surcharges and their causes or probable causes through regular liaison with the community members and Iqoqo (condominium) leaders.

This data should have been collected by the quality control engineer from WSSA and, thereafter by the Ethekwini Municipality Systems Branch staff, on all observed faults and their probable causes, with some assistance from the research field assistants. In practice, however, the Ethekwini Municipality staff was not involved with managing the system and the official handover from WSSA to Ethekwini Municipality and the corresponding training for the Ethekwini Municipality staff had not taken place as intended during the implementation phase. WSSA staff did provide data through the duration of the intervention with although they did not keep records of all faults and maintenance issues.

Without the Municipality Systems Branch staff to assist, the research field assistants did their best to collect all the technical data, although they were not trained or experienced in the provision of water and sewerage. They regularly visited the sites to obtain details of blockages and surcharges as well as what was done about them; other maintenance problems, including the state of inspection chambers, general housekeeping and availability of materials needed for maintenance. Where possible the causes or probable causes of blockages were ascertained. An attempt was made to record all problems but it is not known how successful this was.

The Community Awareness and Promotions (CAP) social evaluation at Brairdale also provided technical data. (Appendix H) Ad hoc technical information was also forthcoming from Ethekwini Municipality Health officials (22) and project team site visits.

All research field team data was captured on to MS Excel per household and per condominium (Iqoqo). The data were summarised for each Iqoqo to enable managers to evaluate how the

condominiums were operating and how many faults had been recorded. These results are shown in Tables F 1 and F2 on the following pages.

2.2 Results:

General

On site data were collected from November 2000 when the first two show houses in each community were installed until May 2002. In both communities households were connecting to the sewer as and when they could. The field assistants made approximately 700 house visits at Briardale, and 350 at Emmaus, during this research period.

Pipe work

At the head of a sewer pipe the mechanism of solids transportation is one of “hop and settle” as the slugs of flushing volume passes the gross solids. In essence the solid blocks the sewer allowing the sewer to fill behind the solid. This has two effects, firstly the hydrostatic pressure builds up behind the solid and, secondly, as the solid is submerged it becomes more buoyant reducing the frictional resistance. While the lateral pressure is greater than the frictional resistance the solid will migrate down the sewer until such a time that the flushing fluid has passed the partial obstruction. Therefore from an hydraulic conveyance point of view the smaller pipe diameters used should facilitate the movement of waste through the system as the volume of water in a smaller pipe will provide more lifting and carrying potential.

Certain councilors who had visited the site raised concern that the diameters of pipes used were too small, however the technical team assured the community that the pipe sizes were adequate provided that the correct wiping materials were used.

The social characterisation exercise, undertaken prior to installation, revealed that only 50% and 33% of Emmaus and Briardale residents respectively made use of toilet paper only as a wiping material. The balance used a combination of other materials that may be less suited for use in a waterborne system (5). After much emphasis was placed on stressing the use of toilet paper as a wiping material during the implementation of the project, later results showed that most people were using a combination of toilet paper and newspaper. This is the reality for poorer communities in South Africa and all sewers for such people should accommodate the use of newspaper, telephone book paper in addition to soft tissue toilet paper.

At Iqoqo H in Briardale there was a section of pipe with a very flat slope 1/615. It was questioned whether this would work in the long term. This could not be tested in this study as there were no houses or sewer connections at Iqoqo H.

TABLE F1: SUMMARY OF FINDINGS PER IQOQO AT BRIARDALE											
BRIARDALE IQOQO	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**TOTAL**
No of plots in Iqoqo	5	29	21	16	10	20	16	23	10	5	155
No of houses in Iqoqo	1	15	11	7	1	11	0	0	7	1	54
Houses with water	1	16	11	8	1	11	0	0	6	1	55
Houses connected to SS	1	12	11	7	1	11	0	0	4	1	48
Average total water (kl/m)	4	91	74	61	12	76	0	0	35	6	359
Assumption: 70% to sewer (kl/m)	3	64	52	42	8	53	0	0	25	4	251
Number of:											
Blockages at connected houses	0	2	1	0	0	0	0	0	1	0	4
Other blockages in Iqoqo line	2***	2	0	Regularly at confluence C,E,F,D until cleared finally Apr-02**	0	1	Same Confluence which is nearest to shack 128	0	2	0	7
Other maintenance problems	1	0	0	3	1	3	0	4	1	0	13
Equipment problems*	1	1	0	0	0		0	0	0	0	2
EWS water problems	0	2	1	3	0	3	0	0	1	0	10
Grease trap complaints	0	0	2	1	1	4	0	0	1	0	9
Roof tank problems	1	1	0	2	1	0	0	0	1	0	6
Approx. no. people using SS (houses connected to sewer X 4.7	5	56	52	33	5	52	0	0	19	5	226
Approx. no. of litres used per capita per day	26	54	48	61	83	49	0	0	62	43	53

SS: Shallow Sewer
* such as: toilet fills slowly, does not flush well, etc.
** The community could not clear these blockages, even with WSSA's help. Mainly building materials were removed.
WSSA had to hire external contractors 3 times to clear blockages at this point: Oct-01, Nov-01, and finally Apr-02 when system was flushed out by WSSA.
*** major health problem at shack 128 and with vegetables grown near confluence.
**** Several sewer installation issues had not been resolved, see body of report.
When the number of water connections exceeds the number of houses in the Iqoqo water has been supplied to shacks (2 cases)

The data above has been summarised from the regular site visits made by the research field assistants
(approximately 700 house visits were made between November 2000 and May 2002)

TABLE F2: SUMMARY OF FINDINGS PER IQOQO AT EMMAUS								
EMMAUS IQOQO	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**TOTAL**
No of houses in Iqoqo	17	8	21	14	18	10	6	94
Houses with water	0	2	4	7	4	4	2	23
Houses connected to SS	0	2	2	1	2	2	1	10
Average total water (kl/m)	0	13	25	48	33	27	20	165
Assumption: 70% to sewer (kl/m)	0	9	18	33	23	19	14	116
Number of:								
Blockages at connected houses	N/A	0	0	0	1	0	0	1
Other blockages in Iqoqo line	N/A	0	2, one of which caused by some pipe connection being made by unknown Municipal staff	0	3	0	0	5
Other maintenance problems	N/A	1	0	0	1**	5***	0	7
Equipment problems*	N/A	0	0	0	0	0	0	0
EWS water problems	N/A	3	1	1	0	1	0	6
Grease trap complaints	N/A	0	0	0	0***	0	0	0
Roof tank problems	N/A	2	1	1	1	1	1	7
General Iqoqo issues	Excluded from project						Toilet built over EWS manhole	0
Approx. no. people using SS (houses connected to sewer X 5.3)	0	11	11	5	11	11	5	54
Approx. no. of litres used per capita per day	0	41	79	300	103	83	123	104

SS: Shallow Sewer

* such as: toilet fills slowly, does not flush well, etc.

** Durban Municipality manhole lid missing. Iqoqo leader keeps reporting it to various people but no-one comes to assist. He has been clearing the manhole.

*** There have been no grease trap complaints but Iqoqo leader helped one woman to connect to inspection chamber bypassing the grease trap saying it was not needed.

**** One of which solved by community digging channels around Inspection chambers that were being covered with soil to prevent ingress of mud

The data above has been summarised from the regular site visits made by the research field assistants
(approximately 350 house visits were made between November 2000 and May 2002)

Inspection Chambers
The Briardale community said they were not happy with system because when they opened up the inspection chambers they could see debris collecting. Once again this was partly due to the inadequate management of the system by the project team, as the chambers should have been lightly sealed to prevent too much access.

One chamber at Briardale had been constructed in such a way as to restrict the waste flow, allowing build up of solids and splashing.

However it is normal for sewage not to be evacuated at once causing some temporary sedimentation, which should be washed away with high peak water usage. Normally this would not be evident to the user, as it was in this case, because seals should be made using a weak concrete mix to secure the chamber lids. Inspection chambers should be opened only when there are problems, thus avoiding unnecessary smells and health risks.

Several problems occurred in Iqoqo H Briardale where there were no houses built and only a few shacks existed. Lids were left off the unused inspection chambers and rubbish was thrown into them. Some damage was caused to inspection chambers by passing traffic.

An inspection showed that a significant number of lids of inspection chambers were level with the ground and there was ingress of rainwater. In most cases these chambers were raised by one brick height. The inspection chamber frame and cover should be designed better in future, as their seals were poor.

Grease Traps
There were some complaints of smelling grease traps at Briardale. These causes included:
- Some grease traps that were poorly constructed and leaking on to the ground caused bad odours and mosquito breeding
- Communities also reported that grease traps needed to be cleaned too often whereas people living in conventionally sewered communities did not have grease traps to clean
- Poor internal plumbing (See later)

Blockages
In spite of all the shortcomings of the construction and management of the project there were not very many blockages. Most blockages occurred on the condominial lines rather than the household lines. Ten condominial blockages were recorded in total, five from each community. These were clearly caused by inspection chambers being left open thereby collecting debris, by mud from ingress of storm water and by building materials collecting in the construction process and through the poorly sealed pipe ends.

At Briardale there were blockages at critical points that were not cleared adequately until WSSA intervened and flushed the entire system. Investigations of the causes of the blockages showed that the main factor had been the introduction of debris, mostly building materials and sand into the system. Plastic bags were use instead of robust end caps to seal pipe ends allowing contamination of pipes with sand and soil. This may have not been a problem if the sewer connections had happened quickly, but in the case of Briardale it may be years before all the houses are built. These pipe ends, at least, should have been suitably sealed. It was intended that the inspection chambers would be sealed with a weak mortar after all the house connections were made. Until this happens this provides easy access for undesirable materials such as building waste and storm water debris.

One blockage at Briardale was especially severe and difficult to clear of cement, stones and sand that had collected at the confluence of four condominial lines. Contractors who were brought in twice to unblock this inspection chamber did not solve the problem so it was decided to flush the system. Proper end caps were installed to prevent further ingress of debris and the system at Briardale was then flushed using a 5000 litre water tanker and fire hose. One severe blockage,

caused by a half-brick lodged in the pipe, was removed. The entire reticulation was systematically flushed, expelling a significant volume of sand.

Once this had been done there were no further reports of blockages at Briardale during the remaining two months of the research period.

There were only five household line blockages recorded in total, one at Emmaus and four in Briardale. Inappropriate wiping materials probably caused these, although two cases were attributed to steel wool and a facecloth.

At Emmaus one blockage at Iqoqo C in March 2002 was reported to have been caused by an inspection chamber being left open by Ethekwini Municipality staff that were connecting a new pipe. They left it improperly connected in such a way that a blockage resulted at house number 59. They returned to repair the damage but it is not known how Ethekwini Municipality staff came to be involved with connecting new pipes to the Shallow Sewer system.

In all other cases the communities cleared blockages, using the equipment provided, except in two known cases when community members called in plumbers to assist with household blockages.

The quality of life surveys indicated that the occurrence of blockages was the same (14%) in households with Shallow Sewers and conventional sewers.

Other related problems

Many other problems were raised that were not directly Shallow Sewer issues. These have been separated from the Shallow Sewer problems as they could also relate to other communities.

There were problems reported by the Ethekwini Municipality Environmental Health Department, in Briardale of internal plumbing faults where p-traps were not installed under kitchen sinks, allowing odours to permeate back up the pipes from the grease traps into the houses.

There were several complaints of poor toilet flushing, low water flows as well as cisterns not filling sufficiently for them to flush properly. These were not investigated in any detail in the project but should eventually be evaluated by the building inspectors who would normally report on the standard of housing and service provision.

In one of the houses at Emmaus there was very low flow from the kitchen taps. On investigation it was discovered that this was a plumbing design problem related to using roof tanks. The roof tank had been positioned above the cistern for optimal use there but in a big house such as this there was very slow flow to the kitchen that was far away. It was found that communities view all related problems such as plumbing and water issues as part of the Shallow Sewer “package”. One should be aware of this when designing Shallow Sewer systems and such inconveniences should, ideally, be avoided.

Water Usage and Operation of the Shallow Sewer System

According to the WRC Report (13), “The Shallow Sewer system can typically be used without blocking due to frequent flushing and small diameter pipes with a low water usage. Successful operation has been observed with an average household usage of 25 litres per capita per day.”

At Emmaus and Brairdale the Shallow Sewer system has been installed to all houses but the low connection rate could jeopardise the functioning of the system. Tables F1 and F2 show the connection rates and approximate water usage per condominium. Whether or not there is sufficient water flushing these systems is not known at this stage but it is likely that the condominiums with few houses connected could be at risk of blocking.

However if the number of people estimated to be using the system is related to the total water used by those households, then the approximations available from this research indicate that all condominiums have an average flushing in excess of 25 litres per capita per day. This result

implied that blockages would not be caused at Briardale and Emmaus by insufficient flushing with water. However many households who do not have their own water supply, purchase water from those with water meters, hence it is difficult to estimate how water much actually enters the sewers.

This can be seen especially clearly in the Emmaus data in Appendix 3 where the usage per capita is very high in Iqoqos D and G. In these cases there are people selling water, one of whom was a water bailiff prior to the intervention. It is suspected that one of the houses in G is also the local tavern.

3. Environmental Health Risk Conditions

In order to research whether installing the Water-borne Shallow Sewer systems (WSSS) reduced the environmental health risks in the pilot communities, the following hypothesis was made:

> *Installing WSSS substantially reduces the exposure of communities to environmental health risk conditions related to water and sanitation*

3.1 Methodology

Suitably qualified and experienced public health workers from Ethekwini Municipality Environmental Health Department conducted environmental health risk surveys before and after intervention identifying risks and conditions at Emmaus and Briardale.

Two internal reports, one on Briardale and one on Emmaus were produced (22).

Photographs and video material were also collected before and after the intervention in order to substantiate findings.

3.2 Results

It was anticipated that installing Shallow Sewers would offer similar health benefits as conventional waterborne sanitation, although it was expected that there would be some risks associated with the maintenance of the system.

Health officials stated that, at Emmaus, the comparison of environmental risks that they reported (22) applied only to the few households connected to the Shallow Sewer, and that for the remainder conditions remained unchanged, apart from pit privies having replaced the patented septic tanks.

Where changes were reported there were the removal of risks regarding clearing sewerage blockages, use of contaminated plastic and rusted metal water containers, defective patented septic tanks, and wastewater disposal while an improvement general, personal and food hygiene was noted. Rodent infestation and mosquito breeding was said to have worsened.

At Briardale the Health officials highlighted (22) various water, housing and plumbing and sewer construction problems that have been included in the results reported in section 2.

Health risks were identified in the poorly fitting covers that allowed easy access to the inspection chambers, design of inspection chambers that promote blockages and odours and ill-designed grease traps that creating favourable conditions for odour emission, fly attraction bacteria and vermin.

Resulting from this report, the project team visited Briardale to assess the quality of the installation. The WSSA contingent included an experienced Shallow Sewer project manager. WSSA began negotiations with the community and the councilors, and proposed a solution that involved putting their staff on site for two weeks to maintain the system in order to assess the details and the extent of the problems. This was in the planning stages at the time of writing this report.

4. Conclusions

It was clear that this type of project requires significant social intervention from the implementing agency on a continual basis. Technical support and training need to be maintained until the community is capable of running their system with minimal assistance.

It was unknown whether there were sufficient sewer connections to properly evaluate the system as a method of conveyance. At Briardale most of the houses that were built were connected to the sewer system, which may be sufficient to draw conclusions about the system in some condominiums. However at Emmaus there were so few connections that it is unlikely that any conclusion could be drawn about the system.

One of the most significant findings was that the Shallow Sewer methodology provides plumbing training to enable the community members to build their own sewers, fit wet cores and make sewer connections. It is highly unlikely that the standard of plumbing with this type of training could enable the community to undertake these tasks to normal building standards as required by the National Building Regulations. However funding for such projects would normally come from the PHB subsidies, in which process funds will not be released unless certain standards are met. Hence there may be a conflict with the Shallow Sewer methodology, as it stands, and the South African legislation for housing and the funding of housing.

Complaints of poor toilet flushing, low water flows as well as cisterns not filling sufficiently for them to flush properly should have been identified as quality issues by the developer, People's Dialogue and appropriate action should have been taken.

The designs of grease traps and inspection chambers should be reviewed with respect to sealing and the resultant reduction of odours and vectors; access, to prevent unnecessary contact, collection of debris and health risks; and height above the ground to prevent ingress of mud and storm water.

If such regular cleaning of grease traps is required, then people living in conventionally sewered communities who do not have grease traps may be causing blockages in the main sewers by excessive grease being disposed down drains. Low water temperatures in communities without hot water could perhaps, compound this problem. It may be worthwhile investigating the grease trap option in communities with conventional sewers.

Effective Conveyance

The technical effectiveness of the Shallow Sewer system installed in the pilot areas of study could not be fully assessed because of the low connection rate and usage.

The results indicate that undue blockages should not occur due to insufficient use of water because the per capita volume use exceeds the requirement of 25 litres per day for the estimated number of people using the system.

The potential for blockages was reported as a result of the use of unconventional designs and methods in the construction in the inspection chambers and grease traps. The condominial line blockages were directly attributed to the construction methods and design where there was ingress of mud, debris and building materials from open inspection chambers, grease traps and inspection chambers that were flush with the ground and unused pipe ends that were not properly sealed.

These faults should have been recognised by the implementing team and the community should have been assisted to rectify problems they were unable to solve alone. However Ethekwini Municipality and WSSA decided not to intervene in an attempt to evaluate the extent of the social support required.

The low connection rates prevented the test of surcharging occurring due to the inability of the system to convey water at the flow rates generated by normal domestic use. At the rate of

connection in the pilot study surcharging was infrequent and the known cases were attributed to other factors.

The key to success in this technology is the social intervention, which requires knowledge and dedication on the part of the implementing agency.

Environmental Health Risk Conditions

The poor standard of plumbing and workmanship in the construction of grease traps and inspection chambers at Briardale prevented the comparison that was intended from being made. Once the problems have been resolved the environmental health risk conditions should be re-assessed.

Health officials concluded that at Briardale the system, in its current state, had failed and had introduced a higher risk of public health nuisances than prior to the intervention.

At Emmaus no conclusive comments or recommendations were made, except that the Shallow Sewer system appeared to be an effective waterborne system if installed correctly.

5. Way Forward

There are considerable benefits to be derived for the Shallow Sewer concept, notably:

- The large saving in capital costs
- Ease of access into confined spaces

It appears the range of "Shallow Sewer type" technologies need to be developed and investigated before embarking on large-scale projects. The extent of the range is from traditional Shallow Sewer technology where the community "own, operate and maintain" the sewer on one hand to what would amount to a conventional sewer, in servitudes or similar, owned and operated by the local authority but laid to shallower depths. An interdisciplinary approach, covering at least the legal, technical and social professions is required, but should include environmental health aspects as well.

In addition broad scale policy decisions need to be made relating to the mismatch between politically driven expectations of high delivery rates and high quality social upliftment. These policies need to be included into the range of "Shallow Sewer type" technologies.

In conjunction with the above the following specific issues need to be addressed:

- Long-term studies on water usage, blockages and surcharges at Emmaus and Briardale and other sites need to be conducted to confirm the technical effectiveness in terms of capacity and sustainability
- Investigate the necessity of grease traps and if necessary redesign them to suit the findings of the investigation and the community's lack of enthusiasm to clean them.
- Undertake further studies on comparing blockages that occur in Shallow Sewered and conventionally sewered communities to evaluate whether the design of Shallow Sewers with their grease traps is more effective in preventing blockages in the community's sewers as well as protecting the city's sewers.
- Investigate the legal models to accommodate the range of "Shallow Sewer type" technologies in terms of ownership and servitudes (or similar). (The interdisciplinary approach would be particularly useful in the is regard)
- The National Building Regulations regarding water and sanitation need to be investigated and modified to accommodate the "Shallow Sewer type" technologies. In conjunction with this some means of managing the minimum quality requirements needs to be developed
- Research to find the optimum sewer pipe diameter for South African communities, using a combination of newspaper and toilet paper wiping materials, is required for further Shallow Sewer designs.

Appendix G

Record Of Experience Gained During the Project

INCORPORATING:

Deviations from the Model Methodology

AND

Lessons Learned from Events at Emmaus

April 2003

1. Introduction

One of the recommendations of the main report suggests that the way forward for Shallow Sewers in the current socio-political-legal climate should be to minimise the social constraints whilst maximising the technical advantages, implying that the social engineering should be reduced. This recommendation is made in the light of the current socio-political-legal circumstances, which could very well change or, as some of the variations to the methodology that were applied in the implementation are significant, reviewers may put a different interpretation on the causes of the social-political-legal difficulties encountered on the project, in which case they may want to apply either the full implementation methodology or a modified version in the future. In either circumstance, the implementation lessons and experiences gained on this pilot project could become valuable. The purpose of this document is to record the lessons and experiences gained in relation to the implementation methodology during the project. The reader needs to bear in mind that experience is subjective and is interpreted with opinion.

2. Format and Structure of this Report

One of the stated objectives of the Ethekwini Municipality Shallow Sewers Pilot Study was that it should be a transfer of technology, which implies a learning experience. It was inevitable therefore that the perspective of the researchers would change continuously during the project and also that the relevance and importance of certain aspects would only dawn and be internalised late in the project, although they may well have been pointed out and emphasized earlier. Further, as this was a pilot study, not all aspects of a full-scale implementation could be replicated, particularly those related to scale. This necessitated changes from the South American, (specifically La Paz, Bolivian), tried and tested model methodology.

For people associated with this project, experiencing the methodology for the first time, this modified methodology was accepted as the norm, as there was no other reference point. Hence it was only with hindsight that the relevance and importance of some of the variations became apparent. In essence what is being stated is that it is extremely difficult to record the learning process from the inside, without any reference points. Fortunately on this project there have been two events that have provided reference points: a report written by the Project Manager Miguel Vargas before he left the project, and the output from a workshop to determine the causes of failure of the process at Emmaus.

As the learning curve on this project was steep, some of the perspective on these two events had changed again by the end of the project. Although the events were written up and recorded close to the event, these have been re-written with some hindsight commentary, and in this manner some insight is given on the importance of certain aspects of the methodology. This provides both a record of the issues, as well as providing some indirect insight into the lessons learned and experience gained on this project. By its nature most of what is written is opinion, based on the assimilation of diverse information, and which has not been scientifically tested.

This pilot study was intended to investigate the implementation of the Shallow Sewer Technology in South Africa. For this reason it is assumed that most of the readership will be South African and will not have knowledge of the methodology as applied in La Paz. To cover this void, a simplified version of this methodology is provided in tabular form up front.

This is followed by commentary on and extracts from the Shallow Sewer Pilot Project: Methodology Section reported by Miguel Vargas, the Project Manager (Appendix J). This extract of his report highlights the variations from the model implementation methodology. The in-bedded commentary is intended to highlight aspects, which the researchers determined to be significant with retrospection.

The findings of the workshop held to identify what went wrong at Emmaus after the project there collapsed, are documented under the heading “Summary of Findings of Workshop Held In March 2001 to Evaluate Events At Emmaus and to Report on Lessons Learned to Date”. This has been reworked from the original record, primarily to adjust the style so that it complies with the rest of

this document. However it was felt that, where relevant, these findings should be put into context of the whole project rather than to keep them purely as they related to Emmaus at the time of the workshop. Further details are given at the start of this section of the report.

The summary of the findings from the workshop, are by their very nature, a conclusion with implied recommendations. Therefore to add conclusions and recommendations would be pure repetition. Not withstanding this, recommendations and conclusions are provided for the section on "Deviations from the Methodology Proposed for the Implementation of Shallow Sewers".

Although, the thrust of the recommendations for the way forward in the main document, is that the social component of the model Shallow Sewer Methodology should be down scaled it is by no means the only way forward, and therefore lessons learned, particularly those learned in relation to the social aspects, have been recorded. For the purpose of recording the conclusions and recommendations here, this document is written in a manner that assumes that the way forward for Shallow Sewers is to apply a "South Africanised" full implementation methodology.

One of the aspects whose significance only dawned on the researchers late in the project was the importance of "milestones" or evaluation steps and the consequence of not enforcing corrective measures related to them. This aspect is in fact a conclusion, but because it is critical in the understanding of the model methodology, it is reported up front in Table G1: Simplified Table of Implementation Process and Evaluation of "Milestones"

3. "Milestones": the Evaluation.

The methodology breaks the implementation into a number of steps. One of the covert objectives of each of these steps is to develop confidence between the parties, i.e. the implementing agent needs to be assured of the community's commitment to the project and the community needs to be confident in the commitment and ability of the implementing agent. This is achieved in the methodology by setting "milestones" or evaluation pauses at the end of each of the steps. At the outset of each step certain objectives for both the community and the implementing agent are set and evaluation criteria determined. At the end of the step when these "milestones" are evaluated, a number of decisions need to be taken. If everything is in order and everyone has done what he/she undertook to do at the intended level then, by mutual agreement, the process can proceed to the next step.

On the other hand, if all is not in order, then one of three things must happen. Either both parties can accept the deviation, (in which case the consequences of this action must be clearly understood by all parties), or an intervention coupled with an appropriate re-evaluation must occur to correct/strengthen the shortcomings or the project must be abandoned (either temporarily, until such time as the defaulting party has corrected the default, or permanently). Strict enforcement of the option is critical.

It is pertinent to highlight that in broad terms the cost of each successive step in the methodology gets progressively more expensive and onerous. The "milestones" then not only help identify and manage potential problems, but also assist in controlling wasted expenditure and effort.

Table G1 below provides a tabulated simplification of the implementation methodology. The evaluation phase contains some examples of sample questions that need to be answered. But, as implied above, the actual questions need to be developed in accordance with the specific needs and circumstances of each intervention.

Table G1: Simplified Table of Implementation Process and Evaluation of "Milestones"

Step 1	**Evaluation of the status quo before the intervention** **The following preliminary investigations are made:**
1.1	Inform the community of the intervention and process
	Evaluation 1: Does the community support the intervention?
Step 2	**Cadastral and social characterization**
2.1	Technical and geo-hydrology assessment (if applicable) to define condominium groupings
2.2	Social characterisation and community structures that exist
2.3	Current sanitation and water supplies
2.4	Institutional capacity
	Evaluation 2: Have members of the community been able to repeat back to the implementing agents the important aspects of the project and the methodology to be used? Have members of the community been able to identify potential implementing problems that may be specific to their community? (Ie Is the community ready for the intervention?) Has the implementing agent provided everything that the community has perceived that should have been provided this far? (Ie Is the service provider ready for the intervention?) If positive in both cases then proceed. On the basis of these findings, design the technical and basis of social intervention
Step 3	**Design of the education phase and communication strategies**
3.1	Discuss education requirements with the community, giving them the options how to present the education and communication routes to explain what is expected of them
3.2	Confirm community choices
3.3	Decide on communication methods and protocols
	Evaluation 3: Are the community's perceptions of what is required of them in terms of education consistent with what the implementing agents requirements are? Have health and hygiene practices improved? (I.e. storage of water, fly control) Is the communication method functional? Are the community's choices consistent with their affordability and expectation? Etc.
Step 4	**Contractual phase:**
4.1	The community makes its choices and decisions
4.2	Continued education reinforces what has been learnt and provides understanding of the implications of their decisions
4.3	Sewer layouts and designs done with community participation
4.4	Contracts are drawn up and signed by all parties
4.5	Evaluate political structures, influences and buy in. Manage political climate
	Evaluation 4: Has the impact of 3.2 been tested? Have the contracts been signed? Has anything changed in political/social/management that warns against proceeding to the next phase e.g. has the political leadership changed or have the political promises changed? Has the political and community leadership perceived the impact to the community dynamics that the intervention will make? Can the community sustain the demands on it?
Step 5	**Implementation and consolidation phase:**
5.1	The sewer reticulation is built and the connections are made to it.
5.2	The community is taught how to maintain it and how to manage problems
	Evaluation 5: Can members of each condominium rod the line, repair benching etc? The implementing agent evaluates the project as a whole. (This evaluation falls under the research programme function in this project) Can the community sustain the demands on it?
Step 6	**On going social and technical maintenance by the implementing agent**
6.1	Set up suitable liaison between the Municipality and the community
6.2	Re-enforce education when necessary, i.e. health / hygiene awareness, maintenance skills and contractual obligations
	Evaluation 6: Has a community liaison officer been assigned to this area and trained? The service provider should evaluate this aspect after a suitable period and probably at certain intervals thereafter. Is the implementing agent structured to manage community-based interventions?

4. Deviations from the Methodology Proposed for the Implementation of Shallow Sewers

The Project Manager, Miguel Vargas of Water and Sanitation Services, South Africa, reported on the methodology used in the Ethekwini Shallow Sewerage Pilot Project (Appendix J). This report includes the proposed methodology: Social Intervention Model for Implementation of Shallow Sewerage Systems. The last two pages thereof give the Project Manager's evaluation of the deviations from the methodology at that date, November 2000. He left the project shortly thereafter.

What follows is an interpretation of these deviations, reviewed in hindsight of the experiences gained on the project. Direct quotations from the Project Manager's Report (Appendix J) are presented in italics.

4.1 Methodology Instruments: Area Characterisation

> *" The cadastral survey including the location of the wet cores or sanitary areas to be executed by the project team was delegated to the topographical surveyor mainly due to the difficulty of the terrain for referencing and the lack of experience by the personnel provided by the social consultant."*
>
> *"The results of this were centred on an extended negotiation process with each condominium in the location of the inspection chamber being close to the wet core"*

Because of the interdisciplinary approach of the WSSS, the effect of this should be negligible.

4.2 Methodology Instruments: Participatory Diagnosis and Planning

> *"The methodology called initially for a long series of discussions about the sanitation situation in the community, the identification of health hazards in each condominium and the creation of an enabling environment for the community to identify their own sanitation problems and figure out the solution in a coordinated manner."*
>
> *"Indications from the initial project presentation and advice from the social consultant (BESG) pointed out that the community was at a stage of realization of their sanitation problems and ready to take action."*
>
> *"This turned out to be partially true, with not all households being aware of the consequence of their polluted environment. Eventually, the households that were aware of the implication of the project at the onset of the actions became the leaders during the implementation phase."*

A number of comments are pertinent:

4.2.1 From the information collected by BESG, both communities gave sanitation high priority and the implementing social consultant, LIMA Rural Development, confirmed this. However their degree of understanding and motivation to address sanitation issues may not have been as expected or as anticipated in the model methodology.

It appears that the Emmaus community did not find their own core problems through questioning deeper and then providing their own solutions as per the methodology, but selected Shallow Sewers for convenience and a quick method of getting rid of the patented septic tank problem.

A compounding influence was the notion that they had been complaining about their situation for a long time and at last someone was listening and offering them a solution, which they would be likely to accept even if it they did not feel it was the answer. It thus appears that they were only aware of the ideal of the project at a superficial level.

In retrospect, at Emmaus their motivation and priority seemed to be the inconvenience due to the patented septic tank blockages and the failure if the existing system. The smells in some houses were very offensive and, being indoor toilets, caused great discomfort for the occupants.

4.2.2 This methodology should have taught the community how to help themselves to get out of poverty and how to pool their limited resources to achieve their common goals.

Experience has shown that the opposite has happened:

- At Briardale, tools and materials for installation and plumbing of wet cores which, were provided for the people to share, were "hijacked" by enterprising members for their own personal gain.

- It was also reported in Emmaus that the money paid to the condominium leaders for work done by the people was not always fairly distributed. (This is hearsay, but could be grounded in truth, as the project team did not influence the community's management of such things).

This indicates an underlying lack of "community spirit" within both communities, but must be weighed against the initial enthusiasm that was present at the start of the implementation phase at Briardale, where "three days" work was completed in six hours on the first day.

4.2.3 The conclusions drawn in the Social Scan Report were misleading, namely:
"The new leadership appears to be strong. The community fully supports the committee. The community has a high level of trust in the committee."

This report did say that there was risk at Emmaus with the inexperienced, new committee but they did not capture the seriousness or the rift and rivalry between the "owners" and "lodgers". This proved to be a serious problem that delayed the implementation of the project as described in the Social Intervention: Final Report. (4)

This should have been addressed at the first "milestone" point where the "re-do", "exit" or "pause" rules should have been applied. However it would have been very difficult in practice in light of comment 4 below.

4.2.4 Had this not been a pilot study, with its Public/Private contractual relationships and dedicated resource allocations, reaching "exit points" would have prompted a different response and the project team may have seriously considered withdrawing from the project. If the system was being implemented on a wide scale, the implementing team could have simply moved on to another site while progress was slow in this community. The practicality here of following the methodology idealistically on such a small scale has to be questioned.

Nevertheless, continuing with the project collected valuable research information that could be used in the replication of the system.

4.2.5 In the ideal situation, a range of sanitation options should have been provided for the community to choose from. As the intention of this project was specifically to implement and test Shallow Sewers, the communities were presented with this sanitation system only, and the option was "take it or leave it". This approach of only offering one solution, has been successful in Bolivia. But the expectations of the communities are different as the implementing agents and governments cannot afford to supply any higher level of service, so in reality there is no other choice. This is not the case in South Africa and the communities are very aware of the range of options, particularly the expensive ones, which have become the benchmark. Had the communities been offered the full choice and the

methodology been applied properly the process of learning the pros and cons of the various systems as part of the empowerment to make the choice, may have given them more confidence that the Shallow Sewer system was the right choice in their circumstances.

It is worth noting that in Bolivia, although there is no choice, the community was taken right back so that they understood what their fundamental problems were. The application of the Shallow Sewer training enabled them to make changes to their cultural practices in terms of improving hygiene and environmental consideration.

4.2.6 One of the major issues affecting the implementation was the choice of water supply and the disparity in income between households. Those that could afford the full pressure system were adamant that they would not settle for less, whilst those with lower incomes really had no choice and were happy to receive the roof tank water supply to their houses. The process, however gave the community the choice and in this case it would have been far better to package the low-pressure water system with the Shallow Sewer system and avoid the conflict that ensued.

The responses from the community tended to question whether the initial negotiations with the communities had indicated the exact and total amounts that the people were expected to pay for each choice, i.e. Connections fees, tariffs, wet core material and plumbing costs, tool costs etc. It was, however, confirmed that these had been presented and debated.

4.3 Methodology Instruments: Popular Communication

This element deals with how to communicate effectively with the community, using “instruments” to which they would relate well, such as through posters or through the children who are usually more literate than their parents etc.

The project team felt that, on reflection, this should have been considered more effectively up front in the “packaging” of the project.

The methodology states that:

> *“Popular communication becomes a fundamental instrument for the pedagogic process, leaving the traditional concept of the communication as a simple broadcasting action.”*
>
> *It is understood that every communal action is a communication action. This is reflected in the communication means and languages produced and used. Notwithstanding, given that the population is one of low income and does not count on formal and permanent means for their own communication production, the project should encourage as alternative production, originating from the local residents.”*
>
> *“The project should encourage and use communication channels often being used by the community, and identify other potential channels for use. Additionally the project would propose alternative and popular communication media, as well as the insertion to traditional media in the intention of democratizing its use.”*

The methodology goes on to say what topics should be discussed and how these should be recorded.

The Project Manager reported that, in the Ethekwini Pilot Study:

> *The impossibility of contracting a popular communicator for the complete project implementation yielded a two-fold consequence. The principle followed was to utilize the material already developed by other institutions such as SANTAG, DWAF, EWS etc, in order to minimize material development costs, given the small scale of the project.*

> *On the one hand, the material developed by the project was limited to the Shallow Sewerage System Instruction Book with the input of an outside artist. The lack of material about tariff and connection costs, project steps and legal arrangements eventually delayed (not significantly) the implementation of those actions.*
>
> *On the other hand, the condominium leaders and the committee became actively involved in the communication process, adding credibility to the project but posing some limitations for individuals not having regular contact with the community structures. This was particularly dramatic for some condominiums in Emmaus.*" (It appeared that some homes failed to receive all the information)

The project team decided to use the committee meetings and meetings with the individual condominiums as their communication method with the people. This was not always effective. Sometimes the community members attended workshops and meetings, at other times negotiations and discussions took place either with the community forum / committee or with the condominium leaders. This resulted in a lack of consistency in the messages being delivered to and received from the community members.

There were many different people/groups communicating with Briardale. These were: People's Dialogue, Municipality Water, Miguel Vargas (the original Project Manager) and LIMA, and the replacement Project Manager with his technical and social assistants as well as the research field assistants, Municipality Health officials and Councilors. At times some of these people gave information and opinions that conflicted with the messages of the implementation team.

Experience from this study indicated that an implementing team should put in enough effort to understand community-specific problems and communication networks before designing the training programme. During the implementation they should also be alerted to the community's responses and have the flexibility to acknowledge and make changes, if appropriate.

The social consultant, LIMA, and the Project Manager, Miguel Vargas, were retained only until the installation of the sewer reticulation. Their departure from the project team had a major impact on communication with the communities. The connections to the sewers were drawn out and fraught with social issues, which probably could have been solved more readily had the communication dynamics not changed.

In retrospect, because the project took much longer than anticipated, there was significant personnel changes to the project team during the implementation, which affected the communication with the communities, which in turn resulted in insufficient follow up to the social intervention work reported in October 2000. For example, ensuring that the newly capacitated committee at Emmaus held their AGM, ensuring that the importance of the maintenance instruction manuals was grasped, that the health and hygiene awareness had improved and that they understood the agreements they had entered into.

It is recommended for future projects that the same team and project manager be kept in place throughout, if possible.

An issue, which is pertinent to the communication issues, is that had this not been a pilot study then there would, in all likelihood, have been only one implementing agent, which would have reduced the opportunity for presenting conflicting messages by different agents. It also highlights the importance of structuring the municipality or local government in such a way that all development projects are approached and communication is conducted in a unified, consistent manner when dealing with communities.

4.4 Methodology Instruments: Evaluation

"Given the existence of a complete research component funded by the Water Research Commission and extending beyond the project completion, many of the evaluation activities were passed on to this component."

"Henceforth, the evaluation effort was limited to community evaluation about project implementation."*

These results are to be found in the LIMA Final Report (4).

This assertion by the former Project Manager was discussed in detail to understand where the research programme would or would not meet these expectations. The following understanding of the Evaluation Process was recorded in order to compare the requirements with the research programme.

4.5 Evaluation Process

The methodology states that

"Evaluation is a part of the social intervention methodology and it is present during the totality of the process. The evaluation goals are:

- *Enable an efficient secondment during project implementation to identify possible failures and introduce timely correctives*
- *To identify the degree of participation of the local residents in project definition and execution*
- *To identify in each implementation phase and detect possible discrepancies between proposed objectives and actual partial results*

Evaluation will identify parameters for working strategy modifications."

4.6 Field Team: Profile

There was no social consultant available in South Africa with the appropriate experience. When LIMA Rural Development was selected, it was envisioned that they would be given suitable, specific training and it was expected that they would be capable of providing advice on social adaptations to the methodology for it to be suitable in the South African social environment.

These hopes did not materialize as expected but the positive attitudes of the LIMA team made up for these weaknesses.

4.7 Field Team: Training

Specific training in the methodology by an experienced overseas social consultant had to be abandoned because of budget limitations. Instead a group of five people were sent to Bolivia to visit a similar project.

The Project Manager reported:

"Such a visit was quite successful from the institutional point of view, since participating officials gained a deep understanding of the project functioning which would later support project implementation. However the initial objective of providing the project team with sufficient tools and knowledge for project implementation was not completely achieved. Only two senior staff from LIMA assisted and one of them later resigned his position. These factors hampered the passing of the methodology training to the project team on the ground with many deficiencies having to be solved in the biweekly project team meetings with the Project Manager and the provision of seasoned technician to the project team."

This training approach gave a few key individuals an excellent insight to the system albeit without the in-depth social training in the methodology. However the spread of this experience was limited and two of the delegates have since left their places of employment and were no longer available to the project team.

4.8 Work Phase: Self Help vs. Payment for Work

Cash contributions were made to the communities for their labour, contrary to the principles of the methodology. This was done because it was perceived by the communities that the Ethekwini Municipality Water Department had set a precedent for payment for digging trenches. Further it was argued that community needed the money in order to be able to pay their connections fees.

The councilor at the time supported this argument saying that hungry people could not work well.

The result of this was that the people were paid for their work but were unwilling to use this limited resource to pay for their water connections.

During the implementation of the project local government elections occurred. The new councilor at Emmaus actually frustrated the project team's efforts by telling the people that there was a new policy of "free water for all" meaning that water and connections were free and that they need not pay in the meantime, which was patently untrue.

Another reason given to introduce the cash payments was that there was no micro lending or other financial mechanism available to help the people to connect to the system.

In the Ethekwini Municipality Water Department the approach is slightly different as the pipe work and the roof tanks or ground tanks always belong to Ethekwini Municipality. The people get paid for digging trenches for the pipes that belong to Ethekwini Municipality, but the Municipality does not pay for the work for any pipes owned by the community.

In the roof tank installations in the pilot study, it is unclear whether the Municipality should be paying for the pipes and fittings between the water meter and the roof tank. This was not done in the pilot study, even though it seems inconsistent with their normal practice.

One of the difficulties for the people living at Emmaus was that they had already received their subsidies and thus had to provide their own capital to pay for all the pipe work and fittings to connect from the water meter to the roof tank and into the house.

4.9 System Consolidation

> *"During this phase, the household connections to the system are finalized, and the system starts to function. The sanitary and environmental education and the training for operation and maintenance are consolidated. The community makes a final evaluation of the process and the field team moves off the site."*

This phase experienced severe delays, mostly after the Project Manager's departure as only two show houses in each community had been connected by that time. LIMA (4) gave the community's evaluation at this point, indicating that they were satisfied to date. After this the people experienced difficulties in connecting to the system.

4.10 Systemisation and Final Evaluation

This section also relates to the Methodology Instruments: Evaluation, above.

> *"The community does not participate directly in this phase. The co-ordination team performs this task using the input given by all the stakeholders involved."*
>
> *"The task previewed for this phase includes the systemisation and project evaluation, analysis of the results for applying the methodology, and in particular:*

a. *Effectiveness of the community organisation and community groups formed*

b. *Analysis and evaluation of the condominium organisation*

c. ***Analysis and evaluation of the new relationship created between Ethekwini Municipality and the population in relation to the implementation of the system***

d. *Identification of health and attitude changes by local residents*

e. ***Evaluation of Ethekwini Municipality staff involved in the project and identification of potential "champions"***

f. ***Identification of field activities to be continued after the project end***

g. *Elaboration of final reports and lessons learned by the project*"

The above denotes the expectations of the research and most of the information for this task was collated and reported by the Research Manager in the final Research Report.

However points **c, e and f** highlighted above were not part of the research programme and need special consideration.

In light of the failure of the project at both sites, an evaluation of the relationship between the Municipality and the community is no longer relevant. In view of the recommendation that the social aspect of the Shallow Sewers project is down played, and that the technical aspects of the Shallow Sewers is retained, a new approach to Shallow Sewers needs to be developed and researched, requiring a new approach. This will negate item e, but will in itself automatically identify activities that need review.

5. Summary of Findings of Workshop Held in March 2001 to Evaluate Events at Emmaus and to Report on Lessons Learned to Date

At both sites serious problems were experienced at the end of the research period. The reasons for the problems were very different, but a certain commonality was exhibited. At Emmaus the main problem was the householder's difficulty to raise the funds to complete the wet-cores and make the connections. This was complicated by the expectations of the community as a result of their interpretation of statements made by politicians that the Government would provide free water services including free connections.

Further, severe problems arose due to diverse wants within the community in relation to the water supply. The wealthier minority, who could afford it, would have preferred a full pressure water supply. The majority could not afford this level of service and therefore voted in favour of the semi-pressure (roof tank) system. This led to unhappiness and division within the community, and subsequently became a political issue during the local elections. The Shallow Sewer project was consequently damaged in the crossfire.

At Briardale the Housing Developer failed to deliver as expected. The community reacted by rejecting everything it associated with the Housing Development, including the Shallow Sewers.

In an attempt to assist future projects, an evaluation by the Project Team, of the cause of the implementation problems at Emmaus was conducted by means of a brainstorming workshop in March 2001. The findings indicate how the project could have been managed more effectively and what areas should be considered before and during implementation. This report also compares these findings to the methodology proposed by M Vargas of WSSA, indicating any new findings as opposed to deviations from the proposed methodology.

In order to identify the issues deemed to be important in the failure at Emmaus, a brainstorming exercise was conducted to question the following "What can we learn (and what should we measure) from Emmaus in order to gain the most from the experience and to avoid the problems we had there for people considering Shallow Sewers in future?" The lessons learned are surmised to be important in improving the methodology for South African application.

The record of outputs from the workshop tended, by the very nature of the process, to be relatively brief and in some cases superficial. In order to identify core issues, the brainstorming facilitation methodology required that issues, which related to one another, were consolidated or grouped together. Thus, the report did not make a clear distinction between criteria for selecting suitable communities for interventions, and critical criteria for managing the intervention. This has made the review process of lessons learned extremely difficult, as there is very strong similarity between the issues affecting the two. Recording these two issues either creates needless repetition if reported separately, or loss of distinction between the two, if reported together.

The hindsight review has been informed by the ideas captured at the workshop but has extended them in light of later experience and the reporting has tried to distinguish between management and criteria for selecting suitable communities. The core issues, recorded at the Emmaus workshop, have been retained as headings in this section of the report and the extended findings are reported in the present tense and are indicated in italics.

5.1 Product Packaging and Marketing

Product packaging and marketing was highlighted as a focus area from which the following specific recommendations evolved:

- "*The packaging of the system or options is very important and should be carried out only after the social evaluation on the community has been completed. The better the information gathered about the community prior to starting the package design, the lower the likelihood of problems developing later.*

- *The package should only offer what is appropriate to the community and the service provider.*

- *The project should be organized so that water and sanitation are supplied simultaneously as a package with satisfactory payment having been arranged upfront to avoid deviations from the agreed plan. In the ideal situation the water, sanitation and wet-core should all be provided as one unit to avoid the situation in which the water is supplied and the sewer exists, but there is no means of getting the waste water into the sewer. I.e. the wet core provision must be included in the water services package. Wet cores should be constructed and the connections to the sewer should be made before the water is turned on, thus preventing potential health hazards. It should be noted that where there is a housing subsidy the problem of providing finance for wet core provision should not arise. In the Ethekwini situation the Shallow Sewer should be tightly linked with the semi-pressure (roof tank) water supply. If the community accepts the Shallow Sewer than it must also accepts the roof tanks.*

- *It is imperative that there is a mechanism for paying for the water and sewerage services before the project is undertaken: this applies to both the capital cost as well as the service charges. Water connection fees and other capital costs (e.g. wet-cores) to be born by the community, must be secured up front or an alternative means of connecting / paying should be facilitated before the start of the project. A financing plan/scheme may be required for payment of capital costs. (See Appendix B: Ability and Willingness to Pay). In the case at Emmaus the intention was that moneys obtained by the community for undertaking the construction would be used to pay for the wet cores and connections. This did not happen, as the community demanded this money on completion of the construction. The community members were unable to save this money, and by the time it was required for*

the wet-cores etc., it had been used for other purposes. This needs to be taken into account, and the financial package needs to be "sold" to the community.

- *Paying the communities for work encouraged incentives that were contrary to a self-help philosophy.*

- *The training and capacity building provided should be specific to the needs of the community and its structures. It appears that poorly educated communities tend to associate the education with the current "hot" issue only, and as the issues change follow up training may be needed.*

- *There is a need to temper the "community driven" approach with a strong framework of non-negotiable issues. The "non-negotiables" need to be part of the "package" and are specific to the community and the local governments needs. (Hence the requirement that the package can only be designed after the community evaluation). In the Emmaus case the semi-pressure water supply should have been linked to the Shallow Sewer system as the only option, had it been realised that some members of the community could not afford a full pressure water system."*

5.2 Community Project Fit

By their very nature, interventions in a community disturb the equilibrium of the status quo. Human nature is such that in general it resists change. The odds therefore tend to be against achieving a positive perception by the community that the intervention has been successful. Determining whether the intervention is the correct intervention for the community, and whether the community is ripe for an intervention are critical. Real motives and internal dynamics play a pivotal roll in being able to assess and control the potential for success. As these are dynamic, they also need to be managed throughout the project. The way the community functions needs to be thoroughly understood and managed to ensure that the net outcome is positive.

Determining the "community project fit" is usually based on a snapshot of the potential of the community before the intervention commences and, in the main, most of the specific issues that emerged at the workshop applied to the snapshot. However, some of the issues overlap directly with project management, and have been included here to both save repetition, and because this is where it was recorded at the workshop.

- *"At the community evaluation phase evaluating the community's stated needs and priorities requires careful consideration. The reason for having stated water/sanitation as a high priority is important, and possibly indicates motives. Side issues such as convenience or the project possibly providing a source of income during the construction phase, or the project providing short-term political recognition for the leadership, may raise the intervention on the priority list, but does not bode well for sustainability or commitment to the project when the chips are down. The interrelationship between health, education and the will to lift oneself from poverty were considered to be important indicators, and these should be divorced from politics. The history of a successful prior project implementation may strongly indicate the community's ability to cope with an intervention. In hindsight, it was felt that understanding the reasons why the project was successful, may be a better indicator than merely knowing that the community had been involved in a successful project. Understanding the reasons why an historic project failed may also be revealing.*

- *Understanding the process of how a community reached the decision to go ahead with the intervention may also be useful. Depending on the power of the leadership, the community may agree to participate in the project although they do not support it and may not necessarily be committed to it. Coupled to this is the community's level of understanding of the project at the time the decision was made and whether the whole community was involved with the decision making process.*

- *Reliable indicators are required to assess the ability of the community to afford the system. People are generally reluctant to disclose their incomes, and sometimes give erroneous answers to direct questions related to this, and therefore indirect methods of assessment may be more reliable. Incomes certainly need to be crosschecked against indirect methods of measurement. If the community cannot afford a service, it will not be sustainable.*

- *A fully functional development forum with an effective, cohesive management structure whose decisions are supported by the community is essential. It must be evaluated whether such a structure exists or if not whether it can be whether a viable mechanism to develop and support such a system can be established. During the progress of the project the functioning of the community management needs to be evaluated and managed continuously.*

- *The developer needs to understand the power bases and their dynamics, both in the community and beyond, and needs to determine whether the power system can be managed positively throughout the cycle of the project."*

At Briardale, when the Housing Development failed, there was an associated change in the community leadership. The assumed mechanism of this change is both interesting and pertinent to understanding the local democratic systems.

Initially there was a small group of dissenters who gradually splintered off from the mainstream. Their support appeared to gradually increase until they split the community into two factions, which made management of the community very difficult. At some point, which was difficult to determine, presumably when the upstart group decided it had a certain critical mass of support, there was effectively a coup d'etat. The reason that this process could occur is that there was a real issue, in this case lack of Housing Developer performance, which initiated and sustained the rift in the community. The reason that the splinter group was successful was because no one managed the real issue.

The process fundamentally is not different from what occurs in western style politics, except that in western style politics the transfer of power is generally confined the election time frame. This unconfined process raises important question for the implementing agents. Is it the implementing agents place to control the politics and therefore the leadership of the community? The answer probably is that when trying to determine the project community fit, one of the critical items is that either the Shallow Sewers project must become only part of the whole development which must take place under one developer, or else there must be no other developments which could create real issues for dissidents to rally around. (There is an issue relating to motivation for leadership which is dealt with in the next section, but which is related to this incident).

5.3 Strength of Community Leadership and Structures and Stakeholder and Political Environmental Monitoring

Local council elections were held during the implementation of the project. There was no mechanism within or without the electoral process whereby the project team could control election candidate's promises, which were contrary to those agreed and already being implemented under the Shallow Sewer project. In the Emmaus situation this led to the collapse of the project as it undermined the objectives of the project and the local community leadership.

It was inevitable that the project team should focus on leadership as being critical to the success of the project. The following emerged from the Emmaus workshop:

- *"In the communities the power base is not necessarily as indicated by elected leadership. It is important to know how the power is distributed within the community. Identifying the people who, in reality, influence community decisions in itself is a challenge as they may not necessarily be part of the community. The initial and on-going support for the project of these people is as important as the support of the formal elected leadership.*

- *Interventions will lead to disputes and a robust mechanism for their resolution is essential.*

- *Trust building within the community and between the community and the implementing agency is a vital factor for success."*

The process of the "coup d'etat" at Briardale, recorded in the section above emphasizes the importance of the first two comments above. The third item, seen in conjunction with the "coup d'etat" at Briardale raises the issues of the status and authority of the implementing agent and the project within the community. It would appear that the implementing agent should reaffirm these positions with all parties (including the councilor, and all factions within the community) at regular intervals throughout the project, and it is imperative that he/she remains neutral.

There is anecdotal evidence from other projects that there is strong financial motivation to be in a leadership position within impoverished communities within South Africa. It has been suggested that a community "Leader" can control a "salary" of up to about R4 000 per month on providing "favours". This is high incentive for someone without another source of income, and also provides incentive for others not in power to usurp the authority.

From the above it was noted that politicians and other stakeholders could have a dramatic influence on the actions of people in the community. In order to keep control of the influences, which could derail the project one needs to have an effective monitoring program. To be added to this is that there appears to be no formal means of identifying where and when potential problems will arise. The only apparent means of achieving this is by networking at all levels both within and without the community.

5.4 Financial Viability

For financial viability, both the capital and the running costs need to be affordable, and accounted for. While it is appreciated that the inability of the Emmaus community to be able to afford the capital costs, is an exceptional case, which should not arise again under the current Provincial Housing Board subsidy system, the Emmaus experience did highlight the need to ensure that there is sufficient capital funds to cover all aspects of the intervention. The inability of the community to take advantage of a savings scheme, which was implemented to assist them, also highlights the crippling nature, lack of capital has on the indigent.

5.5 Options and Responsibilities of the Community

The people need to truly understand their responsibilities and their options. They have short term responsibilities in relation to the project implementation which may include payment for materials and saving for deposits and getting themselves connected to the system i.e. doing it themselves or getting a third party to do it for them, at a cost. They have long-term responsibilities to pay running costs and taking action when they have a problem. This includes the option of rectifying problems themselves or paying a third party to do it for them.

5.6 Evaluation of the Implementation Success

As has been mentioned earlier, the "milestone" evaluation points in the methodology need to be adhered to rigidly. The implementing team in the pilot study was "set for success" and tended to turn a blind eye when the implementation was not on track, but nowhere was it defined what success meant. It is recommended that people implementing projects establish the criteria for success. This is not necessarily the production of a Shallow Sewer system but a successful community intervention. In the case of this project it was tacitly assumed that "success" meant the production of a Shallow Sewer reticulation.

5.7 Social Environmental Monitoring

Upfront evaluation and on-going monitoring during implementation are essential. In this regard there are two aspects.

- Being aware of when the community may be changing the goalposts.
- Identifying erroneous issues

In relation to obtaining the information which will provide this knowledge, it is important to ensure that the chosen method of communication is providing an effective two-way communication.

5.8 Commitment to the Condominium (Iqoqo) Structure

Although it was never investigated formally it appeared that in the Emmaus situation where the community was established and was stable in its locality, the subdivision of the community into condominiums or Iqoqo had value both from the "group therapy" aspect and the sharing of resources.

6. Summary of Findings of Workshop Held in March 2001 to Evaluate Events at Emmaus Authors' Concluding Impressions

As part of the peripheral education stemming from this project the authors were subjected to and influenced by a number of other concurrent sanitation and community-based interventions. The following impressions may be pertinent to the understanding of the demise of the project and be of value not only in relation to the Shallow Sewer project but to pilot projects involving the community in general.

- In light of the radical change from the traditional manner in which services are provided, the implementation of the Shallow Sewers pilot was possibly implemented too rapidly. The implications of the methodology were not fully comprehended by the affected parties and stakeholders at the early stages of the project, and only with hindsight were the connections between cause and effect made on some of the critical issues. When implementing pilot studies of this nature, where personnel with experience are being used to train the inexperienced through an intervention, focus needs to be on the training and issues such as the institutional arrangements, rather than on the implementation of the project. There possibly needs to be an upfront step in the program that deals with these issues.

  In the Shallow Sewers Pilot Study this was exacerbated as the imported Project Manager was on a fixed time contract, which related to the implementation rather than on the education. This needs to be borne in mind when contracting with these personnel

- In this type of project when Health and Hygiene awareness training is done the information tends to be forgotten unless it is re-enforced with follow up training, i.e. 6 weekly. (Health Dept official). The training for maintenance was not utilized immediately and at Briardale people did not even keep the instruction manuals. This was tested during the survey. (Research Manager)

- Our adult education approach in South Africa is poor. People are given information that they are required to learn and regurgitate. Understanding only comes with interactive learning. Learning should be a reiterative process. Understanding should be assured by repeating what was given and then incrementally varying the applicable situation and adding more information so as to continually re-enforce what was learned. . (EWS Project Liaison Official)

- It appears that the Shallow Sewer process and methodology is incompatible with a socialist state such as South Africa, where people expect delivery with little or no effort on their part. This contrasts with the situation in Bolivia, where the methodology succeeded in helping the very poor to get out of poverty by helping themselves. The people were much poorer than in South Africa and the government there was unable to help them. Even the taxi drivers would not drive down roads that were in a poor state of repair and the community had to maintain the roads themselves for the taxis to come to their area. These people were then receptive to a self-help scheme. (EWS Project Liaison Official)"

- At the time that the Shallow Sewers project was being undertaken, there were a number of similar community type developments and interventions being undertaken. Two related issues arise from this:

    - Communities may be being confused by the different methodologies being applied. Some of the methodologies are very similar, but different enough to possibly confuse, for example the methodology generally being used to implement Dept. of Water Affairs and Forestry VIP projects is very similar to Shallow Sewers.

    - There are some very good systems and parts of other methodologies which suit the South African conditions better than those used for the Shallow Sewers. (e.g. The education component of one of the DWAF projects used an oriental technique which by questioning forces the community to develop a "solution tree" for the problem, thus breaking the South African "regurgitation" approach to education). This raises the possibility of developing a "Shallow Sewer like" methodology specifically for South Africa by picking the eyes out of similar but compatible techniques and methodologies and combining them under the skeleton of the Shallow Sewer methodology.

- There appears to be reluctance within the communities to migrate to areas of different facilities, i.e. people are reluctant to move to upgrade or down grade their access to services. The expectation then is that different service levels will be provided within a community to satisfy the different wants. This has a number of repercussions:
    - It makes the provision of services very difficult and expensive.
    - It creates conflict within the community, and with low community leadership experience, it can have a devastating impact on the community.

7. Conclusions

The proposed methodology provides guidelines to implement the Shallow Sewer system, which is described as follows:

> *"It is a process through which participants having different views about a specific problem, can in a constructive way analyze and communicate to others their vision and together find possible solutions. It is based on an interdisciplinary approach which differs from a multidisciplinary one in different aspects such as objectives, hypothesis, role of the team leader, attitude structures, communications patterns and results."*

The methodology not so much prescribes, but guides an approach that can be tailored to the specific situation. In the Ethekwini Pilot Project the following deviations from the methodology may have adversely affected the implementation:

- The small scale of the project did not allow flexibility of timing for communities to resolve their issues
- The community at Emmaus may not have been sufficiently committed to the project to warrant its selection. This should have been recognized in the diagnosis and planning stage
- There was confusion about the "packaging" of the project. In light of the people's affordability, the full pressure water supply should perhaps not have been offered as an option
- The methods of communication were not always effective. However, this could happen with any project depending on the personalities involved
- Payment for labour may have restricted the development of a self-help attitude
- The training provided to the community was not always sufficient and required follow up, which should have been done in a more controlled manner

- The evaluation process could have been monitored and managed better with respect to shifts in attitude of the people and the appropriate interventions made timeously

In addition, other considerations noted by the project team in their evaluation of events at Emmaus were the following:

- Better evaluation methods are necessary to ensure that the project is financially affordable and sustainable by the community
- That a set of criteria should be sought that would identify when a community was truly ready for such a project
- That external parties with influence over the community should be identified, educated and monitored

At a broader level the Shallow Sewers social intervention methodology is fundamentally a good one. Of particular strength are:

- The modularized format, and the logical sequence of development interspersed with "milestones" which provide a compulsory check on the process.

- It is robust and flexible in that it can be adapted to any type of development, and has been used for suburb beautification and crime fighting.

- It is educational and empowering and is compatible with self-help poverty alleviation strategies.

- The condominial subdivision is apparently valued by the community.

- A number of methodologies with similar philosophies and methods to the Shallow Sewers methodology do exist, each with certain advantages and disadvantages. A uniform and consistent methodology capable of being used for different social and community development should be striven for, implying a single methodology, adopted to South African conditions by amalgamating the best of all the methodologies is required. The Shallow Sewer methodology could well provide the basis for this. Alternatively, the Shallow Sewers methodology could be enhanced by adopting certain techniques from other similar and compatible methodologies.

- At the start of the project one of the "wishes on the wish list" was that there was an easy check list from which it would be easy to determine whether a community was ripe for development or not. Part of Step 1 of the methodology "Evaluation of the Status Quo Before the Intervention" is supposed to determine this. However from the experience gained from Emmaus it appears that the level of investigation needs to be taken down a level, e.g. understanding why a previous intervention was successful is more valuable than knowing that a previous intervention was successful.

- The culture of low mobility, the make-up and structure of communities in Ethekwini, such as the wide variance in income level and hence expectation, coupled with the current socio-political attitude of "the government must provide" makes the provision of a self help, uniformly applied system or package such as Shallow Sewers, very difficult to implement under the constraints of tight programmes and budgets. It must therefore be concluded that under the pressures of rapid provision of services, a community-based approach is the wrong one at this time in the country's development.

- Municipalities wishing to undertake community based service provision need to structure themselves to do this. This is significantly more that merely adding a community based department. It requires a whole philosophy change and includes undertaking all development under this philosophy.

8. Recommendations

Authors' Note:
Stemming from the conclusion above, the recommendation that has been carried forward to the main report is that the Shallow Sewers in South Africa should be developed to retain the positive construction and capital advantages but to minimize the indeterminate, social "drag" on time related service hardware provision. The purpose of this report was to report on the social experiences gained during the Ethekwini Shallow Sewers Project. So that the above recommendation did not override other recommendations in this report the above recommendation has been ignored here. Further, as major portions of the report are based on the outcome of the Workshop to assess the causes of the project failure at Emmaus, the body of this report to a large extent is itself conclusion and recommendation. Therefore to prevent tedious repetition, the implied conclusions and recommendations have not been included here, only the overall recommendations are reported.

It is therefore recommended that:

- A single "South Africanised", uniform social implementation methodology made up of the "best of the best" should be developed and applied. This model should incorporate methods and techniques learned from these other methodologies with similar philosophies, where these have been shown to be better or required in this context.

- A "check list" to determine whether a community is "ripe" for development should be compiled based partly on the experiences reported in this report and on the experiences of others. This "check list" should be used to determine the "ripeness" of the community for development prior to each intervention, tested for its success in determining "ripeness" at the end of the project and modified where necessary, so that with time a reliable "check list" can be developed.

- A formal evaluation of the benefits that the condominial system brings to the community needs to be undertaken. In conjunction with this the parameters of size of condominium and circumstances of success need to be established.

Appendix H

Social Evaluation Briardale

BY

Community Awareness and Promotions (CAP)

January 2002

1. INTRODUCTION

This research element was requested by Patti Eslick as part of the study into the implementation of a Waterborne Shallow Sewer System (WSSS) in Briardale.

The key objectives of this research element are as follows:

- Evaluate the ability of the community structures to identify and manage problems or faults (from the DMWS viewpoint)
- Evaluate the ability of the community to administer the system according to the legal agreements

2. KEY PERFORMANCE AREAS

- Based on the above objectives, the research proposal and discussions with various stakeholders, a Key Performance Area schedule was drawn up. This schedule, in effect broke up the two Key Performance Areas into a number of sub areas, which could then be measured by means of various indicators. The schedule is set out below:

KPA's	Sub Area	Performance Indicators
Management and Administration	1. Effective administration according to the legal agreements and constitutions	1. Conducting of community/ condominium WSSS meetings with respect to ▪ Content of discussions ▪ Relevance to WSSS ▪ Interpretations of agreements ▪ Adherence to constitution
	2. Effective Physical Maintenance of System	▪ Available equipment and storage thereof ▪ Maintenance action agreements ▪ Distribution of labour 2. Existence and content of maintenance records
	3. Effective Management and Reporting Structures	3. Interviews with Key Individuals(community & project team)on the following ▪ Understanding of legal agreements ▪ Understanding of Shallow Sewer system ▪ Maintenance systems ▪ Management and reporting systems
		4. Observation of maintenance and other operations

KPA's	Sub Area	Performance Indicators
Faults Systems	1. Establishment of effective faults handling systems 2. Successful management of fault system 3. Improvement to faults handling system(2nd survey)	1. Fault procedure samples from condominiums 2. Fault action records 3. Fault response time 4. Interviews with key individuals from condominiums on fault systems establishment and management 5. Observation of condominium management of fault problems

3. METHODOLOGY

The approach to this research element followed a number of steps.

- A Key Performance Area Schedule was drawn up to guide the research
- A community survey questionnaire was drawn up based on the indicators
- A meeting was held with the Chairperson of the Briardale community to ensure legitimate entry into the community
- Fieldwork involved the following:
    - 20 Interviews with Iqoqo leadership and ordinary members using the community survey included in **Annexure A.** The interviews covered all Iqoqo areas
    - Observations of community issues
    - Observations of Shallow Sewer management and maintenance
    - Attendance of a community meeting focussing on the Shallow Sewer system
    - Investigation into fault records
    - Investigation into Iqoqo meetings and meeting records
    - Equipment and system inspection
    - Additional interviews of 10 persons focussing on the grease traps and community dynamics
    - Findings based on fieldwork were recorded
    - Analysis of the survey results and other findings took place
    - Conclusions were made

4. KEY FINDINGS

4.1 COMMUNITY SURVEY (INTERVIEWS)

The results were tabulated visually using graphs. These graphs are included in **Annexure B**. A summary of the key findings is provided below.

- Half of the respondents interviewed were chairpersons or leaders of Iqoqos
- Only 24% of respondents stated that they knew of a legal agreement. This figure could be low due to the people giving a negative answer to this if they did not know the contents of the agreement

- All of the respondents who knew about the agreement showed a fair understanding of its contents (although a subsequent interview showed poor knowledge "on the consequences of the system being declared a failure")
- Community members showed a clear understanding of who was responsible for repairing blockages (Iqoqo or community – 100%)
- 65% of respondents stated that the Iqoqo or the community would be charged if the Metro were called in to attend to a blockage or repair
- 55% of respondents stated that they had experienced some form of problem on their Iqoqo line
- 82% of the respondents stated that a rod belonging to the Iqoqo had been used to remove the blockage or repair
- Only 9% said they did nothing about the blockage or repair
- 65% of respondents stated that their repair equipment was stored by a member or the chairperson of the Iqoqo
- Of the respondents who had experienced blockages (50% of cases)
    - 50% of respondents stated that the blockage removal took place in under 2 hours
    - 50% of respondents stated that the blockage removal took place in under 2 days
- 90% of respondents stated that faults are reported to the Iqoqo leader
- No one (0%) stated that the faults were recorded on paper
- It was later verified that there was no understanding of the sewerage tariff. The 90% who said they have not received a bill or were not connected, also had no understanding of the sewerage tariff. There was also extremely limited understanding of the water tariff (5%)
- 65% of respondents stated that their Iqoqo met regularly and a further 35% stated that there was "no fixed time" when their Iqoqo met
- Respondents showed a clear understanding of items that cause blockages
- 10% of respondents cleaned their grease trap daily while others varied from weekly to every three weeks
- 100% of respondents felt that the members of the Iqoqo were aware of their responsibilities
- 85% of respondents felt that their Iqoqo was managing the sewerage system well.

4.2 OPERATIONAL OBSERVATIONS

This fieldwork included observing the system in operation as well as comments on operational issues from leaders and members of the Iqoqo. Additional operational observations were undertaken in December 2001 and January 2002 to further investigate blockages as well as the disposal of grease trap contents.

Observation records for the period 26 November to 11 December 2001 are summarised as follows:

i) Five out of twelve inspection chambers were found to be blocked on one day
ii) Iqoqo A has only one household connected to the system. An inspection chamber in Iqoqo A next to House A9 often overflows
iii) A member of Iqoqo B claimed that they had an inspection chamber that is always overflowing. However, when it was checked, it was found to be clear
iv) In Iqoqo F an inspection chamber was found "blocked with the lid off. A facecloth was blocking the outlet pipe.
v) Iqoqo C has not experienced blockages. It was felt that the reason for this is that most members are not connected.
vi) Iqoqo J leader felt that blockages are caused by children throwing soil or rubbish into the chambers. He also stated that the low water pressure results in toilet paper not being flushed away
vii) The Chairperson of Iqoqo B felt that the flat alignment of pipes (limited fall) was the cause of many of the blockages

viii) The Chairperson of Iqoqo B stated that they were waiting for Bonisiwe of Metro to sort out a blocked chamber

ix) The Chairperson of Iqoqo D felt that the main problem was the grease trap which was unhygienic and had to be cleaned twice a day. She also listed various inspection chambers which were often blocked

x) The chairperson of Iqoqo E stated that they had been unable to remove a blockage and had to obtain the services of a private contractor

xi) The chairperson of Iqoqo F stated that many of the blockages were due to negligence on the part of the community members

xii) The Chairperson of Iqoqo H stated that various promised services had not been received. These included water, electricity and housing subsidies

xiii) The chairperson of Iqoqo A stated that her toilet was unable to flush away toilet paper

xiv) A member of Iqoqo C stated that the smell of the grease trap permeated the house and that the toilet did not flush properly

xv) A member of Iqoqo F stated that the low pressure causes problems when flushing

Observations recorded for the period 22 December 2001 to the 4 January 2002 are included in **Annexure C** and are summarised as follows:

- Only one out of 15 chambers observed was blocked during the 3-week period
- The one blocked chamber was cleared during the observation period and remained unblocked
- Minimal blockage reporting was evident but this was due mainly to few residents experiencing blockages on their lines
- Each Iqoqo was in possession of a rodding pipe while the technical team of the community had in its possession general repair equipment

4.3 RECORD KEEPING

No written records of blockages or repairs were available. This fact is substantiated by the community survey where no (0%) respondents gave an affirmative answer to “Is the fault recorded on paper”

4.4 COMMUNITY MEETING

One of the key indicators of the administration of the WSSS by the Iqoqo was the regular Iqoqo meeting. Although many respondents stated that regular meetings took place, the field researcher was not able to obtain a date or attend an Iqoqo meeting over a 4-week period.

The field researcher was finally informed that a community meeting focussing on the Shallow Sewer System was to take place on the 11 December 2001.

The meeting was attended by approximately 30 community members, the majority of whom were woman. The field researcher explained that he was there as an observer. However, the meeting appeared to have been called especially for him. The community members then gave their impression of the Shallow Sewer system. A summary of the issues raised is recorded below.

- Toilets are not used by some people as they are concerned that they will become blocked
- Iqoqo members who do not have toilets are reluctant to clear blockages
- There was a general belief that the system was inferior
- The housing subsidy scheme is not progressing
- Blocked inspection chambers are not always attended to

It was clear that no regular Iqoqo or community meetings have taken place and thus no regular discussion on the management of the Shallow Sewer has taken place.

4.5 COMMUNITY DYNAMICS

Information on the present state and the history of the Briardale community was volunteered. Further research on community dynamics and its effect on the Shallow Sewer system was undertaken in January 2002 through a short questionnaire.

Key information ascertained to date includes:

- There is currently a leadership problem. The newly appointed chairperson has been told to stand down, as community members were not satisfied with the leadership style. The convenor of the saving scheme is acting as chairperson
- The community is made up of 3 groups of people who came from different geographical areas and different political parties. It has been stated that the 3 groups are now politically neutral and are living homogenously
- Several community members commented on the saving scheme as follows:
    - The scheme allows all Briardale Community Members to save money on a regular basis
    - The savings are for individuals to extend their houses or undertake repairs
    - The savings can be used by the community to repair the Shallow Sewer system
    - People are not contributing regularly to the saving scheme
- Reluctance to comment on community dynamics during the additional interviews was observed

4.6 ADDITIONAL INTERVIEWS (10)

The detailed results of this short additional survey are included in **Annexure D**. The 10 interviews were conducted randomly to probe certain issues rather than gain statistical data. The summary results are as follows:

- Most residents dispose of solid substances from the grease trap correctly
- Although 5 people said they had a copy of the training manual, only one (1) of the 10 people interviewed said that they had received training
- Understanding of the consequences of the system being declared a failure were virtually non-existent
- Most people were generally positive about the community spirit but tended to have negative feelings towards the scheme

5. ANALYSIS OF KEY PERFORMANCE AREAS

5.1 MANAGEMENT AND ADMINISTRATION

Sub Area 1 and 3

Effective administration according to the legal agreements and constitutions and Effective Management and Reporting Structure.

Performance Indicator 1
Community / Iqoqo Meetings

It has been shown that no regular Iqoqo or community meetings take place although members of Iqoqo made claims to the contrary. Only one community meeting took place during the research period. The meeting illustrated the following:

- Discussions were relevant to the WSSS although there was a general focus on the problems of the system
- There was no focus on proactive management of the system for example
  - No reporting of specific faults
  - No adherence to a particular meeting structure
  - No reporting on how faults were attended to and what labour and materials were required
- The meeting only took place due to the request by the field researcher to attend a community meeting
- The chairperson was able to obtain good attendance at the meeting

Performance Indicator 2
Existence and Content of Maintenance Records

No written records of blockages or repairs are in existence. All information on faults was provided verbally to the field researcher

Performance Indicator 3
Interviews

The knowledge of the existence of the legal agreements was low (24%) and consequently the understanding should also be low. When answering specific questions pertaining to the contents of the agreement such as responsibilities and charges to Metro and the community, the understanding levels were relatively high while understanding of the consequences of failure of the scheme, was low.

One misunderstanding was evident at Iqoqo B, where the chairperson stated that they were waiting for Bonisiwe of Metro to sort out a blocked chamber.

Understanding levels of the Shallow Sewer system varied. For example, certain respondents believed that when more houses were connected to the system more blockages would result (which is not necessarily the case). All respondents appeared aware that they needed to clean out their grease traps regularly and the kinds of items that caused blockages. No regular maintenance has been recorded although this will require further investigation as the project progresses.

There were mixed indicators on effective management and reporting. All respondents stated that blockages were reported to the Iqoqo Chairperson although in no cases were reports made in writing. There were isolated cases of blockages and overflowing chambers being left unattended.

SUB AREA 2
Effective Physical Maintenance of System

Performance Indicator 3
Interviews

Performance Indicator 4
Observation of Maintenance and other operations

Interviews illustrated that in almost all cases (82%) a rod belonging to the Iqoqo was used to remove blockage, which had been reported to the Iqoqo Chairperson. It was also stated that in 50% of the cases the blockage was cleared in a few hours, which is satisfactory. However, in 50% of the cases it took up to 2 days to clear the blockage which, could have resulted in serious health hazards

Further observations on blockage rates are required.

It is clear that although no written report is provided to the Iqoqo Chairperson, verbal reports are provided and acted on by the Chairperson and his Iqoqo members. In certain areas the response time is longer than an acceptable time period

Equipment to deal with blockages was evident at each Iqoqo and general maintenance equipment was in the possession of the maintenance committee.

5.2 FAULT SYSTEMS

SUB AREA
Establishment of effective faults systems

SUB AREA
Successful management of Fault System

Indicator 1

No fault procedure samples were evident

Indicator 2

No fault action records were evident

Indicator 3

No fault response times were recorded

Indicator 4
Interviews

Indicator 5
Observations

Interviews indicated that the response time varied from an acceptable 2 hours to an unacceptable 2 days. The system of blockage removal was stated in interviews to be working in most cases. The system involved the following:

- Overflowing chamber observed by Iqoqo member
- Chairperson of Iqoqo informed
- Chairperson gets equipment and calls available members of Iqoqo together
- Blockage is removed

Initial observations in November 2001 showed that a high percentage of chambers appear to be blocked and no action was being taken.

However, during a subsequent 3-week observation period only one chamber was observed to be blocked and overflowing illustrating a general improvement in the situation between November 2001 and January 2002.

6. CONCLUSIONS

This research report clearly indicates the following:

- **MANAGEMENT AND ADMINISTRATION**
  - Some understanding of the agreements between DMWS and the community exists
  - No formal management and administration procedures are in place in any Iqoqo
  - No formal meeting of Iqoqos takes place on a regular basis
  - A recognised chairperson exists in all Iqoqo
  - The chairperson manages the Iqoqo by being a communication link and ensuring faults are attended to by means of maintenance equipment

  The community administers the Shallow Sewer System in an extremely informal fashion. However, most of the principles of the agreement between the community and DMWS are recognised and to a degree adhered to.

  A key agreement principle, which is not understood is the consequences of the scheme being declared a failure. If community members knew of the consequences (installation of VIPs) the incentive to ensure success of the scheme may have been greater.

- **FAULTS SYSTEM**

  The Iqoqos are able to identify and solve problems in most cases. However, the response time in some cases is not acceptable. Observations showed that not all faults were reported due to a lack of or slow reporting.

  The fault systems followed are as agreed, however, no written reporting or recording is undertaken.

Overall, it appears the scheme is operating reasonably effectively from a physical point of view and there is evidence that knowledge transfer on the operational approach took place. However, the lack of capacity, knowledge and "understanding gaps" results in the approach to management of the scheme being reactionary (residents merely react to problems as they arise rather than being pre-emptive) and unstructured from a data capturing perspective.

Annexure A

Community Survey

COMMUNITY QUESTIONNAIRE

What is the name of your Iqoqo? _____

What is your position on the Iqoqo?

Chairman ☐

Treasurer ☐

Secretary ☐

Ordinary Member ☐

Do you know about a legal agreement for your community?

1. If so, who is it between?

Your community and Province ☐

Your community and Durban Metro ☐

Your community and Eskom ☐

Your community and Telkom ☐

Other ☐

2. What is the agreement for?

_____

Who is responsible for the repair of a pipe or blockage on the Iqoqo line?

The Metro ☐

The Community ☐

The Iqoqo ☐

A resident ☐

3. If the Metro is called in to repair a pipe above the Metro connection (i.e. on the Iqoqo line), who will be charged for the cost of the repairs?

No charge ☐

The Iqoqo ☐

The residents (community) ☐

4. If the answer is, the community, how will the money be collected and paid?

_____

5. Have you experienced any blockages/problems on your Iqoqo line?

Yes ☐

No ☐

6. If yes, how did your Iqoqo remove the blockage or repair the damage?

Called the Metro ☐

Used a Rod belonging to the Iqoqo ☐

Used a hosepipe ☐

Did nothing ☐

7. Where does the Iqoqo store its repair equipment?

_____

8. How long did it take?

1 hour ☐

4 hours ☐
1 day ☐
1 week ☐
Still not fixed ☐

9. If a fault is detected, whom is it reported to in your Iqoqo?

Metro ☐
Iqoqo ☐
Community Leader ☐
Resident closest to fault ☐

10. Is the fault recorded on paper?

Yes ☐
No ☐

11. If yes, what is recorded?

---

12. Is there someone with pipe repair skills available for you in your community?

Yes ☐
No ☐

13. Your sewerage bill is calculated as follows

Flat rate ☐
R2.50 per kl of sewerage ☐
R1.42 per kl of water used ☐
Don't know ☐

If you used 6 *kl* of water for the month what would your sewerage bill be?

6 x R1.42 = R8.52 ☐
0 = R0 ☐
6 x R2.50 =R15.00 ☐
Other ☐

14. How often does your Iqoqo meet?

Weekly ☐
Fortnightly ☐
Monthly ☐

15. What issues are discussed at your Iqoqo meeting?

---

16. Tick the items that can cause blockages

Toilet paper ☐
Yellow pages ☐
Bones ☐
Utensils ☐
Oil/fats ☐

Roots ☐

Damage to pipes ☐

17. Does your Iqoqo have a Constitution

Yes ☐

No ☐

18. What is the main purpose/objective of the Iqoqo?

---

19. How often do you clean your grease trap?

Once a week ☐

Every 3 weeks ☐

Once a month ☐

Never ☐

20. Are all the members of your Iqoqo aware of their responsibilities and are they co-operating (helping with Blockages etc)?

Yes ☐

No ☐

21. If no, Why not

---

22. Do you feel that your Iqoqo is managing your sewer system properly?

Yes ☐

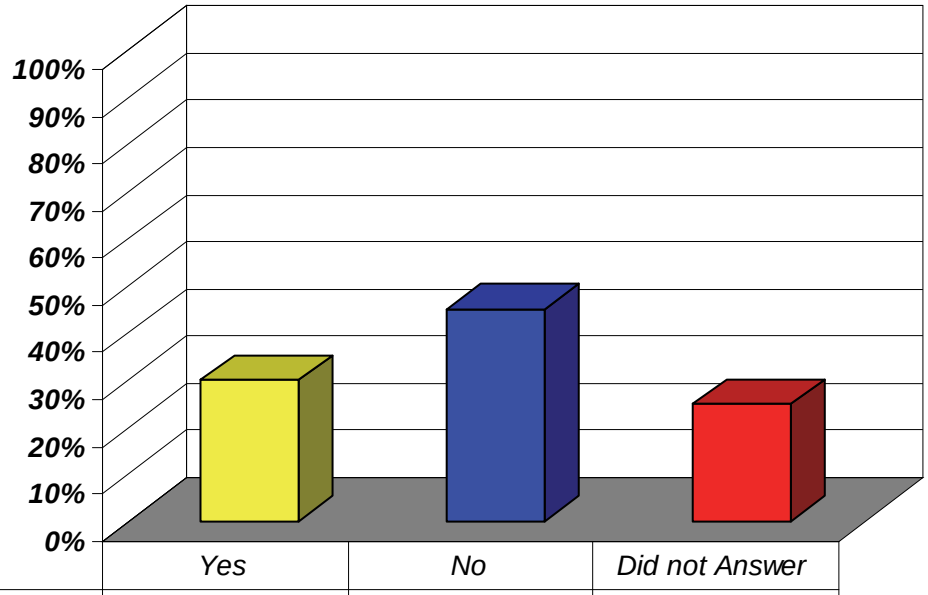
No ☐

23. If no, Why Not?

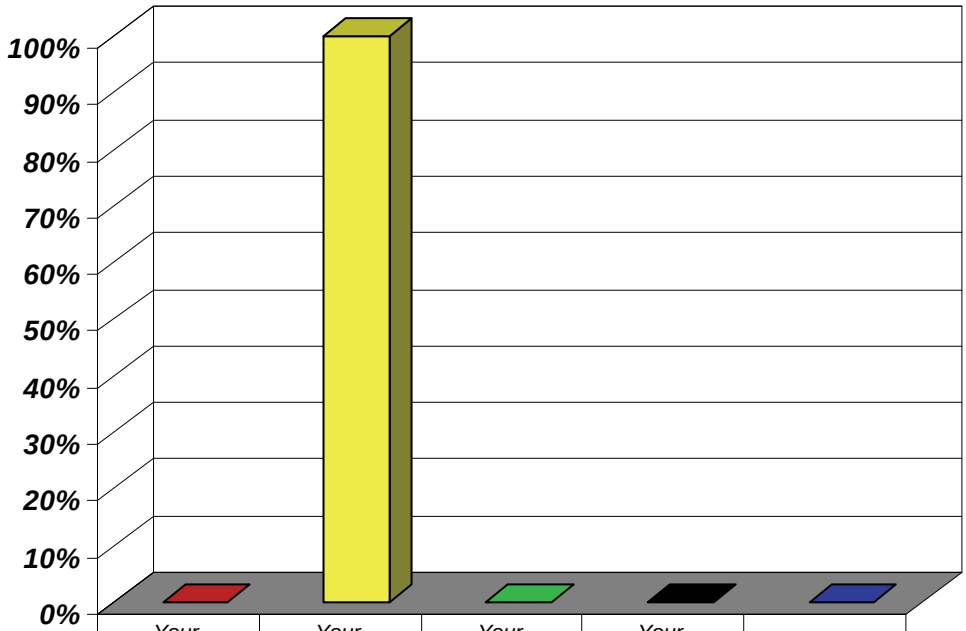
Annexure B

Graphical Tabulation of Results

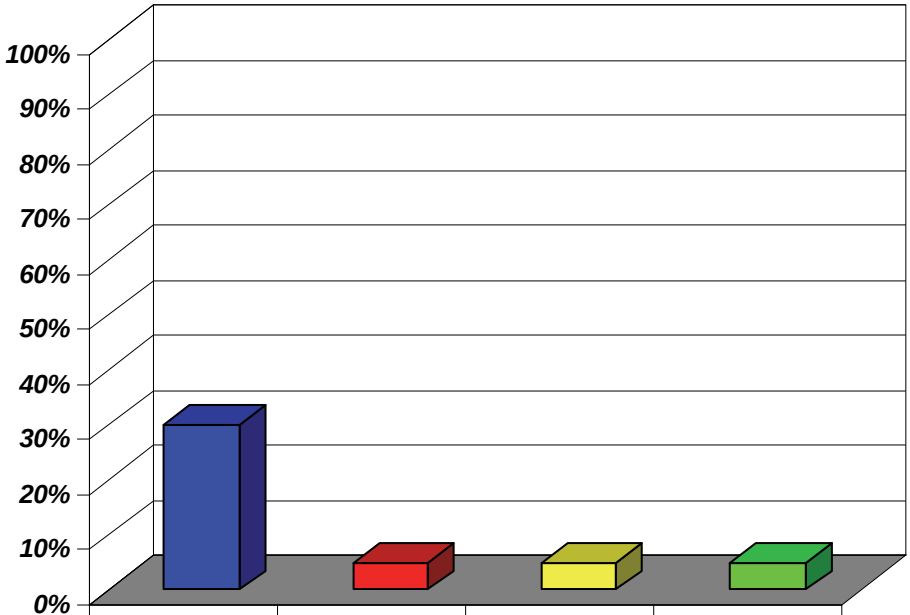
Shallow Sewer Evaluation Questionnaire



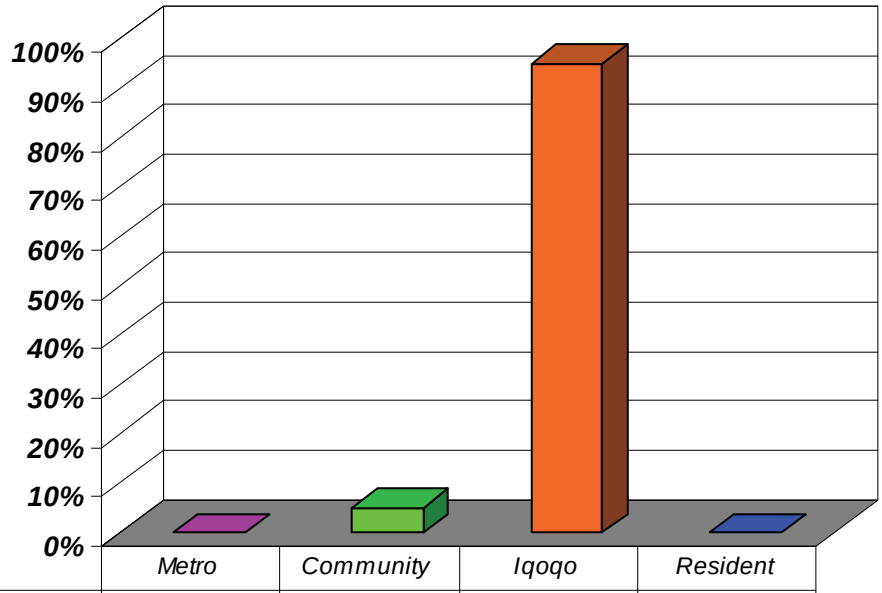
	Yes	No	Did not Answer
1. Do you know about any legal agreement for your community?	30%	45%	25%



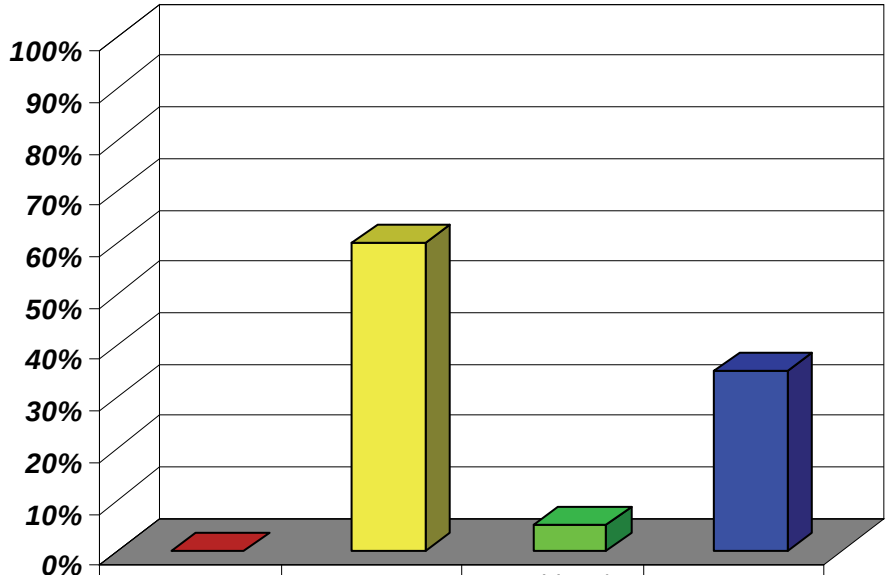
	Your Community and Province	Your community and Metro	Your community and Eskom	Your community and Telkom	Other
2. If so, who is it between?	0%	100%	0%	0%	0%



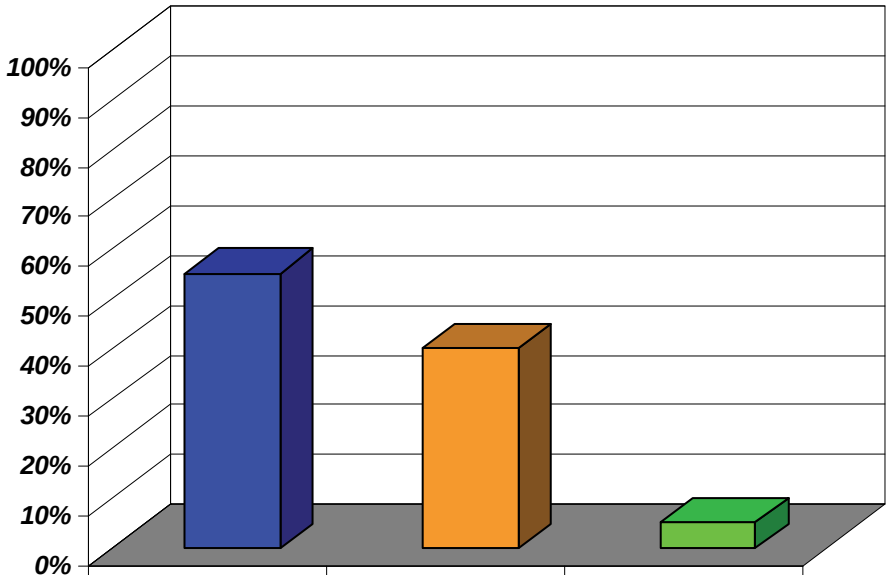
	Take care of the system	Installation of Shallow Sewer System	If problems with Shallow Sewer Systems,	About our infrastructure
3a. What is the agreement for?	30%	5%	5%	5%



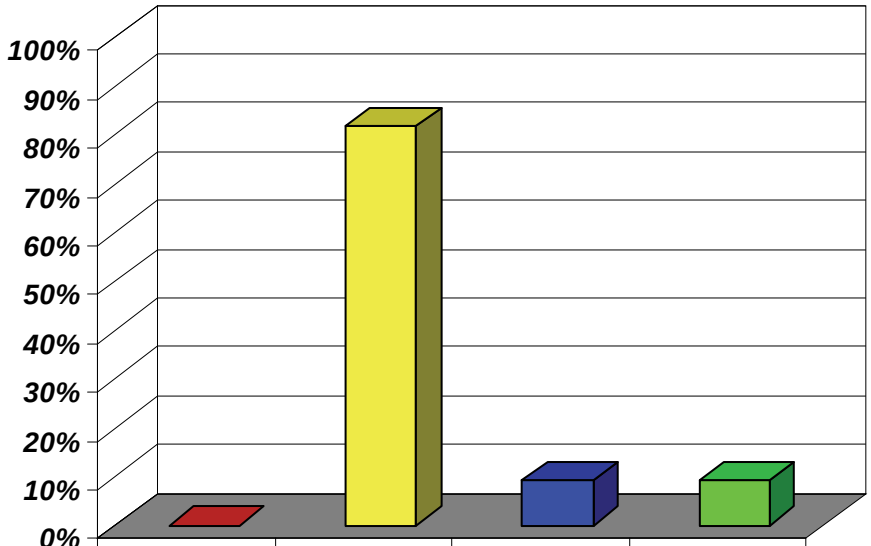
	Metro	Community	Iqoqo	Resident
3b. Who is responsible for the repair of a pipe blockage on the Iqoqo	0%	5%	95%	0%



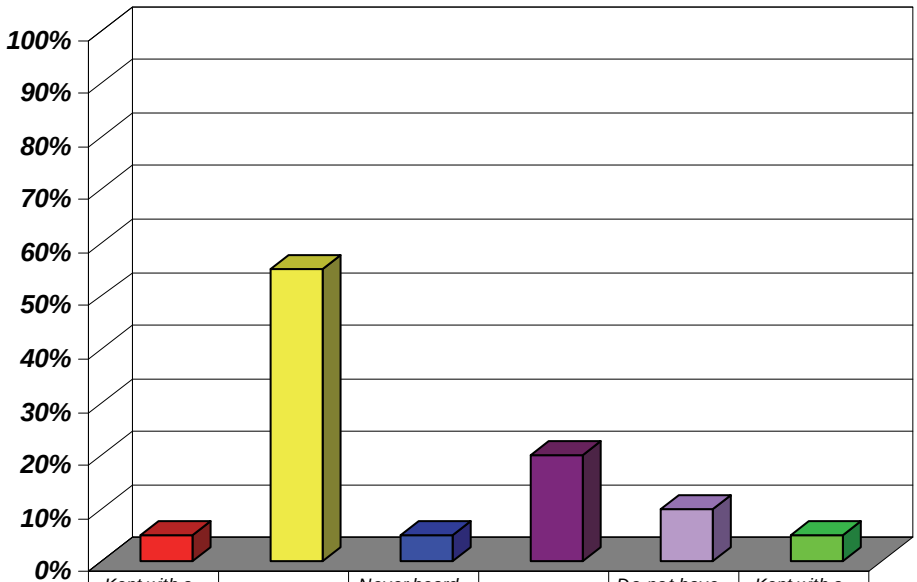
	No charge	Iqoqo	Resident / Community	No Answer or Not sure
4. If the Metro is called to repair a pipe or blockage (who will be charged)?	*0%*	*60%*	*5%*	*35%*



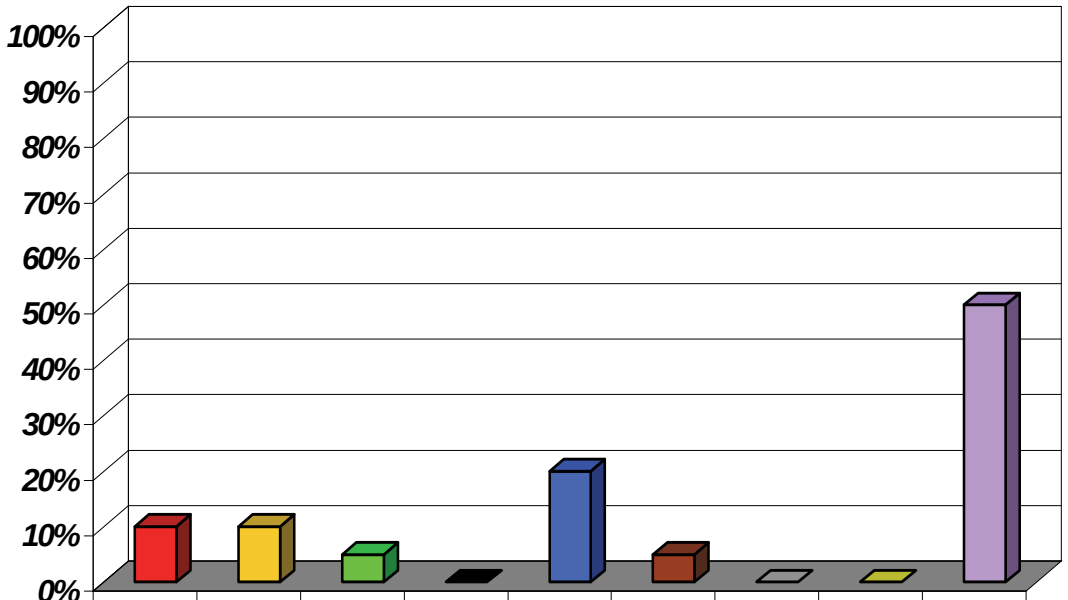
	Yes	No	Not yet using the system
6. Have you experienced any blockages / problems on your Iqoqo line?	*55%*	*40%*	*5%*



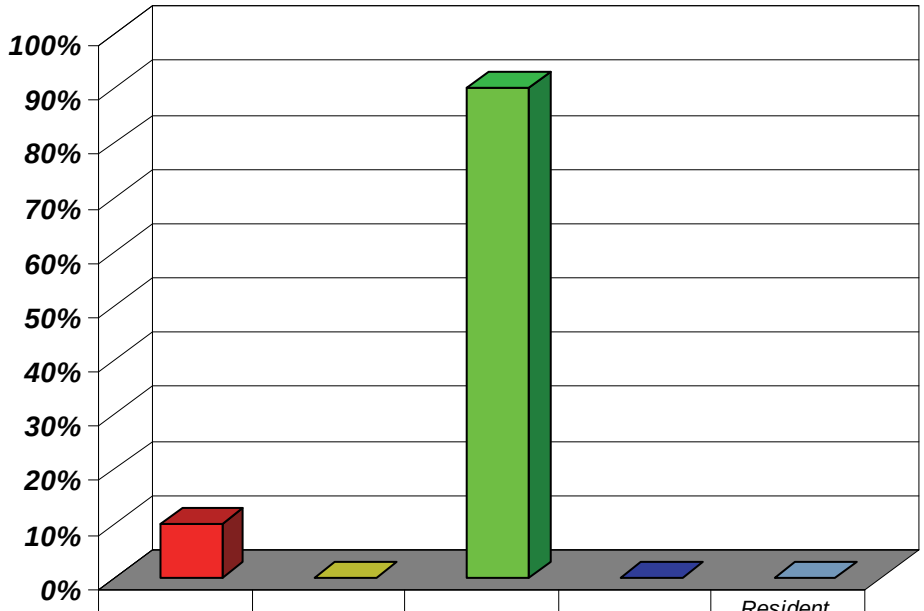
	Called Metro	Used a rod belonging to Iqoqo	Used a hosepipe	Did nothing
7. If Yes, how did your Iqoqo remove the blockage or repair the damage?	*0%*	*82%*	*9%*	*9%*



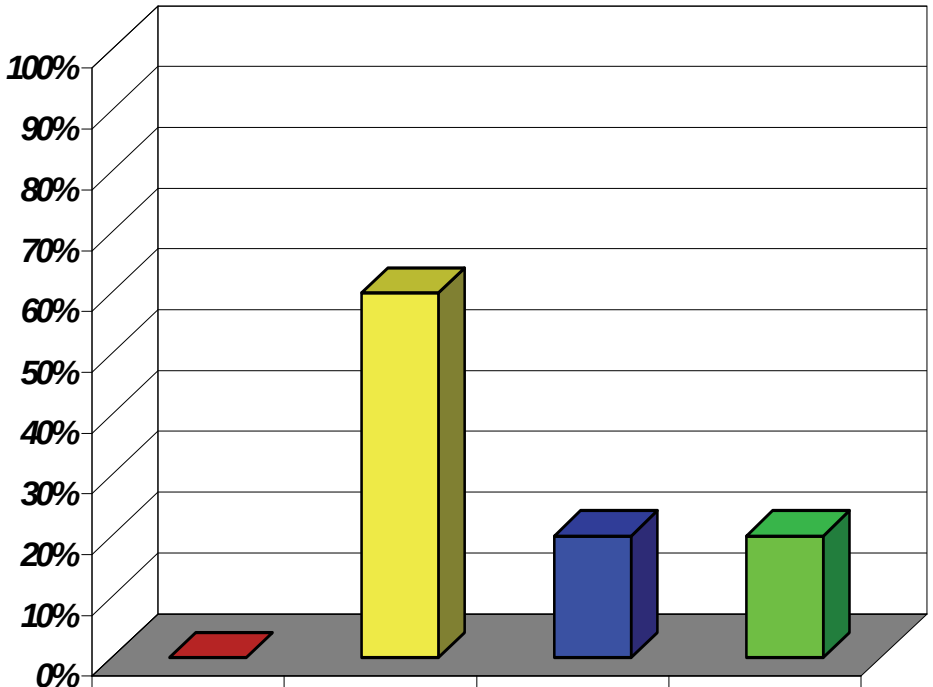
	Kept with a community member	Kept with Leader	Never heard about it before	Do not know	Do not have any equipment	Kept with a member of the technical
8. Where does the Iqoqo store its repair equipment?	*5%*	*55%*	*5%*	*20%*	*10%*	*5%*



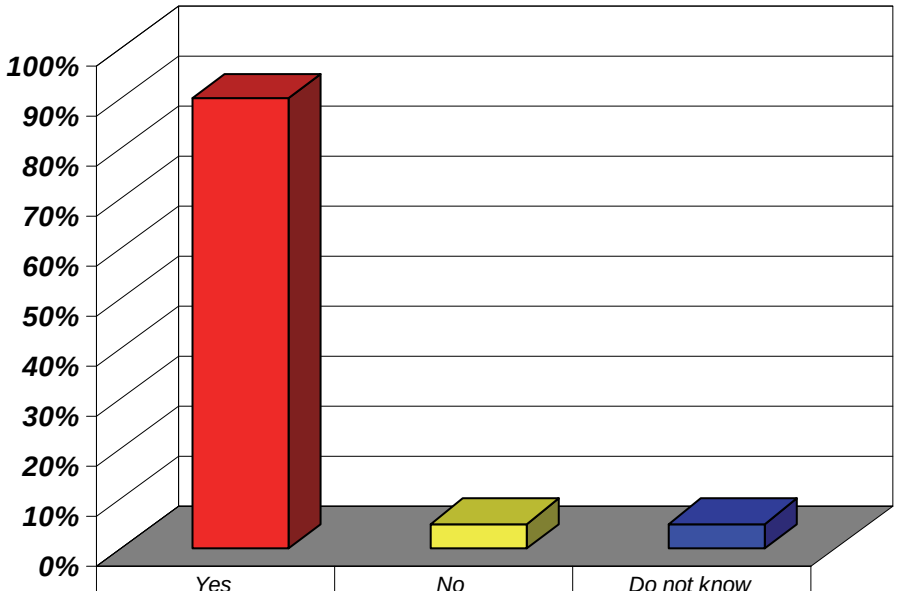
	Under 1 Hour	1 hour	2 hours	4 Hours	1 Day	2 Days	1 Week	Still to be Fixed	Have not had any Blockages
9 How long did it take?	10%	10%	5%	0%	20%	5%	0%	0%	50%



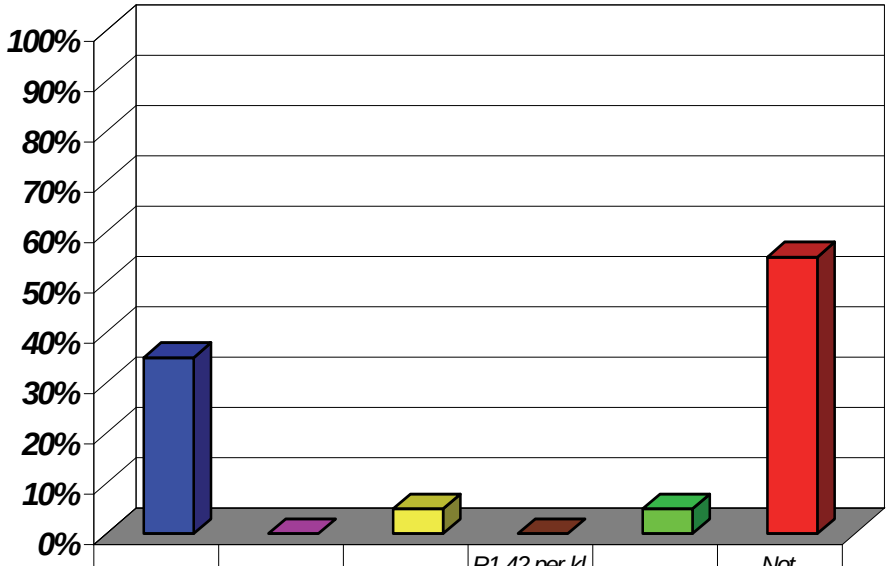
	Do not know	Metro	Iqoqo Leader	Community Leader	Resident closest to Fault
10 If a fault is detected, whom is it reported to in your Iqoqo?	10%	0%	90%	0%	0%



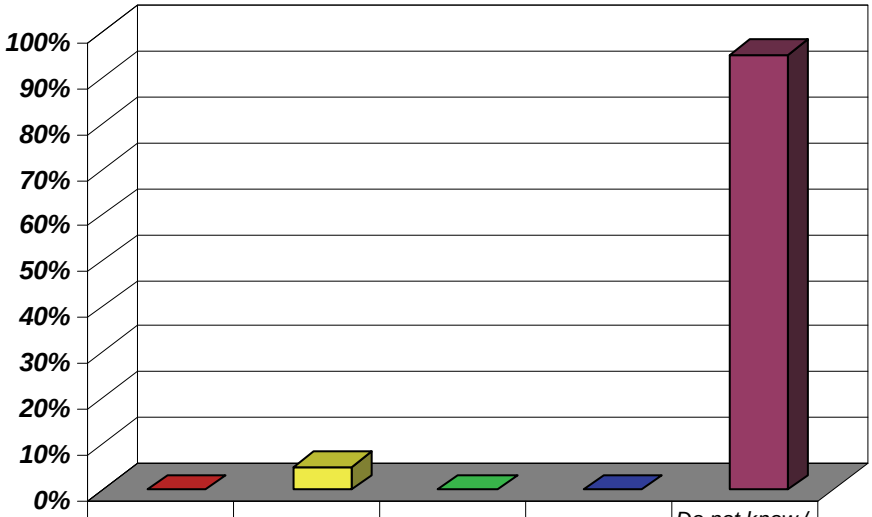
	Yes	No	No Answer	Do not know
11. Is the fault recorded on paper?	0%	60%	20%	20%



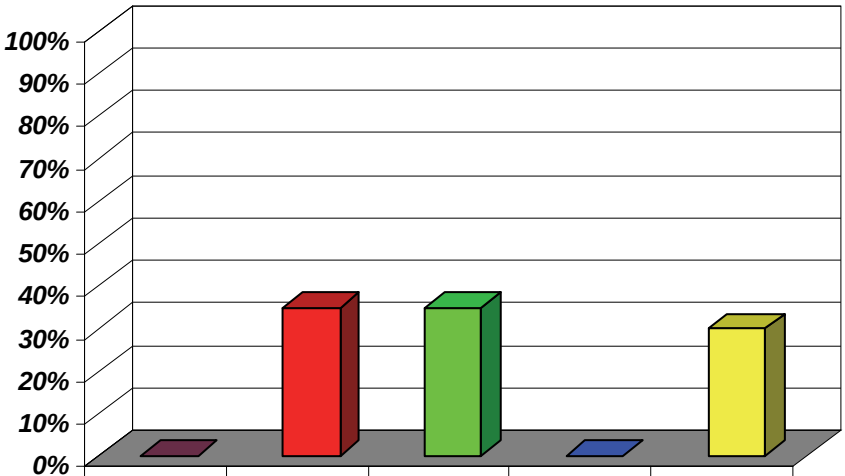
	Yes	No	Do not know
13. Is there someone with pipe repair skills available for you in your community?	90%	5%	5%



	Do not have a bill yet	Flat Rate	R2.50 per kl of sewerage	R1.42 per kl of water used	Do not know	Not Connected / Do not
14a. Your sewerage bill is calculated as follows	35%	0%	5%	0%	5%	55%



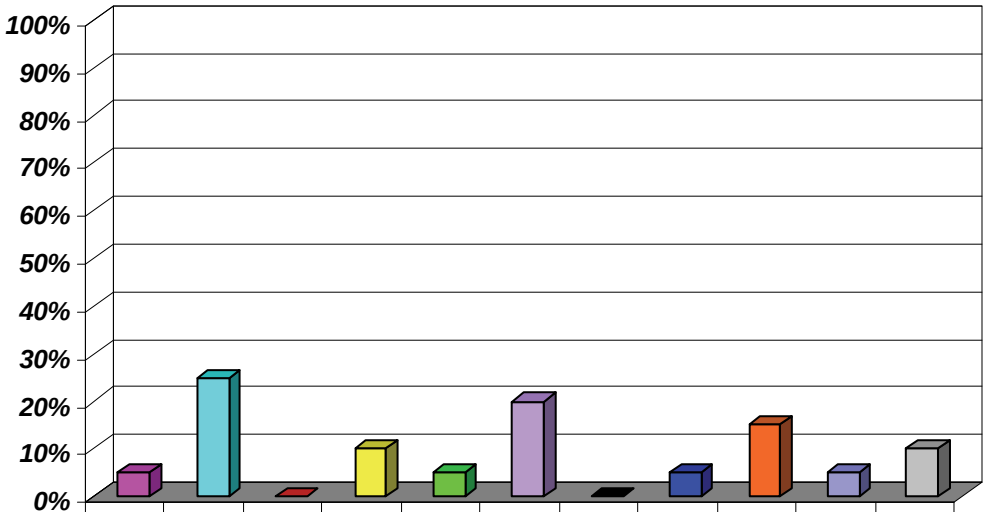
	6 x R1.42 = R8.52	O = R0	6 x R2.50 = R15.00	Other	Do not know / Not Connected
14b. If you used 6kl of water for the month what would your sewerage bill be?	0%	5%	0%	0%	95%



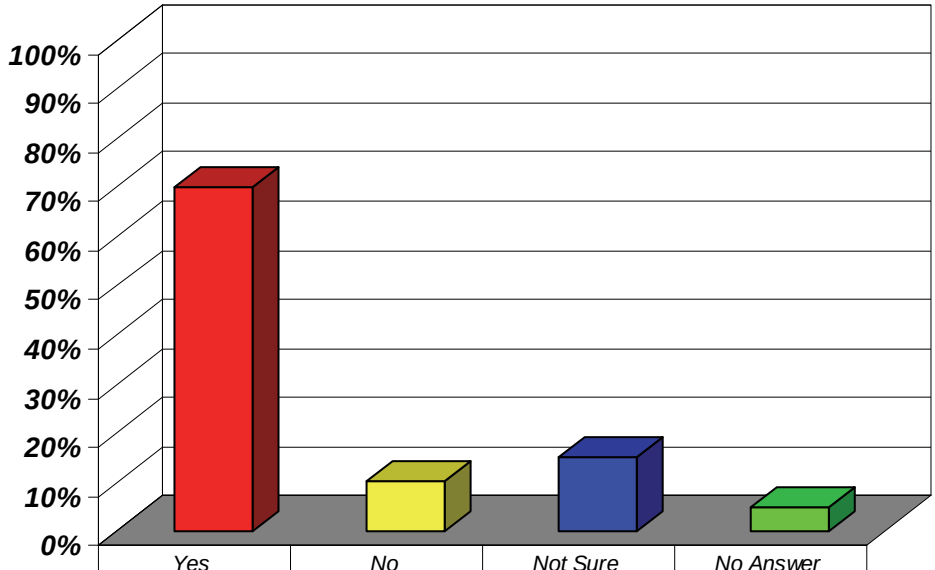
	When necessary	No Fixed Time	Weekly	Fortnightly	Monthly
15. How often does your Iqoqo meet?	0%	35%	35%	0%	30%

16. WHAT ISSUES ARE DISCUSSED AT YOUR IQOQO MEETING

Infrastructure; Roads and Electricity - Urgently needed services
How to look after Shallow Sewer Systems
How to avoid blockages
Work together to help clear blockages
Not to abuse the system
Saving Scheme (How to start and contribute to it)
Raising funds to provide toilet paper to the community
Development - how to build our own homes



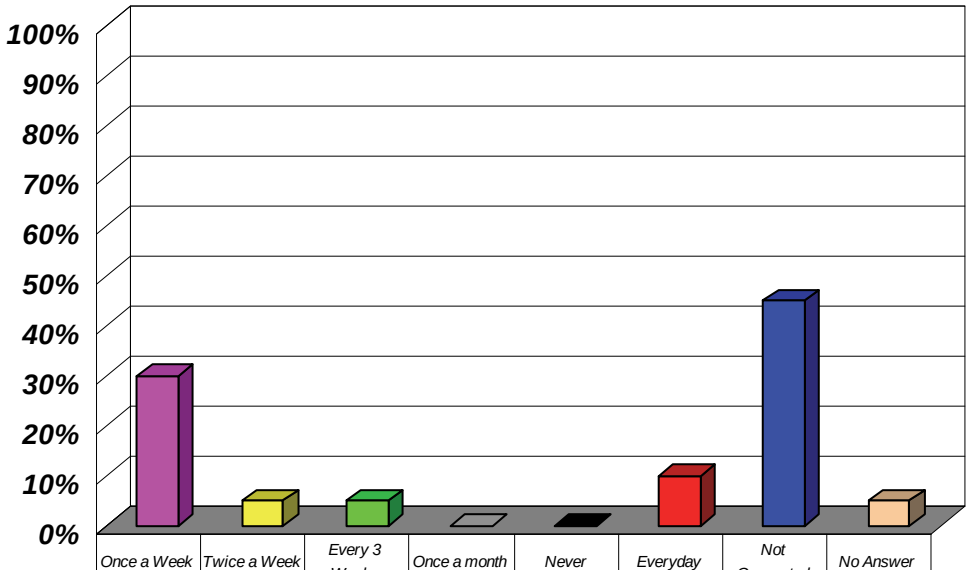
	Tissue	Toilet Paper	Bones	Utensils	Oil Fat	Roots / Soil	Damaged Pipes	Newspaper	Soap	Cloth	Stones
17. Tick items that can cause blockages	5%	25%	0%	10%	5%	20%	0%	5%	15%	5%	10%



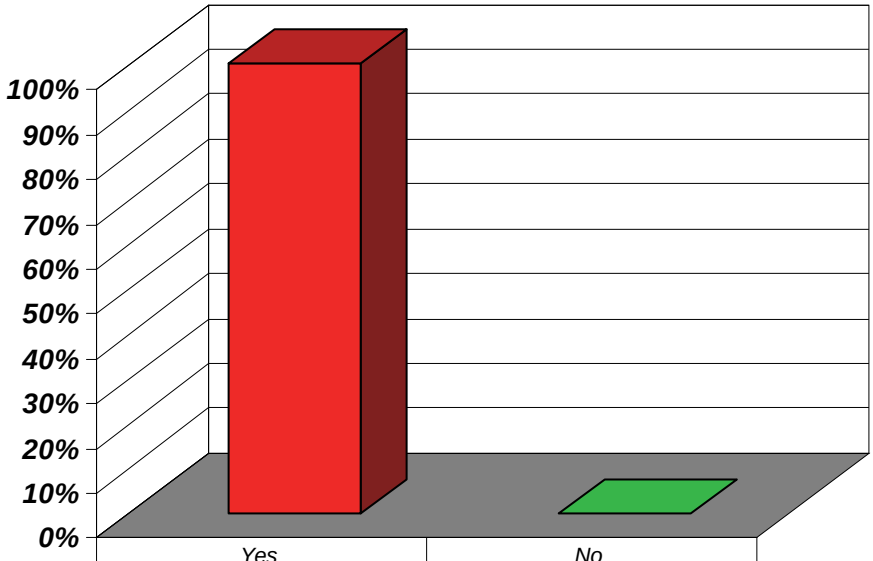
	Yes	No	Not Sure	No Answer
18. Does your Iqoqo have a constitution?	70%	10%	15%	5%

19. WHAT IS THE MAIN PURPOSE/OBJECTIVE OF THE IQOQO

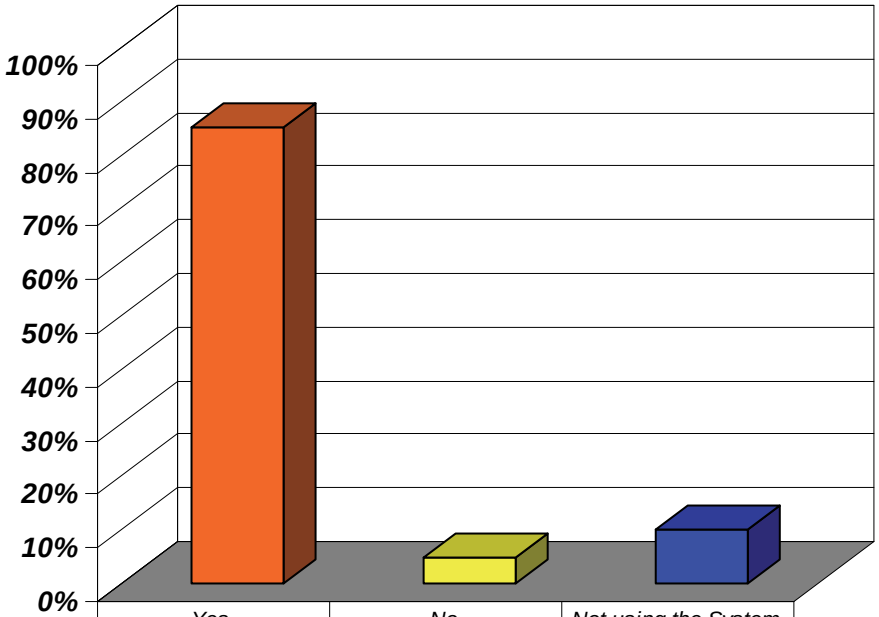
Development of the area
To unblock blockages and make contributions to the saving scheme
Taking care of the Shallow Sewer System
How to settle a new resident in the area
How to co-operate and work together if there is a problem



	Once a Week	Twice a Week	Every 3 Weeks	Once a month	Never	Everyday	Not Connected	No Answer
20. How often do you clean your grease trap?	30%	5%	5%	0%	0%	10%	45%	5%



	Yes	No
21. Are all the members of your Iqoqo aware of their responsibility and are they Co-operative?	*100%*	*0%*



	Yes	No	Not using the System
23. Do you feel that your Iqoqo is managing your sewer system properly?	*85%*	*5%*	*10%*

Annexure C

Observations Recorded

ADDITIONAL FIELD OBSERVATION RECORDS

1. Observation of 15 Chambers and Inspection Boxes over a 3-Week period.

22 December 2001

- The inspection chamber which is linked to Iqoqo's E, F and D was blocked. Apparently it has been blocked and overflowing for 3 months.
- G Mhlongo who lives in a shack next to this Inspection Chamber claims she has reported this several times to the Iqoqo leaders
- She claims that she has reported it to Shabbir – Technical Supervisor and nothing has been done to address the problem
- She told me that because of the overflowing chamber, her house is always full of flies
- On 10 December she felt very sick. She was taken to Addington Hospital in the early hours of the morning. She believes that her illness was caused by the conditions she is living in.
- Of the other inspection chambers which were checked, two were found with some waste material inside although not blocked while the balance were found to be completely clear.

28 December 2001

- On this day Shabbir come with his team. The Inspection Chamber mentioned above was cleared by Shabbir and his Technical Team. The other chambers were checked, and the two chambers, which had some waste material inside, were also cleared. This was reported on the same day by G Mhlongo.

04 January 2002

- All the chambers were inspected and found to be running freely

2. Blockage Reporting

22 December 2001

- On this day four people were interviewed. All interviewees stated that they have never reported any blocked chambers to the leaders

28 December 2001

- Five people were interviewed. All of them have never reported any blocked chambers to the leaders. In all instances the interviewees claimed that blockages have never occurred in their Iqoqo lines.

04 January 2002

- On this day the following people were interviewed with regard to reporting blocked chambers
    i. Nurse Biyela H – 113
    ii. Nokuxolo Mthembu F – 98
    iii. Mpume Mkhwanazi F – 66
    iv. Getrude Mdlalose G – 131
    v. Hloniphile Majola C – 88

Everyone stated that they had never reported any blocked chambers as the blocked chamber as the blocked chambers they had observed were not on their lines.

3. Existence of Repair Equipment

- Each Iqoqo had in its possession a pipe for clearing blockages. No other repair equipment was kept by the Iqoqo.
- The only repair equipment the community have is kept with the two members of the Technical Team: Mr J Mthiyane of G-13 and Thulane Mkhoba of C-77. the following equipment is kept with each member:
    i. Shifting spanner
    ii. Pliers
    iii. Spirit level

iv. Hacksaw
v. Hammer
vi. Chisel
vii. Tape-measure

4. Other Observations

- Some residents have opted to do away with grease traps. They are directing wastewater straight from the kitchen to the inspection chamber.
- There was a great deal of reluctance to answer questions on community spirit.
- Certain residents enquired as to how to go about applying for a water connection.

Annexure D

Detailed Results of Additional Survey

DETAILED RESULTS OF ADDITIONAL SURVEY

What do you do with the Grease Trap material after removal

1. I scoop out the dirty water from the grease trap and spill it at the edge of my premises
2. I just throw the rubbish on the premises although it makes my place stink
3. I throw the dirty water into the bush and put the solid material into the plastic bag
4. We take the dirty water and throw it in the bush as well as the solid substances into the bush
5. This house has no grease trap. Water flows directly from the kitchen to the inspection chamber. The house owner does not want the grease trap because it gives mosquitoes
6. My plumbing is not yet completed so I am not using a grease trap
7. I remove the dirty water and throw it into the inspection chamber and the solid substance into the refuse bag
8. I throw the dirty water to the edge of the premises and the solid substances in the refuse bag
9. The grease trap of this household flows direct into the inspection box
10. I throw it away at the edge of my premises

Have you received Shallow Sewer training with the training manual

Yes	No
1	9

Do you have a copy of the Training Manual

Yes	No
5	5

What will happen if the Sewer System is a failure?

100% stated " I do not know"

How would you describe the community spirit in the area?

1. There is nothing in particular I can say about the community spirit
2. It is good
3. The spirit is good
4. I have no idea
5. There are no problems
6. I would say neither good nor bad
7. The spirit of our people is bad
8. I have never witnessed anything wrong with the community
9. There is nothing remarkable I can say about the community because most of the time I am indoors
10. People here are united and they work together if there are problems like clearing blockages

Why?

1. I am not aware of any quarrels amongst our community
2. Nothing bad has ever happened with us
3. We don't quarrel
4. I only know very few individuals that I am acquainted with
5. I think we are getting along very well as a community
6. Some days we do have problems of misunderstanding amongst ourselves and in some other times we get along well
7. They are not happy because of the lack of electricity and water connections

8. –
9. I don't normally go out and meet other people and I have never heard anything wrong coming from this community
10. They buy and use common tools and equipment for building and clearing blockages

Have the community spirit and dynamics had any effect on the Shallow Sewer system

Yes	No	Did not answer
7	2	1

Why

1. I have not seem anything wrong with this system
2. I am not sure about other people but I am not happy about the system
3. I and my family are not happy about this system
4. We are experiencing this problem of blockages
5. We do not like this system. I am not using my toilet inside my house, I prefer to use the sanitech toilets to avoid blockages
6. Blockages and building materials are not supplied when needed
7. They feel that the system is not a proper sewer system
8. For me as an individual this system is not good because we experience blockages
9. I have never heard anything wrong about the system coming from community members
10. They are very much concerned and worried about the blockages that happen now and again

Record any other community issues

1. None (3)
2. Electricity needed
3. Electricity and roads (4)
4. We are concerned about not having roads
5. The community can join hands together in cleaning this area

Appendix I

Perception Survey on the Shallow Sewer System

AT

Emmaus

BY

Community Awareness and Promotions (CAP)

August 2001

1. INTRODUCTION

This research element was requested by Patti Eslick as part of the study into the implementation of a Waterborne Shallow Sewer System (WSSS) in Emmaus. It was requested following slow progress in the individual connection of community members to the system. The overriding objective of the survey was to explore the reasons for the slow progress and identify some of the perceptions of community members towards the Shallow Sewer system.

2. PROCESS

The questionnaire was developed with input from Patti Eslick, John Harrison of Metro Water and field researchers who have been working in the area for several months. The survey of 56 respondents took place on 27 June 2001 and the 1 July 2001.

Several respondents (5) who were tenants as opposed to owners were interviewed but were able to answer very few questions. Their survey forms were excluded from the captured results as it was felt that the results would be severely affected.

The detailed graphical and response analysis is included in **Annexure A**. Examples of completed questionnaires are included in **Annexure B**.

3. METHODOLOGY

3.1 Development Of Questionnaire

The key issues requiring investigation were identified. Thereafter, questions were developed which would probe the underlying perceptions and understandings of the identified issues. Certain issues were probed further using differing question structures. A number of profile questions were also asked to guide the analysis.

3.2 Sample Size

A large sample of 50 surveys was chosen which represents approximately 59% of the total number of the 85 households in the area. The tenant houses which constituted a further 5 surveys were not included in the graphical analysis as they would have skewed the results quite dramatically as very little about the Shallow Sewer system was known by them.

3.3 Training Of Surveyors

Three field surveyors were used. Two of the surveyors had been undertaking research in the area for some time. A one-day training session took place in which an explanation of each question was undertaken. Minor amendments to the questionnaire were made at the training session. The approach to each survey was also discussed.

3.4 Selection Of Survey Dates

The survey took place over two days. It was decided that one of the days would be a weekend day to ensure that “breadwinners” were also surveyed.

3.5 Selection Of Households To Be Interviewed

It was agreed that the few houses that were connected to the Shallow Sewer were surveyed. Thereafter, houses were selected randomly in all Iqoqos except Iqoqo, A which did not take part in the project.

3.6 Interview Approach

The surveyors introduced and discussed the survey briefly. Questions were explained but no answers were lead unless a selection of answers was provided. This allowed for actual feelings and issues to be captured accurately. If the answer given showed a clear misunderstanding of the

question, further explanations were given. Surveys of respondents took place in Zulu, while the surveyor captured the Zulu response in English.

3.7 Data Capture And Graphical Analysis

The results were then captured and tabulated in Microsoft Excel so that a graphical analysis could be produced. Where answers to open ended questions could be clearly grouped, this was undertaken resulting in percentages and graphs. In certain questions where this was not possible, key answers were captured and trends noted.

3.8 Survey Analysis

An overall analysis of the survey results was undertaken by observing the graphical results, actual answers and observed trends. This was undertaken on a question-by-question basis. Finally, the key findings were summarised and are included in this report.

4. KEY FINDINGS

The fundamental finding of the survey was that the vast majority of respondents were positive towards the system (**90%** would connect if given the opportunity) but financial constraints (**75%**) were preventing them from connecting to it. **80%** of the existing sanitation systems being used by respondents are a potential health risk. Furthermore, health benefits were the main reason given by respondents for being in favour of the Shallow Sewer system. The majority of respondents showed a reasonable understanding of the mechanics of the Shallow Sewer system.

The link between full pressure and normal waterborne sewerage and between semi- pressure and the Shallow Sewer was very strong in the minds of the respondents. This resulted in respondents referring to normal waterborne sewerage as the full pressure system and the Shallow Sewer as the semi pressure system.

5. DETAILED ANALYSIS

- As stated earlier, only "owner" results were captured due to respondents who were tenants having a very poor understanding of the system. Only 5 out of 56 interviews were with tenants. **76%** of respondents were over 30 years of age and nearly **60%** were unemployed.
- No one interviewed had the full pressure water system while **10%** had the semi-pressure system.
- The main reason given for not having a water connection was financial problems (**69%**) with **10%** stating that they did not like the semi pressure water system.
- If one assumes that the main reason for not having a water connection is financial, then **75%** of respondents gave financial problems as the reason for not using the Shallow Sewer system. Only **8%** were very negative towards the system giving answers such as "*I do not want a roof tank*" and "*I do not like it*". One of the reasons given was the following perception.

  "*We think toilets will not work well as the water comes in low amounts*".
- In dealing with a blockage, **59%** of respondents gave encouraging answers such as

  "*I would fix it*"

  or

  "*Report it to the Iqoqo Chairperson*".

  32% stated they would do nothing or report it to Metro.
- The most favoured sanitation system was a "flushed toilet" (**47%**), which was more important to respondents than whether it was full waterborne or Shallow Sewer. **39%** of respondents stated that the Shallow Sewer system was their most favoured sanitation system.
- A high percentage (**88%**) of respondents knew which Iqoqo they belonged to as well as the name of their Iqoqo Chairperson
- **36%** of respondents gave proactive answers with regard to what they would do for their Iqoqo, while **38%** were not available to help or did not know what to do. A example of a proactive answer was "*To lift up the inspection boxes because they will be full of soil*"

An answer, which again illustrates the negative feelings regarding the water connection, is

" In future I will be part of the WSSS project to help the community

get water in the right way"

- **78%** of respondents stated that they did receive education on the Shallow Sewer system. The answers to Question 11, which probe understanding of Shallow Sewer, mirror the education attendance figure with over **80%** giving correct responses.
- A very encouraging result was that **90%** of respondents would connect to the Shallow Sewer system if they had the opportunity
- For those who do not wish to connect, the main reasons given were "*Want full pressure*" (**44%**) "*can't afford it*", (**44%**) "*do not like it*" (**12%**).
- For those who do wish to connect, the main reasons given were "health benefits" **(15%)**and "convenience" (**15%**). Examples of actual statements are:

  "*We are tired of the pit latrine we want to flush"*

  "There will be less disease"

  The statement "*so that all the dirt in out toilets would be washed away*" could refer to the blocked biotag system.
- **76%** of respondents stated that the system has full or partial support of their community leaders. The reasons given for the response to this question varied considerably and could thus not be tabulated. However, the statements do give good insight into some of the community dynamics. Examples of some of the statements are:

  "I think they are tired of the pit latrine"

  "No one has complained according to my knowledge except Iqoqo A"

  "There is a councillor who promised to give us water but he is not available at the moment"

'Because there is no other way to get water as the standpipes have been closed"

"People are not happy, they want full pressure"

'People are confused as they feel that they have not been told the truth about the system"

A response showing evidence of disillusionment is: "They have been working hard on the job but now there is nothing happening"

- Regarding how to connect to the Shallow Sewer system, most respondents stated that they would use a plumber or do it themselves.

6. CONCLUSION

The perception survey thus confirms the following:

- The majority of residents are in favour of the Shallow Sewer system
- The majority of residents wish to connect to the system
- Financial constraints are preventing the majority of residents from connecting
- The main reason for negativity towards the Shallow Sewer system is the link to the semi-pressure system
- Certain residents perceive that the semi-pressure system will cause their toilets to operate inefficiently

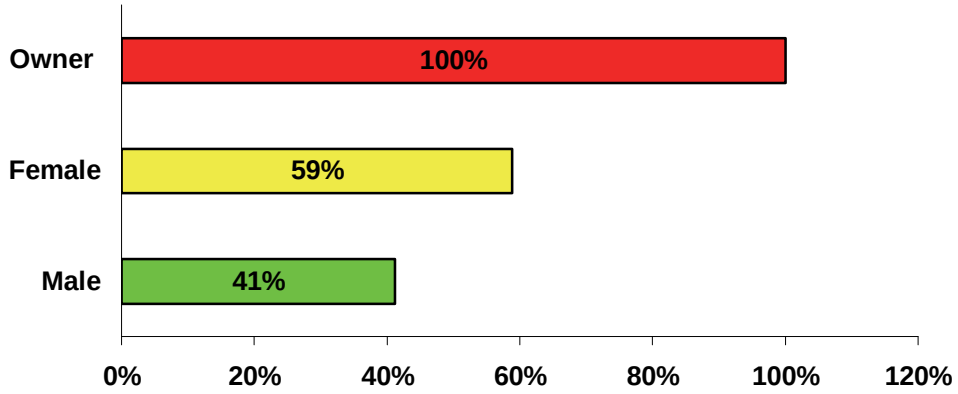
Annexure A

Detailed Graphical and Response Analysis

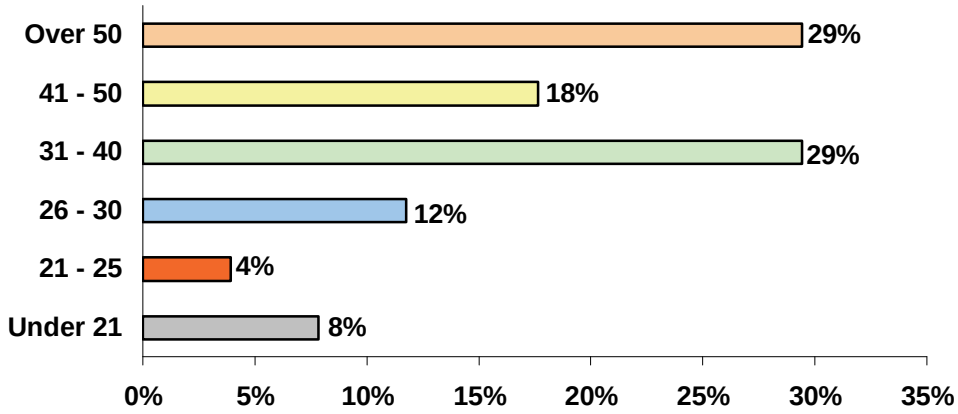
PERCEPTION SURVEY IN EMMAUS ON SHALLOW SEWER SYSTEM

Graphical and Response Analysis

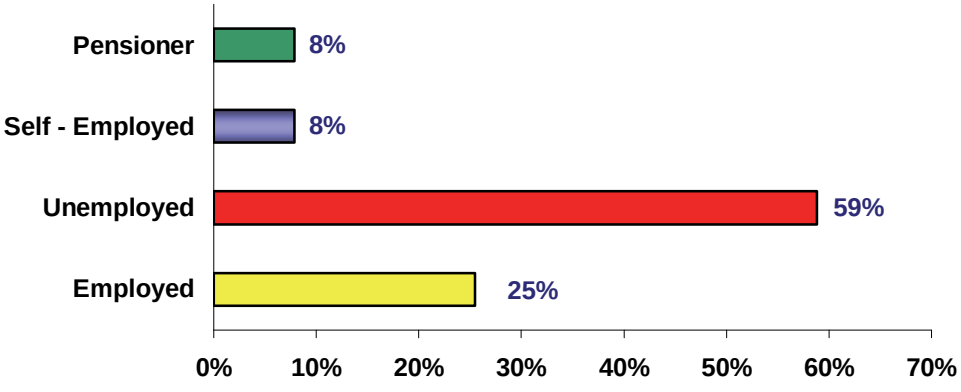
Personal Details

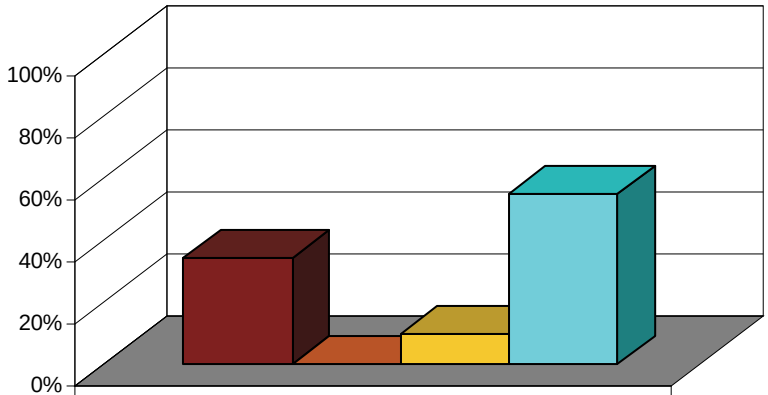


Age



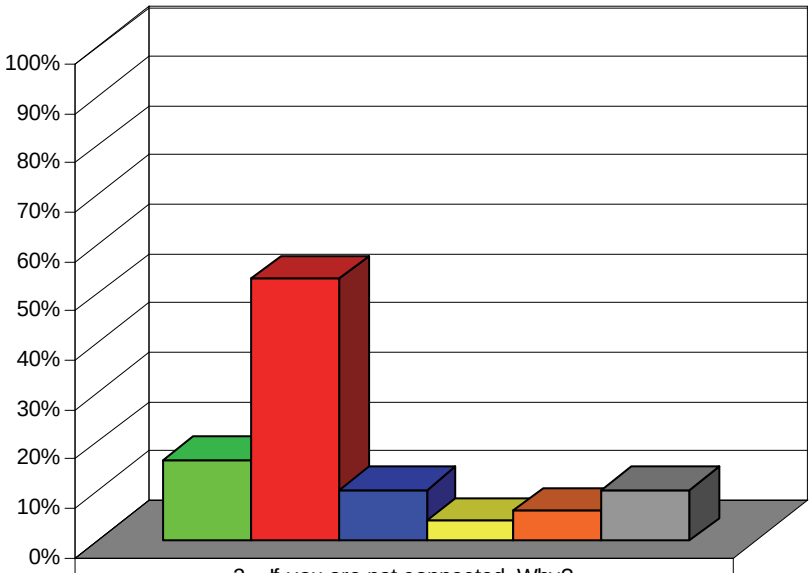
Employment Status





1. What type of water system do you have?

Street Taps	35%
Full Pressure	0%
Roof Tanks	10%
None (not connected)	55%

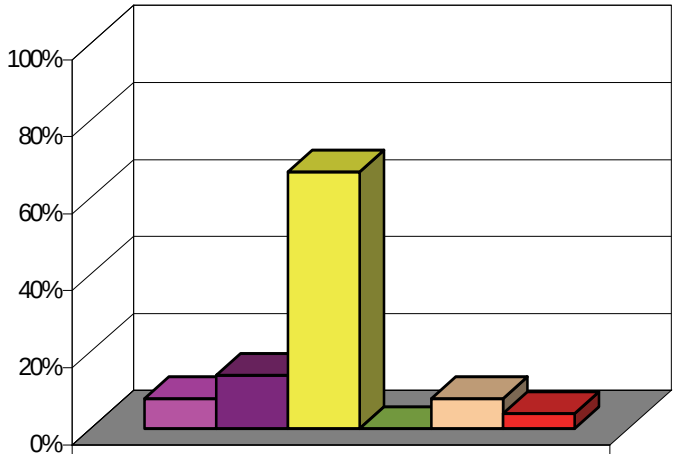


2. If you are not connected, Why?

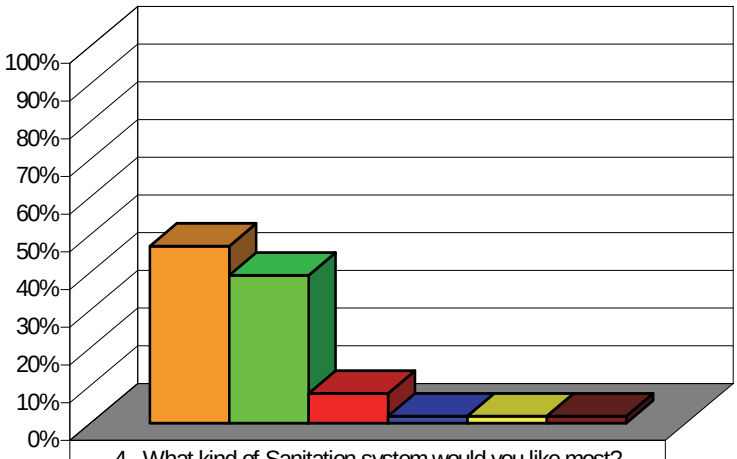
Unemployed	16%
Financial Problems	53%
Have not Decided	10%
Waiting to be connected	4%
Did not answer	6%
Do not like semi-pressure system	10%

COMMENTS MADE BY RESPONDENTS

- **We do not have enough money**
- **We are unemployed**
- **We do not like the system, we prefer full pressure, this water comes out too slowly**
- **We do not have a choice, and we do not have enough money**
- **I do not like the semi-pressure system**
- **I have paid for my connection, but I am still waiting to be connected**
- **I do not know, I am still waiting for a person to tell me why I am not connected**
- **There is confusion with the water affairs and the community that led to a delay**
- **We are waiting for the full pressure as promised by the councillor**



3. What type of Sanitation do you have?	
Shallow Sewer System	8%
Septic Tank (biotag)	14%
Basic Pit Latrine	67%
Chemical Toilet	0%
Forest	8%
Toilets inside, but no water connection.	4%

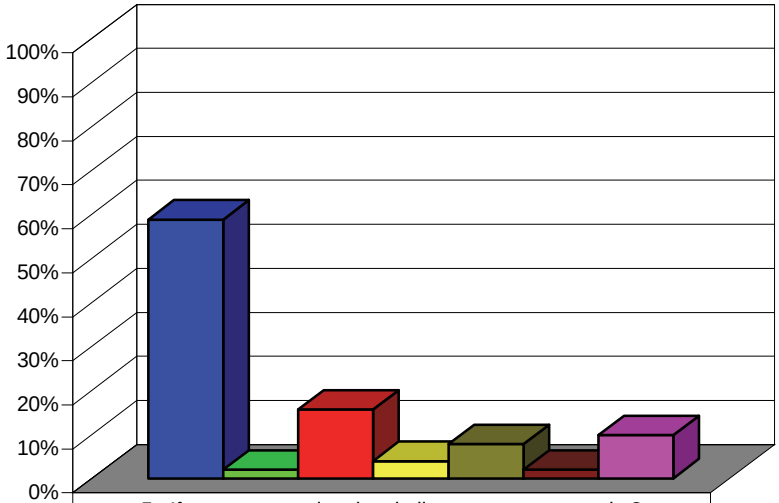


4. What kind of Sanitation system would you like most?	
Flush Toilet	47%
Shallow Sewer	39%
Full Pressure	8%
Chemical Toilet	2%
Do not know	2%
Did not answer	2%

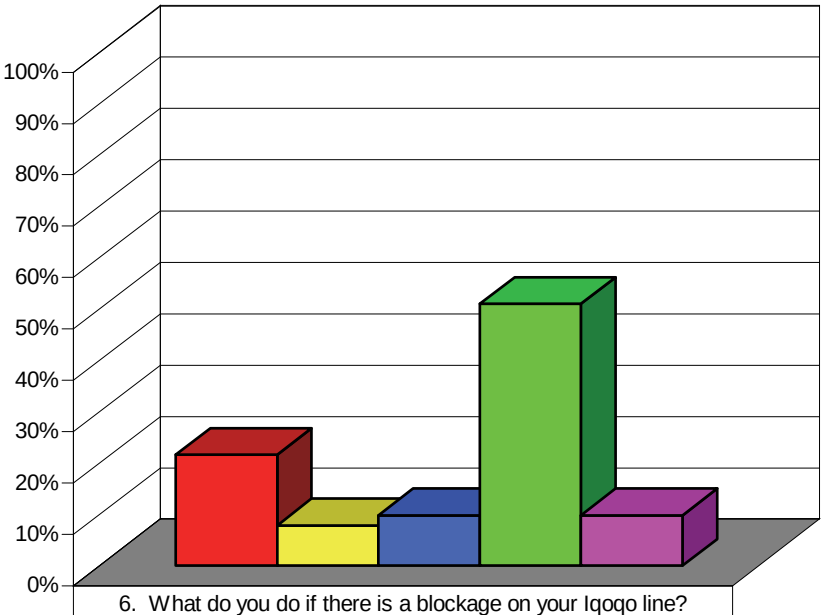
COMMENTS MADE BY RESPONDENTS

- ***We think toilets will not work well as the water comes out slowly and the dirt will not be easily removed***
- ***My husband has been unemployed***
- ***We have financial problems***
- ***We have to buy a red pipe to connect***
- ***We have no water connection***

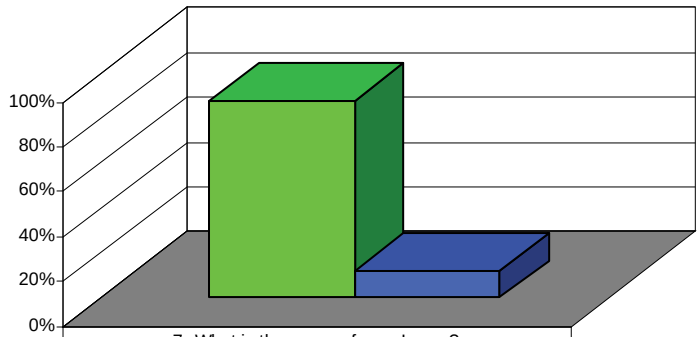
- ***We have just raised the money and will be applying shortly***
- ***I do not want a roof tank***
- ***I do not like it***
- ***Have not decided***



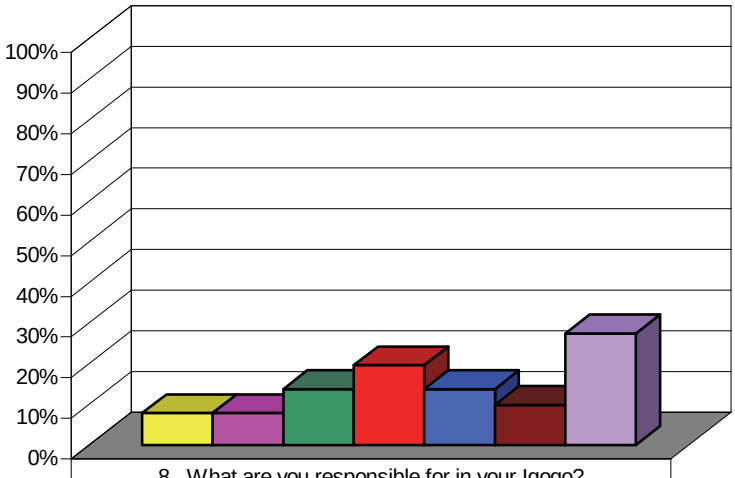
5. If you are not using the shallow sewer system, why?	
Financial Problems	59%
Have a Septic Tank	2%
No water connection	16%
Undecided	4%
Do not like it	8%
Will be applying	2%
Did not Answer	10%



6. What do you do if there is a blockage on your Iqoqo line?	
Nothing	22%
Report it to your Iqoqo Chairperson	8%
Report it to Metro	10%
Fix it yourself	51%
Did not Answer	10%



7. What is the name of your Iqoqo?	
Name	88%
Do not know	12%

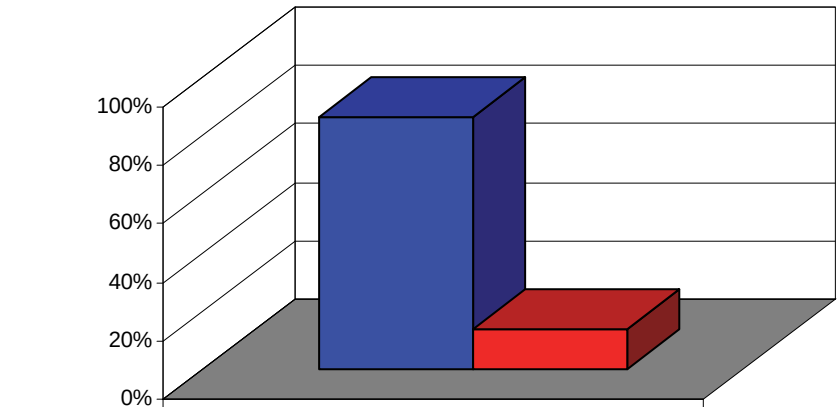


8. What are you responsible for in your Iqoqo?	
Currently an Iqoqo Leader or on the committee	8%
Not available to help	8%
Helped to install pipes / plumbing	14%
Nothing	20%
Co-operate and help with Admin	14%
Do not know	10%
Did not Answer	27%

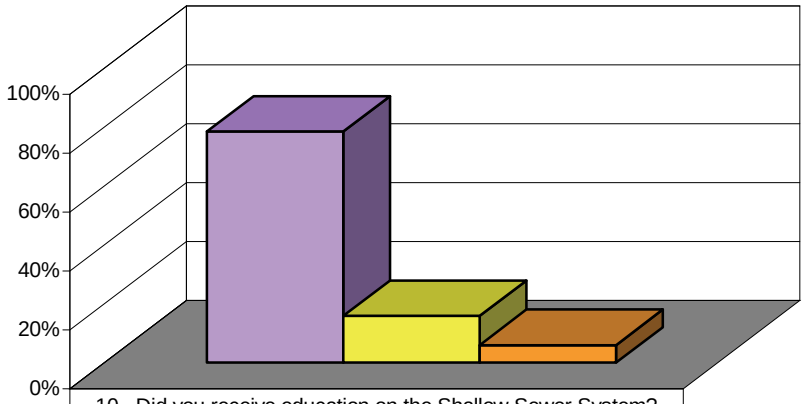
COMMENTS MADE BY RESPONDENTS

- ***If I have a problem and do not know how to solve it, I will report to Metro Water***
- ***To lift up the inspection boxes because they are low and it will be full of mud/sand***
- ***My son will try and fix things (as he was trained)***
- ***We'll report what happened to our Iqoqo***
- ***I would like all community members to be connected, and those who have no money, be sponsored by the government***
- ***Although I do not know what to do, I am prepared to help with anything***
- ***Nothing, I am not working***
- ***I would like to see our people getting empowered***
- ***We'll have the plumbers trained on site***
- ***In future I will be part of the project (WSSS) to help the community obtain water the right way***
- ***I can help where the problem is. If I win the lotto, I will pay for my neighbours to be connected***
- ***I am not always available***

- ***I am a committee member***
- ***I am a member of my Iqoqo***
- ***I would like to see the unemployed being connected first and then we pay monthly instalments***

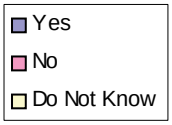


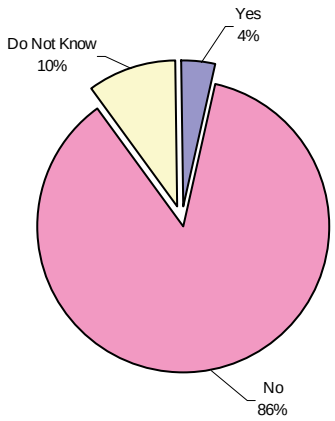
9. Who is your Iqoqo leader?	
Name	86%
Do not know	14%



10. Did you receive education on the Shallow Sewer System?	
Yes	78%
No	16%
Did not Answer	6%

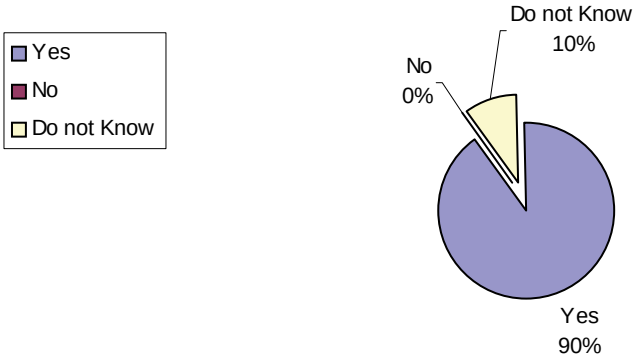
11. With regard to the Shallow Sewer System, Is it Totally Free?



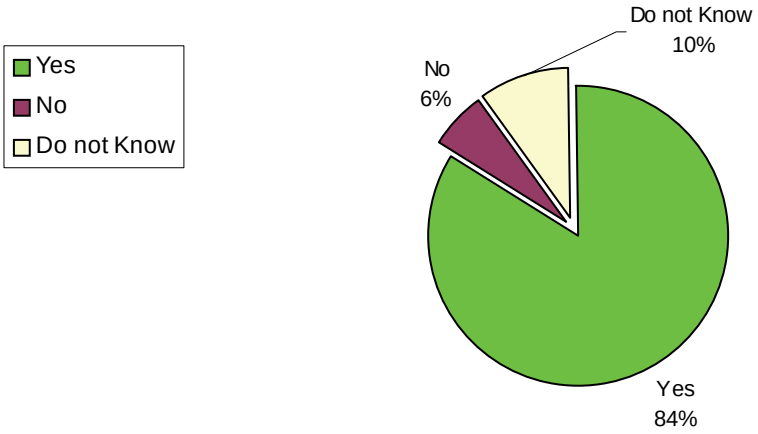


11. With Regard to the Shallow Sewer System,

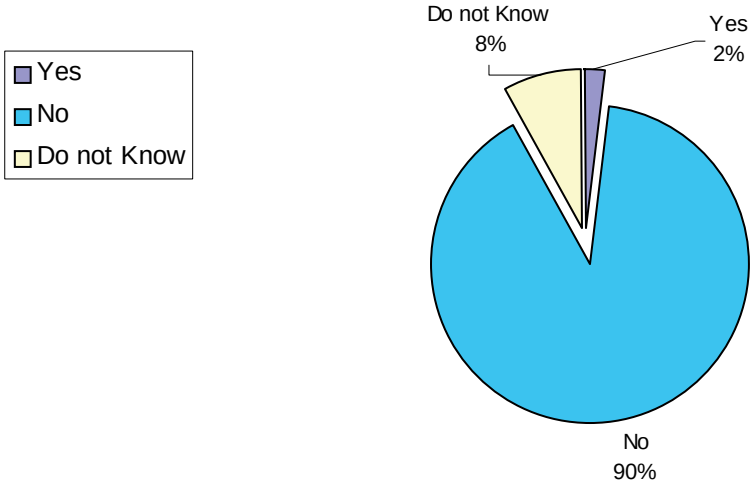
Do you pay for the connection?

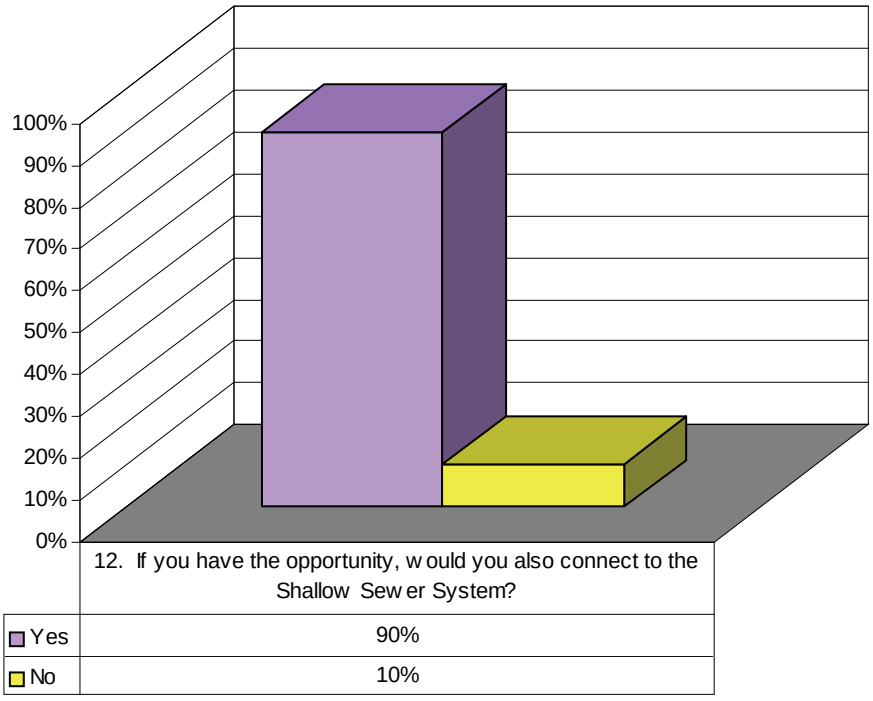


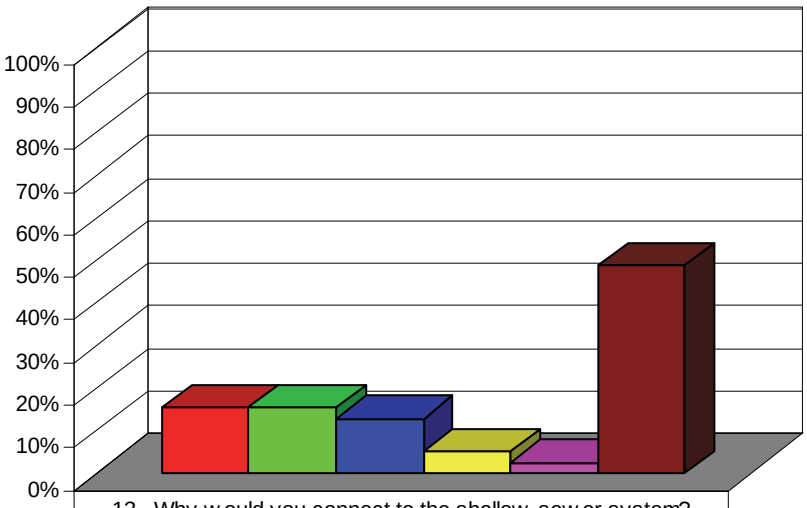
Do you maintain the sewerage system in you community?



Can it work without water?



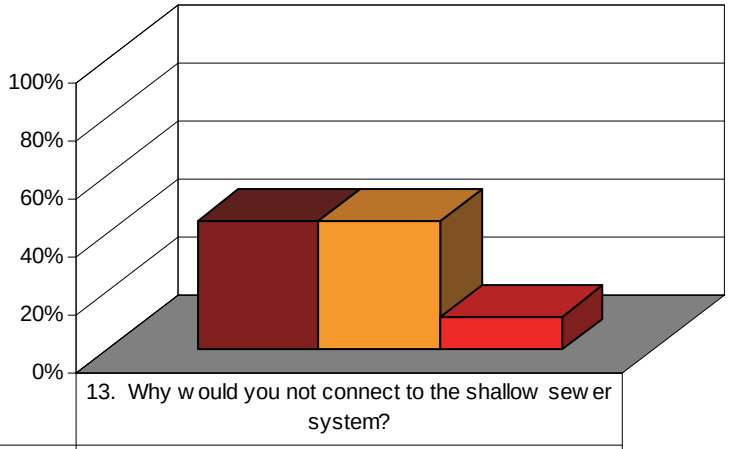




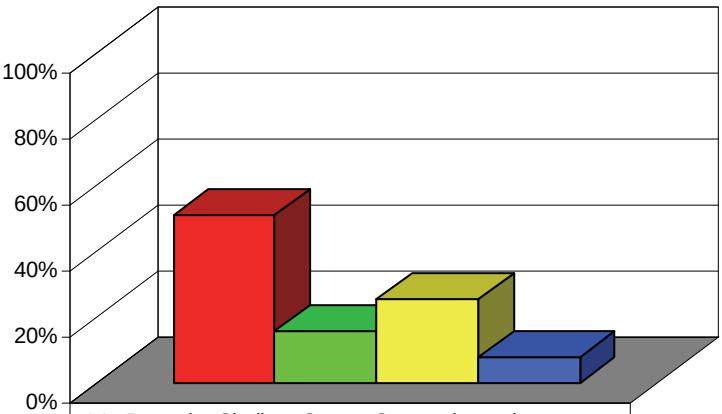
13. Why would you connect to the shallow sewer system?	
More convenient & affordable	15%
Hygenic	15%
We like the system	13%
It has been agreed by the Iqoqo's	5%
Standpipe has been closed	3%
Did not answer, were positive	49%

COMMENTS MADE BY RESPONDENTS

- It is important to have water in the house
- We would not have dirt in our house
- All the dirt in our toilets would be washed away
- we like the system, we are tired of pit latrine and want to flush
- It is for my own benefit
- It will be easier, I will not have to collect water
- It is healthy and it will reduce disease
- It has been agreed at the beginning by the Iqoqos
- The standpipe has been closed and therefore have no option
- There will be a reduction in disease



13. Why would you not connect to the shallow sewer system?	
Would prefer Full pressure	44%
Can't Afford it	44%
Do not like it	11%



14. Does the Shallow Sewer System have the support of your community leaders / Elders?	
Yes	51%
No	16%
Partly	25%
Do not know	8%

15. WHY (does the Shallow Sewer system have the support of your community leaders / elders) COMMENTS FROM RESPONDENTS

YES

- We have had pit latrines for a long time, and are tired of it and now prefer an inside flush toilet
- No one has complained to my knowledge, except Iqoqo A
- The Iqoqo's agreed at the beginning
- A councillor promised to give us water but he is not available at the moment, maybe he'll subsidise us
- Some like it, but I do not like it for reasons I do not know
- It has been progressing smoothly
- Some of the leaders are using the system
- It is always discussed at meetings and we are all in agreement
- There is no other way of getting water as the standpipes have been closed
- We have been encouraged to pay for the connection
- Some people (leaders) have asked Metro to close the standpipe so that we will connect to this system

DO NOT KNOW

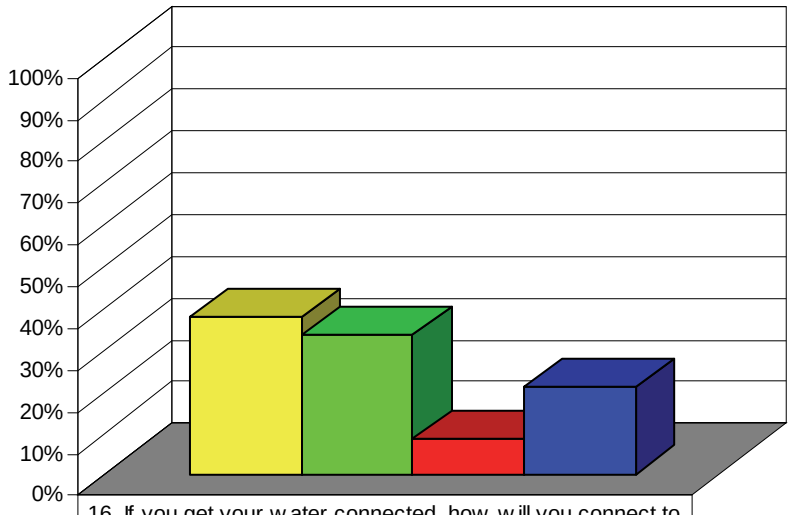
- It is up to us whether we like it or not

NO

- Everyone does his/her own thing in our community
- They want full pressure system but they do no have enough money
- They do not want it as the water flows very slowly from the tank
- The roof tanks sometimes run out of water

PARTLY

- The community and elders are divided
- They have been working hard on this job but now there is a delay
- Work with the leaders was only at the beginning
- The system has low water pressure
- Some prefer full pressure, some want the system
- Community members are confused and feel that they have not been correctly informed about the system
- The roof tank is semi pressure



	16. If you get your water connected, how will you connect to the Shallow Sewer System?
Call a plumber	38%
Connect Myself	33%
Do not know	8%
Will not get connected	21%

Appendix J

Methodology Section
of

Report to Ethekwini Water Services Management: Shallow Sewer Pilot Project

BY

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Water and Sanitation Services (South Africa)

November 2000

1. METHODOLOGY

SOCIAL INTERVENTION MODEL FOR IMPLEMENTATION OF SHALLOW SEWERAGE SYSTEM

1. Background[1]

The provision of adequate sanitation has a major impact on health and quality of life and this is a priority in South Africa. In the efforts to expand the provision of sanitation services to the millions of South Africans without such services, National Government have set the basic level of sanitation services as the VIP (ventilated improved pit-latrine). However, the level at which sanitation services are provided continues to be one of the most contentious issues for urban service provision.

The Durban Metropolitan Council has resolved that all subdivisions in its area of jurisdiction will be served by a waterborne sanitation system unless it proves to be impractical or uneconomical, in due course. A stumbling block in the achievement of this objective is the high cost, unaffordability and unsustainability in expanding the existing conventional waterborne sanitation system into low-income community areas, within a reasonable time frame.

Durban Metro Waste Water Mission is to ensure the provision of affordable and acceptable services for the disposal of sewerage, including conveyance and treatment where appropriate, control of water and air pollution and provision of ancillary services, operated in accordance with sound engineering, business and public and environmental health principles. It operates throughout the Metro area, which is populated by Durban Metro Council Area of services of about 136 400 Ha, with a Total Population of 2,2 million people living in some 500 000 dwelling units. These are distributed 69% “formal” as population, 26% “informal” population and about as 5% “peri-urban” population. Durban Metro Waste Water provides waterborne reticulation and the sewerage is conveyed via a network of pipelines 5100 km long to 28 treatment works where some 500 million litres are treated daily.

In order to achieve its goal Durban Metro considers it essential to develop viable alternative waterborne based solutions for the provision of sanitation to the urban poor in dense settlements. The shallow/simplified sewerage system has the potential of addressing a number of the issues which such an alternative system must resolve, particularly with respect to the concept of it being people driven and it’s reliance on a significant amount of community ownership and input.

Based on findings of the study initiated by the WRC on the applicability of Shallow Sewer systems in South Africa (WRC TT 113/99), Durban Metro considers that the Sanitation System, utilising Shallow Sewer design parameters and philosophies, has application in the topographic and socio-economic context of Durban, South Africa. Thus, Durban Metro would like to further the recommendations of the study into this proposed pilot project.

Shallow Sewer systems were developed by South American engineers in the early 1980’s in an attempt to provide an affordable sanitation alternative for dense urban settlements, hence the technology is also known as the “Brazilian condominial sewerage or condominial sewerage”. Thus, the term shallow or condominial will be use in this document to mean the same system

The technology relaxes many design characteristics of conventional sewerage and in the process allows for shallow depths, smaller diameter pipes, flatter gradients and community based construction and O & M. The concept has been successfully implemented in Brazil, Greece, Australia, USA, Bolivia, India and has become the norm in Pakistan.

[1] Based on “Durban Shallow Sewer Pilot Project - Memorandum of Agreement”, in draft, September, 1999

This model allows for savings in different items, such as length and diameters in pipes, excavation, materials, shuttering, etc. It permits not only to reduce costs for the population served, but also to increase the water and sanitation coverage without increasing projected investment.

2. The Project

This project is a partnership between Durban Metro Wastewater Services, Water and Sanitation Services South Africa and the Water Research Commission. Other actors include the Department of Housing, Environmental Health, Metro Housing, the National Commission for Sanitation and selected NGOs.

The project objective is to learn from the implementation of a pilot project using the condominial sewerage technology to test its suitability for replication in the Durban Metropolitan context. This includes the technical aspects such as design standards, operational parameters and material and maintenance requirements; the social aspects such as cost recovery and affordability, community participation in the project cycle and sustainability, institutional arrangements such as partnerships to implement, operate and maintain the system.

During its pilot stage, the project will provide household sewerage connections to up to 300 families in one or two selected neighborhoods in the Durban Metro area in a period of 12 months followed by a monitoring period of 6 months.

Given its pilot nature, the project will invest considerably in community awareness and mobilization. Indeed, evidence from other pilot projects suggests that a significant amount of social intervention is required at the beginning to be able to "break" the inertia for such an innovative approach.

Because of that, the project will not entail obtaining realistic information about the medium or long-term cost of social intervention. However, it will do so for the technical costs.

Often practicioners in the sanitation field focus Shallow Sewer system's innovations on the modification of some technical standards. However, the conception of the Shallow Sewer system goes beyond that. Its conception comes from a wider analysis of common practices of service provision, including the role of beneficiaries and institutions, the right to participate in the decision and the access to information and services. These concepts actually coincide with current advised policy and international practice in the field of sanitation service provision for the urban poor.

Therefore, it is not possible to separate the technical issues from the social and institutional aspects that accompany the implementation of Shallow Sewer systems. In consequence, it has been considered appropriate to present the fundamentals not only of the condominial (shallow) sewerage systems, but also the grounding roots for the intervention methodology.

3. Fundamentals Of The Condominial System[2]

The fundamentals of condominial systems can be summarized in three main aspects, which explain it:

3.1 Objective

To achieve universal service coverage by introducing alternatives opposed to the condominial system by:

- Reducing significantly the amount of investments with the use of appropriate technologies, due to the scarcity of resources in developing countries.

[2] Mello, Jose Carlos; in "Sistema Condominial de Esgoto, Razoes, Teoria e Pratica", Brasilia, 1994.

- Attracting and organising the participation of new agents in the service provision process, such as the community, the governmental and non-governmental organizations, the international development community, etc.
- Creating conditions to inform the community about their sanitation problems and the importance of their participation in solving them.

3.2 The logic

- Whoever has and feels a problem is a natural agent of its solution
- This solution will only be possible if it comes from a pact between the involved parties.

In the different scenarios of the sanitation problem in the developing countries, the communities' effort to produce solutions outside the conventional system for coping with the lack of services is remarkable. The condominial system rationale is to channel this participation to build a social compound and to conceive an adequate technical solution, which is economically feasible as well. It is important to achieve an understanding of the problem from the community's point of view. The community should also be informed to intensify and complete their problem understanding.

3.3 The idea

The central idea of this model is the democratisation of water and sanitation services, classified according to the following aspects:

- Democratisation of information: stimulating the debate and the modification of the social action trends
- Democratisation of the decisions: about the selection of the most adequate solutions according to communities' will and ability to pay
- Democratisation of service access: through the use of technical conceptions agreed with the local residents and ratified by formal agreements.

A technical conception representing less cost and the establishment of a social pact to allow a complete understanding among residents expressed in the following idea-forces of the condominial system:

- Community participation in the decisions and actions, it is a citizen's right but also as a responsibility, the responsibility of contributing to the solution of the communal and own interest problems.
- Tailoring to reality, through the knowledge of local reality's peculiarities and cultural and physical experiences. Then solutions within the potential boundaries of the financial and human resources available are established.
- Unbundling levels of service to assist populations in their different needs. The majority of the users define the basic level of services. Those who wish higher services should pay the additional costs according to their election.

4. The Condominial System

4.1 Elements of the System

4.1.1 The condominium

The condominium is the geographic or neighbourhood unit, delimited by one or more blocks. It constitutes the basic unit for participation and decisions about the system. The neighbours, through a formal agreement among themselves decide the condominium's formation and scope. Sewage collection of each condominium is made through a "condominial branch" or "feeder pipe".

The "condominial branch" is considered a private component of the system and as such, the investment cost associated with it, it is generally a resident's responsibility, in a similar way to the conventional sewerage connection costs.

Each resident, involved through the community participation in the design, discusses the rights and duties of the parties. The residents decide collectively for one of the options of the "condominial branch" layout, chosing between the backyard, frontyard or sidewalk options, assuming the connection costs or service tariffs charges according to his/her option.

The idea is to provide the community with the right incentives to choose the condominial system. The incentives should reflect the true costs savings associated with the condominial system. These incentives should reflect the projected costs savings associated with the condominial systems.

When tariffs do not reflect these implementation costs, adequate equivalent incentives should be presented to the community.

4.1.2 The micro-systems

The condominial system can also be conceived using the concept of "micro watersheds", which are the natural drainage system.
The collection and treatment of sewage is denominated "sewerage system", but when it is applied to "micro-watersheds" is called "micro-systems".

The structures for sewage transportation and pumping within watersheds –always very expensive- are substituted in the micro-systems by small local treatment units, preferably using simple technology through biological treatment, in order to assure a rational and safe discharge to effluents.

The adoption of the general system, incorporating the formation of small independent micro-systems for sewerage collection and treatment, allows that gradually the totality of the city is covered with services.

During the pilot stage in Durban, micro-systems will be only considered for sewage collection. Sewerage treatment will continue to be centralized.

4.2 Institutional aspects of Condominial Sewerage

Usually, institutional motivation for implementing the "condominial" sewerage as an alternative solution to the "conventional" sewerage, are implementation costs that can be, in certain cases, a sixth of those for "conventional" systems.

Durban Metro Water Services is the institution responsible for providing services in the Metropolitan Area

Actually, the adoption of this system does not represent any technological innovation. It does represent an innovation in the adoption of an institutional solution accepting the principles of community organization and participation in the system design, implementation, partial operation and maintenance, in addition to the new design parameters resulting from this exercise.

Therefore, the institution in charge of service provision should be aware of the financial and human resources commitments the implementing condominial sewerage at a bigger scale represent in terms of developing staff social skills for community interaction.

Institutionalising the system has been an experience dating back to 1980 in Brazil, with experiments done by CAERN (Rio Grande del Norte's Water and Sanitation Company). Ever since, it has been developed as a model, being increasingly accepted as a solution by the sanitation companies due to the resources reduction needed for urban infrastructure investment.

It is worth mentioning as an example the CAESB case (Brasilia's Water and Sanitation Company). CAESB has the concession for providing water provision and distribution services, sewage collection, transport and treatment in the totality of Brazil's Metropolitan capital. CAESB has

incorporated the condominial system for both water and wastewater services, this being the only model. Therefore, no other system considering “conventional” concepts is permitted any longer.

The condominial sewerage system intends an implementation cost reduction that permits to service a population that can be five times larger that it could be using the conventional system. This cost reduction is achieved by utilising the notions above mentioned: changing the concept in the pipe layout, using the idea of sewerage treatment by micro-watersheds and tailoring the dimensioning methods.

4.3 Conventional and condominial systems compared

4.3.1 Conventional System characteristics

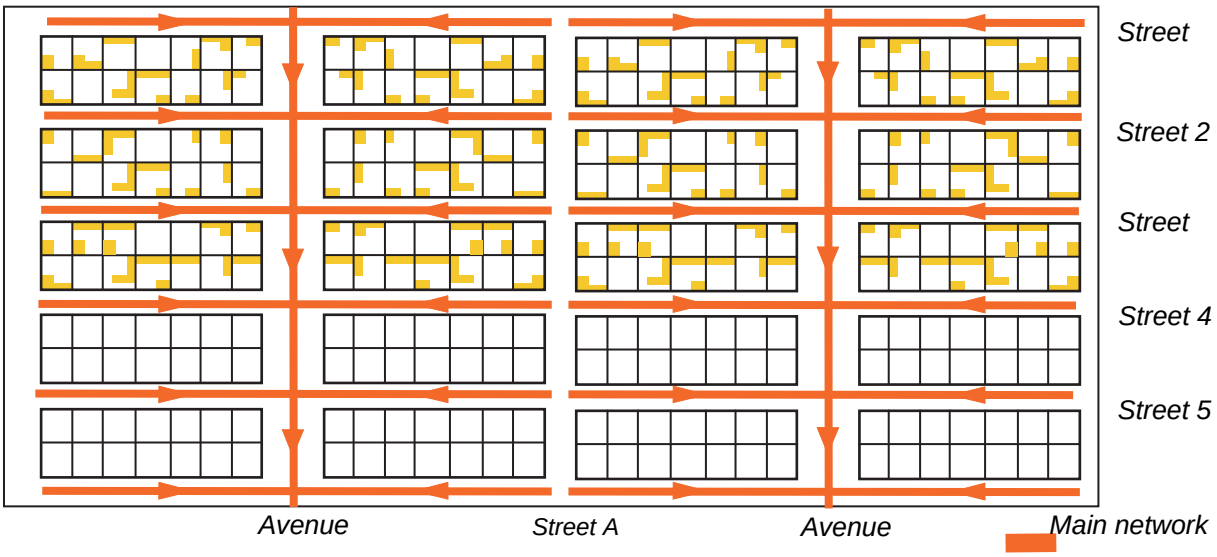

Diagram J1: Typical layout of a conventional network

Conventional system's collectors are at all times implanted in the public roads, implying that:

- There are collectors in each public road and they are always being considered for calculation on their depths, even if they will not be immediately constructed
- Collectors are to be laid out at a minimum depth of 1,00 m considering road traffic protection
- Minimum depth also implies wider trenches so people can work inside them
- Minimum depth implies as well usage of manholes every time a network inspection is necessary (minimum at each road intersection). This is extremely costly
- Minimum depth also implies greater shuttering and increased dewatering
- Minimum depth also demands the usage of more resistant pipes to external pressure

In addition to this, it is accustomed to use minimum diameters of 150 mm in conventional systems.

4.3.2 Condominial System characteristics

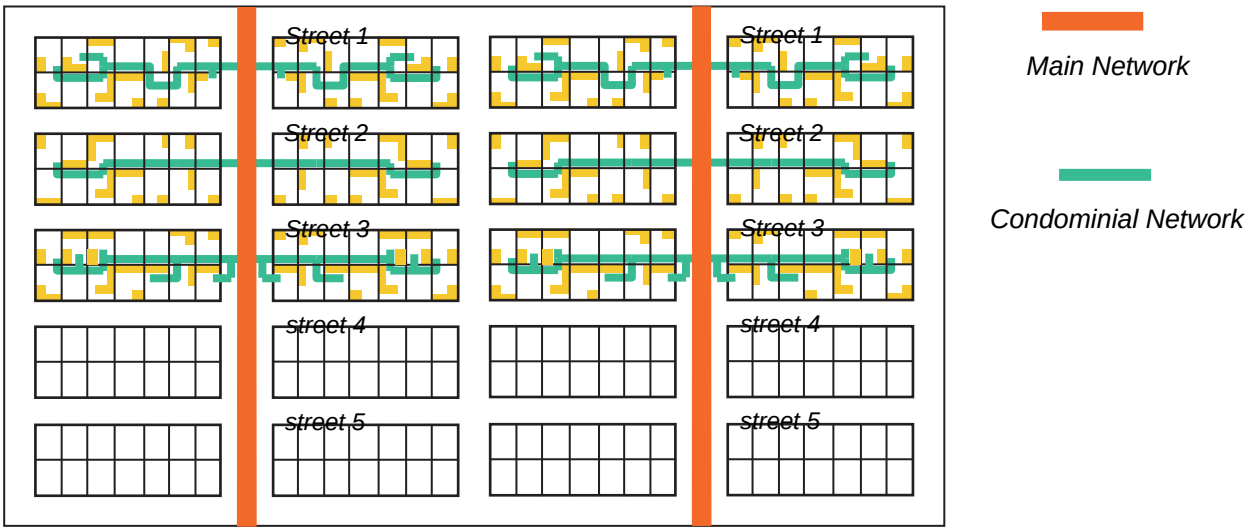

Diagram J2: Layout of a condominial network

For a better understanding of the "condominium" concept, it can be compared to a building of flats, in which the inhabitants agree on their use, maintenance and administration. The condominial "branches" or "feeders" are constructed by the backyard, frontyard or sidewalk, implying that:

- In the case of the backyard layout, the use of only one line to collect the sewage from two back-to-back adjacent plots
- Minimum depths vary between 40 to 60 cm (depending on installations) with a typical trench 30 cm wide. This decreases considerably the excavation volumes.
- The use of "indoors" pipes for the condominial "branches" or "feeders" since these are laid out in protected areas with no vehicle traffic. This type of pipes may be used up to a depth of 1,20 m.
- Since a total control of the contributions to the system is achieved in condominial systems (i.e. no security factors for drainage into the system), it is possible to use a 100-mm diameter pipe, increasing the diameter only when the hydraulics calculations determine so doing.
- The usage of inspection chambers instead of manholes (manholes will be only used in collectors). Inspection chambers are cheaper, and easier to construct and use.
- Shuttering and dewatering diminution in the same proportion to the depth diminution.
- The use of collectors is greatly reduced. Collectors are only used to link condominial "branches" or "feeders"

4.4 Project integral conception

In the project conception, the main approach focuses on the sanitation problem solution of an area as a whole. This implies actions not only in water and wastewater, but also in micro drainage, community development and actions in sanitary and environmental education. Thus, the systems can be structured to local residents' lives, allowing change in habits and conducts towards personal hygiene, water use, and refuse management, treatment and disposal.

To achieve these objectives, intensive community work should be done with the active participation of the population in project development. This work should include discussions of the most appropriate technical solutions, the specific technologies to be implemented, and a strong component in sanitary and environmental education using participatory and constructivist methodology.

5. Condominial Systems Social Implementation Process

5.1 Basis for the implementation

For the construction of condominial systems, according to concepts created by the engineer Jose Carlos Mello in 1980, it was necessary to count on the mobilisation and intensive participation of the potential beneficiaries. Thus, an adequate social intervention methodology was developed to meet this proposal.

This methodology has been applied during 1992 for the development of water and wastewater systems in low-income populations in the periphery neighbourhoods from the Brazilian cities of Dourados and Campo Grande. In 1994, it was also applied to 80% of the population in the city of Angra dos Reis in Rio de Janeiro State, as part of the Basic Sanitation Project –PROSANEAR- funded by the World Bank and the Brazilian Government. Currently, this methodology is being applied in the El Alto/La Paz pilot project in Bolivia, aiming to provide water and sanitation services to 10,000 families in low-income areas of the city.

The methodology used in these experiences considers the system implementation works as a whole, with no separation among the social component, the engineering component and the education component. To achieve this, an implementation strategy based on the interdisciplinary action concept was used: the social intervention, the education and engineering works (technical alternatives) and construction works were intimately related all the time. These activities were implemented through a team including professionals from different disciplines (engineers, social

promoters, doctors, architects, teachers, sociologists, psychologists, social communicators, etc.) that were properly trained in the social intervention methodology proposed, specially to act in a participatory way in an interdisciplinary team.

Each family made its joining to the wastewater system; it gave its opinion about the pipe layout and was trained for the system's maintenance. With the objective of achieving changes in sanitary habits and attitudes, the project ensures that the sanitary education reaches all the inhabitants, specially women, and not only to the community leaders or community organizations such as the community committees, as it was done traditionally.

Therefore, the basic principle of the social intervention methodology used was that the system construction should be an educative experience developed through research, popular and participatory education. The relationship between the beneficiaries and field team should be horizontal, between equals, between individual and individual, in order to create a favourable environment in which persons unable to speak in public could express freely. This principle is based in the "pedagogy of the oppressed", being enriched with the execution of the interdisciplinary approach and with the life experiences of the people participating in the elaboration of technical and popular education proposals.

5.2 General Objective

To agree with the beneficiary community the implementation and maintenance of the condominial sewer system.

To achieve this objective, it is important to a) take into account the environmental reality of the project areas and the population to be benefited, b) actions need to address several concrete problems during the process of implementing the services including the community development, health and sanitary education.

5.3 Specific objectives

- To demonstrate the existing relations between sanitation and living conditions, specially in relation with health, sickness prevention and the stability hazards in potential landslide areas.

- To offer the population complete information related to the technical alternatives that they could use to solve their sanitation problems, including the costs and responsibilities associated with each alternative.
- To offer the population the necessary elements so it can consciously decide, which is the more adequate solution for sanitation in its neighbourhood.
- To train the local residents on maintenance and operation of the elected system, especially in those aspects which are their responsibility.
- To support the community initiatives in search of solutions to the problems detected communally during the social intervention and training process.
- To inform the community about the importance of using the wet cores properly to defecate, in opposition to their current practice of doing it in the open fields.
- To support technically the auto-construction of the basic wet core.
- To support the community organisation process for the auto-construction works, through communal works or by self-help.
- To inform the community when it is deemed necessary, about the specific modifications that should be done on their plots, with the objective of making the possible technical solutions compatible with the works and the local reality.
- To inform the community about the difference between the sewerage system and the drainage system, as well as the importance of each system.
- To guide local residents about the need of adjusting each plot's sanitary fittings to public system connection.
- To inculcate local residents about the importance of treated water for human consumption
- To advise the population about the proper way of potable water storage.

- To educate local residents about the contamination cycle, making emphasis about the problems involved by poor waste disposition, having livestock inside or near their houses, as well as the need for good body hygiene and food manipulation.
- To create awareness about the existing relationships between the neighbourhood's micro-system and the hydrography basin, identifying the possible environmental problems associated with the basin and its negative impacts on the neighbourhood.
- To identify potential environmental problems at the neighbourhood micro-system level having an adverse impact to the hydrography basin.
- To advise in the search of solution for neighbourhood degraded areas.
- To inform the population about the cautions needed to ensure a good maintenance of the water and wastewater system, as well as the relationship between that the individual's action consequences onto the communal infrastructure.
- To inform the population about the importance of paying the charges for water and wastewater services.
- To motivate the organization of youth, children and elderly associations with the objective of promoting human growth and development activities.
- To inform women about the importance of make personal and familiar changes in their hygiene, health and environmental preservation habits.
- To support and promote initiatives for income generation, especially targeted at women.

TABLE J1: THE INTERDISCIPLINARY APPROACH

It is a process through which participants having different views about a specific problem, can in a constructive way analyze and to communicate to others their vision and together find possible solutions. An interdisciplinary approach differs from a multidisciplinary one in different aspects such as objectives, hypothesis, role of the team leader, attitude structures, communications patterns and results

COMPARISON BETWEEN THE INTERDISCIPLINARY APPROACH AND MULTIDISCIPLINARY APPROACH

	Multidisciplinary	Interdisciplinary
Objectives	To coordinate all the contributions of several disciplines to solve a problem	To integrate all the contributions of several disciplines to find innovative solutions
	To work within each person's paradigms	To obtain a paradigm transformation from which all people work together
	To take advantage of each individual's excellence	To work for the collective success
Leader's Role	To integrate different contributions	To support the team members to integrate their ideas and solutions
	To develop the final product based on individual contributions	To manage the team for the development of a final product
Team Process	To use the specialized jargon of each discipline	To form a common language
	To share information	To prove hypothesis
	To accept conclusions from each team member	To achieve a deeper understanding of each team member's perceptions and conclusions
Attitude	We do what they used to do	We develop something new
	"That is the way the authorities did it"	"We can contribute to form a new strategy"
Communication	Avoid disagreements	Allow disagreements
	To avoid discussion or questioning among the team members	To encourage discussion and mutual discovery
Assumptions	Problems have multiple causes and each member will solve one part of it.	Problems have multiple causes requiring integrated solutions
	Team members are concerned only for their part	Each team member get involved in the totality of the issue
	There is a hierarchical structure among disciplines	Each discipline has the same importance
Results	Solutions are isolated	Solutions are integral

The challenge is to change multi-disciplinary teams into inter-disciplinary teams, in which different disciplines work together in an integrated and synchronized manner. These teams are bigger than the sum of the parts.

The added value of using interdisciplinary approach can be seen in the following results:

- A completed and systemic vision of the situation/problem that avoids over-simplification and generalization
- Reports that can be understood across disciplines and by non-technical managers or professionals
- Knowledge and familiarity of each actor involved in the processes to be implemented.
- Integrated solutions and plans considering the connections and interactions among the technical, managerial, political and human elements of the situation.

Source: Liebler, Claudia –"Making interdisciplinary teams work: A guide for teams leaders and technical assistance managers" – WASH Technical Report No.92- February 1994 – pages 1,2,3

5.4 Methodology

5.4.1 Description

Within the condominial systems methodology, the construction of the works is an educational and mobilising process. Thus, at the end there are not only the water and wastewater systems built but also the community organised.

5.4.2 Facilitator stance and pedagogical approach

To accomplish the above mentioned, it is necessary to count on a reflexive methodology and pedagogy thus allowing the construction of a neighbourhood identity. This is essential for community liaison and participation in the systems construction, operation and maintenance, having ample knowledge of the rights and responsibilities resulting from this process.

This process allows creation a new population attitude to the community matters, where the inhabitants are able to formulate new representation parameters between the public and the private issues.

The methodology strategy begins with a series of individual and communal practices to overcome concrete problems. With an individual view, communal problems appear to be only economic, or social, or educational, but reality is more complex. This complexity requires an interdisciplinary perspective to front these problems.

The interdisciplinary approach will happen in practice, through the work in the communities of a team composed by professionals from different disciplines: social workers, engineers, architects, sociologist, educators, etc., able to develop actions in an integrated manner. In this way, theoretical and technical knowledge from various disciplines and the knowledge of the community are combined to produce a new knowledge, able to motivate transforming actions.

5.4.3 Basic considerations for the methodological proposal

The intervention in a determined community consists of allowing the local residents to make an analysis of their social, historic, economic and cultural reality, considering that:

- As individuals of this process, they can identify the origin of their problems and the responsibilities they should assume to solve them. Here the individual identifies with the other, and they get the understanding that the same kind of problems affects everybody.
- Solidarity should be encouraged among the individuals and groups as partners responsible for a solution of a problem affecting everybody, breaking individualism, principal factor of paternalism culture.
- A positive relationship with the environmental physical space should be developed.
- Through a socializing process, it is possible to acquire a practical and technical knowledge.
- Through the dialogue and debate, negotiation and consensus for interventions is pursued. However, the internal divergences and differences in the communities are respected.
- It is key to obtain the participation of schools, health centres, neighbourhood associations, mother's clubs, OS and religious organizations.
- It is important to develop specific activities targeted to the active involvement and participation of women.
- The value and respect for inhabitant's beliefs and cultural manifestations, as well as the support for its rescue and preservation. All of this constitutes valuable tools for the motivation, organization and transformation of individuals and groups.

5.4.4 Characteristics of the community participation work

Based on the previous concepts, the community participation work will be a dynamic process of inter-relation with the beneficiary community having all the participating agents, to define mutual rights and responsibilities, where the relationship is horizontal from individual to individual.

The adoption of the condominial system does not necessarily means solving all the existing problems. The lack of experience in the adequate use, in its maintenance, the poor hygienic and health habits, the inadequate relation with the environment, the poor relation towards the public assets, the lack of a holistic view and the weak exercise of the participation and negotiation.

Community discussions are commonplace during the application of the methodology

Therefore, it is necessary to adopt a methodology approach and reflexive pedagogy that allows:

- To permit an effective participation and organization of the involved parties
- To facilitate the adhesion and management of the system, as well as an adequate management of their benefits
- To promote the relationship of the individual with the community
- To instil the awareness of the right and responsibilities among the neighbours to solve the problems originating the project.
- To allow the establishment of a new approach to communal matters, where the local residents are able to understand how individual actions have an impact to the totality of the community.

The challenge in this methodology is to create a collective conscience, transforming group of neighbours, isolated and non integrated individuals into a group of collective citizens, constructing a practice of “acting with”, of “sharing with”, disregarding individualistic options and attitudes, but without neglecting the individual knowledge and experience in solving their problems.

5.4.5 Natural results when the methodology is applied

The technical and social team and the community should promote changes in the concepts about its organization and how to front the problems with an abstract solution yet no tangible.

The condominial system may serve as a basis for the establishment of a legitimate organization with legal recognition (the condominiums), which can be an instance for decisions and performance of actions for the development of the totality of the community.

These principles should be transformed to concrete attitudes within the relationship between the involved parties. These relations will be later formalized in an agreement.

The totality of the activities will be developed in cooperation with the community, which becomes the project counterpart. The community provides for example, venues for the meetings and local encounters and copies for the communication tools. Therefore, the project should not offer anything for free.

It is essential not to see the project as a donation, but rather as teamwork between the community and the facilitators.

In general, during each step of the process, local residents will increasingly take part in the project, participating on:

- Performing a community self-assessment
- Establishing priorities to problems and planning actions
- The knowledge and selection of a technical alternative to solve their sanitation problem
- The debate and decision about the formation of condominiums
- The adhesion to the condominial system
- Definition of economic incentives allocation resulting from savings in project implementation.
- The environmental assessment of the block and neighbourhood in which they live.
- The adaptations of the residential hydraulic installations to connect to the condominial system
- The health and environmental education activities and events
- The formation of working groups for works construction, improvement of health and the surroundings, the refuse system, the communication process, the sanitary education, etc.

- The formation of “multiplicative” agents and the process of legitimate new leaders.
- The actions of self-help
- The solution of other problems affecting the collective.
- The search of spaces for interaction and negotiation with public, private and popular institutions.
- The processes of planning, executing and evaluating project results and activities.
- The systematization of the lessons learned resulting from the system implementation process.

5.5 Methodology Instruments

To perform the participatory process in the Durban Shallow Sewerage Project, the following Methodology Instruments will be used:

- Area characterization
- Participatory diagnosis and planning
- Popular communication

5.5.1 Area characterization

There is a general knowledge about the areas determined for the project, but it is necessary to deepen and characterize it.

The characterisation would be made through a census investigation, a cadastral survey, an identification of the surrounding environment, and a historical recount and sociological analysis of the neighbourhood and its inhabitants. This information will form part of a “baseline”, which will be the comparison point during the final evaluation.

This “characterisation” will be one of the instruments that the social agents use during the diagnostic and the participatory planning.

5.5.2 Participatory diagnostic and planning

The participatory planning will be used as an instrument for discussion and knowledge of the local reality. The community will elaborate an action plan for project execution in a concerted way with the field team, making priority the environmental aspects to the solution of the sanitation problems.

The rationale for the adoption of this instrument lies in the fact that many claims, demands and mobilisations are done in a non coordinated manner. Sometimes these actions are done in a spontaneous manner. These activities have little or no impact in the formation of a personal or group consciousness.

To overcome this difficulty, actions should be planned, making sure that the communities have the responsibility of analysing, diagnosing, planning and acting in the overcoming of their problems, leaving behind the fatalist and passive attitude to difficulties.

In this process, the systematic evaluation is present in every step of the way, to avoid diversion and to be able to establish changes. Such route changes will be done with criteria collected from analysing results and products at the individual, collective and institutional level.

The implementation of this process will have as an axis a pedagogic action of popular education, looking for the complete development of communities, reinforcing their identities and widening their critic consciousness.

5.5.3 Popular Communication

In the proposed methodology, popular communication becomes a fundamental instrument for the pedagogic process, leaving the traditional concept of the communication as a simple broadcasting action.

It is understood that every communal action is a communication action. This is reflected in the communication means and languages produced and used. Notwithstanding, given that the population is one of low-income and it does not count of proper and permanent means for their

own communication production, the project should encourage an alternative production, originating from the local residents.

It is common that the low-income groups, already affected by the lack of basic structure to develop their full citizenship, be stigmatized by the media.
The media does not take into account the community's universe: their needs, diversities, achievements, cultural production, religion, historic origins and perspectives. Even less, it does not value their opinion and critics about their own reality, or allow spaces where these groups can manifest themselves. On the contrary, the majority of the media, like the radio, does not develop educational or formation processes. When the media does encourage participation, it is masked or focused to their sponsors' commercial needs.

The majority of programs reserved for the periurban population are the police or sensationalism news that disintegrate and isolate. The media, often vertical and centralized, contributes to low-income communities' marginalisation when treating periphery local residents as a potential bandit. In this sense, poverty image translates to enemy's image, someone that should be repressed or suppressed.

These factors reinforce this community's social isolation. They do not count on participation channels in the different decision instances nor in message elaboration or media production, where they can be active individuals. Their role is one of a passive consumer of information and commodities.

Therefore, the project should encourage and use communication channels often being used by the community, and identify other potential channels for use. Additionally, the project would propose alternative and popular communication media, as well as the insertion to traditional media in the intention of democratising its use.

The project would provide the basic preparation for communication elaboration, through workshops and common language production, taking into account community's social and cultural universe.

Group and collective communication instances will be encouraged and promoted. During the communication events, information and knowledge levels (about criteria, habits, and attitudes) are clarified. This community production will have as its subject, sanitation, environmental education, health, condominiums and the subjects resulting from these discussions.

Local residents will use this means for their own message elaboration in the educational and the organisational field. The socio-technical field team will prepare documentation about the process developed by the community, to return it later to the community. The documentation will be made based on the photographic, audio and video recording made in the work groups in each community.

5.5.4 Evaluation

Evaluation is part of the social intervention methodology and it is present during the totality of the project process. The evaluation goals are:

- Enable an efficient secondment during project implementation to identify possible failures and introduce timely correctives
- To identify the degree of participation of the local residents in project definition and execution
- To identify in each implementation phase and detect possible discrepancies between proposed objectives and actual partial results

Evaluation will constitute parameters for working strategy modifications. It will be registered through:

- Monthly and quarterly technical reports of each phase.

- Photographic and video documentation of meetings with the community, given that the community agrees.
- The final report will depart from the “baseline” records at the beginning of project implementation.
- The final report should contain another area characterization, taking into account the new conditions on sanitations and local residents organization.

6. The Field Team And The Training Process

6.1 Professional’s role and profile

To ensure a good social intervention, in which the actors easily develop the defined strategies, it will be necessary to count on technicians identified with the proposed methodology. Their character should be one of the popular educator, socio cultural animator and someone who favours new actions, even though they are external agents to the community.

An interdisciplinary team, properly trained would undertake the work. This process will require from the persons involved more working time than a traditional methodology.

Social technicians may have background on diverse disciplines, given that they have a respectful attitude to popular knowledge, to family’s life history, and their resistance and survival means.

Technicians should have a motivation and sensibility for community works, and experience in community mobilisation, popular education, studies systematization and documentation. Additionally, they should be able to use planning methodologies and project schedule elaboration.

Field team working hours should consider population spare-time. Thus, the field team should work during evening and weekends.

It is fundamental that the members of the field team be motivated to be trained and willing to work with non-traditional methodology.

Engineers being part of the team should be civil or sanitary, with experience in water and wastewater system implementation. They should have willingness for teamwork, ability to work with the population, and keen to get training on education and community mobilisation.

The technicians in engineering should belong to the area of surveying, civil construction or sanitation, and should be able to perform topographical surveys, and more important to be motivated to be trained in the proposed methodology.

In general, the professional and the social as well as the technical technicians should have experience in their area. They should have a general knowledge about the South African and KwaZulu-Natal reality, be sensible to the social problems, value the popular knowledge, and be able to integrate the technical and social knowledge.

6.2 Team Training and participants agents

It is understood that a Work like this, with few references in the South African context, besides being innovative is a training instrument for all participants. Thus, participants will be able to act with new parameters of social intervention in a more global way, to help solve the water and sanitation problems in the peri urban areas.

6.2.1 Team training

The training of the team will be performed in study periods, intertwined with practical actions; even the project development is in itself an educational action for the social agents.

When deemed necessary, the field team would be trained through a series of "workshops" in specific subjects such as gender relations, popular communications, health, preventive medicine, basic sanitation and environmental preservation.

6.2.2 Initial training for the field team

The initial team training would have duration of one week. The activities in the training will include:

- Reconnaissance of the intervention zones and systematization of the initial impressions during the visit.
- Reading and analysing the existing material of the communities where the project will work
- Study of the project and its methodology conceptions
- Study of the technical elements of the engineering proposal for the condominial water and sanitation systems.
- Study about community development, environment and sanitation.
- Planning of field intervention

The training will use a method encouraging a team spirit. Popular education and communication techniques would be used to help as a reference for the team interacting with the local residents. Daily evaluation would be part of the educational process and not a separate action as the traditional systems for adult education.

7. Work Phases

7.1 Institutional and community arrangements

Prior to starting any action on the field, pertinent councilors and committee leaders are informed of the scope of the projects. Agreements are made to establish each participant's role and input to the project. The project is presented to the community, whose approval should be given at least by 50% of local resident's signatures.

7.2 Cadastral and Social Characterization

Given the nature of the Shallow Sewer layout, and the intensive process of social education and training associated with it, it is essential to count with the social characterization prior to start the technical design and the community participation process.

The social characterization constitutes the basis for adapting the social intervention methodology. Trained field teams perform this task, with information support of available aerial photographs and a survey team from Durban Metro.

7.3 Agreements and Definitive Design

During this phase, the field team is trained in how to approach the community, how to build effective teams, how to do participatory assessment and how to orient and guide the participatory process.

The community assesses the situation of its environment in terms of health, sanitary conditions, and quality of life, with the guidance and support from the field team. The field team uses several participatory tools as the talking map, photographic expositions to question and analyze their current situation.

The field team presents to the community different alternatives for solving their problems and the community decides which alternatives they want and are willing to pay for.

The activities for this task are done through a series of local resident meetings per condominial branch. During this stage, the field team meets with EACH condominium and household representative to organize how the condominial branches works are going to be laid out, the location of the inspection chamber and wet cores.

Once the final design is presented to the community, they accept and sign the commitments to implement the project.

7.4 Training and task planning

During previous stages, community groups and persons directly related to the project are identified and some training events are prepared for them. In this stage, emphasis is made on training and informing teachers from local schools. Teachers will support the community awareness process by helping the formation of local communication groups.

Task organization includes task prioritization, days, time and responsible person for each task, in common agreement among the field team, the community-based organizations and local residents.

7.5 Works implementation

During this phase, systems are built according to the schedule developed by the community and the field team in the previous phase.

Basic training in plumbing, plastering, etc. is provided to local residents, who will undertake the works. Additionally, assistance is provided to obtain materials for the construction of the wet cores.

The field team performs supervision and monitoring tasks, and it is available daily for consultation, comments and questions that the community might have regarding procedures, measures in relation with acquisition of material (quality and quantity) and building of household connections.

Additionally, some community activities are performed during this phase, such as cleaning of neighborhoods and public spaces, performance of cultural and sport events, conferences and meetings about the environment, promotion of ecological fairs and rehabilitation or improvement of public entertainment facilities. Results of each of these activities should be spread to the entire neighborhood.

Strong support is provided for construction of toilets, sanitary modules, etc. This is a critical phase for the system, but population's doubts and concerns are resolved on site.

7.6 System consolidation

During this phase, household connections to the system are finalized, and the system starts to function. The sanitary and environmental education and the training for operation and maintenance are consolidated. The community makes a final evaluation of the process and the field team moves out of the site.

7.7 Systematization and Final Evaluation

The community does not participate directly in this phase. The co-ordination team performs this task using the inputs given by all the stakeholders involved.

The task previewed for this phase includes systematization and project evaluation, analysis of the results for applying the methodology, in particular:

- Effectiveness of the community organization and community groups formed
- Analysis and evaluation of the condominium organization
- Analysis and evaluation of the new relationship created between Durban Metro and the population in relation with the implementation of the system
- Identification of health and attitude changes by local residents
- Evaluation of Durban Metro staff involved in the project and identification of potentialities
- Identification of field activities to be continued after project end
- Elaboration of final reports and lessons learned by the project

2. DOs AND DON'Ts

Without the intention of oversimplifying the application of the methodology, and according to the request of Durban Metro officials, a small table including the Do and Don'ts for the social intervention methodology is included. This table is separated into sections according to the principles and the steps of the methodology.

The information contained in the table is the product of the experience gained by an engineer in the application of the methodology in different projects around the world. Thus, the table below is not intended to substitute in any way the deep, methodological social research about the provision of water and sanitation services in very characteristic anthropological, sociological, psychological and cultural environment.

Table J2: Dos and Don't's

PRINCIPLE/ TASK	DOs	DON'Ts
Community selection	▪ Use the demand response approach (community demanding water and sanitation as priority) to select communities ▪ Inform the community about the cost and implications of the project ▪ Ask the community about their interest in participating in the project ▪ Involve the community as a whole in the preliminary consultation process ▪ Portrait the project as the communities'	▪ Use the perceived "need" of the communities as a selection criteria ▪ Delay the decisions about costs and community involvement until the construction phase ▪ Assume that the community wants to participate and have the sanitation system ▪ Include only the community leaders in the initial consultation process ▪ Portrait the project as the agency's
Institutional arrangements	▪ Keep the politicians informed about the decision making process, even if they do not have a technical background ▪ Consult every agency about the community involved, even if they do not have a technical nature	▪ Limit your information search about the community to technical specialized agencies
Agreements and Definitive Design	▪ Include both the tenant and the owner in the decision making process about the layout ▪ Take your time to consult the appropriate individuals within the household to make the decision about the layout ▪ Explain the condominium plan and ask for each household representative signature on it.	▪ Assume the owner or the tenant alone can proceed with the decision about project layout ▪ Close your consultation rounds with the condominiums without getting complete satisfaction from the householders ▪ Assume a standard design or a preferred layout based on the information of few households

PRINCIPLE/ TASK	DOs	DON'Ts
Social Characterization	▪ Specify to the community what kind of information is going to be collected and for which purpose ▪ Involve the community in the validation of the tools to be used to collect the information ▪ Check with the community about language, days and time of the application of the methodological tools ▪ Introduce the surveyors to the community as a whole ▪ Train the surveyors about how to approach the community and how to be sensitive about specific questions	▪ Contract a third party to collect information ▪ Use preset standardised questions from other projects ▪ Include all sort of information to be asked, without relevance for the project implementation ▪ Assume the information from one community should be just like their next door neighboor ▪ Assume the surveyors are qualified to ask socio-economic information
Training and task planning	▪ Train the field team individuals in every single aspect of project implementation for Shallow Sewerage and working with communities ▪ Develop an interdisciplinary team under which the technical staff know social issues and the social staff manage technical knowledge ▪ Assume that the time saved on training will be charged twice in covering flaws during implementation ▪ Assign project team couples (social + technical) to specific condominiums ▪ Discuss with the communities the whole project process in as much detail as possible ▪ Get an agreement about the allocation of responsibilities for provision of tools and equipment	▪ Presuppose that an NGO would be knowledgeable of the methodology ▪ Assume the social consultants would use participatory techniques and approaches ▪ Separate the technical and the social staff and produce specific training ▪ Create hierarchical levels within your project team
Works implementation	▪ Stagger condominium construction ▪ Incentive the condominium that get organized first ▪ If possible, produce identification cards for the project team on the ground ▪ Trust the community in material storage but discuss eventual problems and consequences	▪ Start with all your condominiums at once ▪ Have the condominium contacted by diverse, ever changing project representatives

System consolidation	▪ Understand community timing in terms of project completion	▪ Give concessions and overspend to have the project finalised
Systematization and Final Evaluation	▪ Involve the community in evaluation ▪ Use participatory evaluation and assessment techniques	

3. PROJECT IMPLEMENTATION

Introduction
This section deals exclusively with the specific departures from the proposed methodology. When introduced, these departures where an attempt to adapt the methodology to the specific local conditions or due to time or budgetary constraints. Given the limited information gathered after project completion, the certainty about the methodological departure implications is limited.

For specific step-to-step information about the project implementation, the reader is referred to the precedent section, LIMA Task completion reports.

3.1 Methodological instruments: Area Characterisation

The cadastral survey including the location of the wetcores or sanitary areas to be executed by the project team was delegated to the topographical surveyor mainly due to the difficulty of the terrain for referencing and the lack of surveying experience by the personnel provided by the social consultant.

The results of this are centred on an extended negotiation process with each condominium in the location of the inspection chamber being close to the wetcore.

3.2 Methodological instruments: Participatory Diagnosis and Planning

The methodology called initially for a long series of discussion about the sanitation situation on the community, the identification of health hazards in each condominium and the creation of an enabling environment for the community to identify their own sanitation problems and figure out the solution in a co-ordinated manner.

Indications from the initial project presentation and advise from the social consultant pointed out that the community was on a stage of realization of their sanitation problems and ready to take action.

This turned out to be partially true, with not all households being aware of the consequence of their polluted environment. Eventually, the households being more aware of the implication of the project at the onset of the actions became leaders during the implementation phase.

3.3 Methodological instruments: Popular Communication

The impossibility of contracting a popular communicator for the complete project implementation yielded to a two-fold consequence. The principle followed was to utilise the material already developed by other institutions such as SANTAG, DWAF, DMWS, etc, in order to minimise material development costs, given the small scale of the project.

On the one hand, the material developed by the project was limited to the Shallow Sewerage System Instruction Book with the input of an outside artist. The lack of material about tariff and connection costs, project steps and legal arrangements eventually delayed (not significantly) the implementation of those actions.

On the other hand, the condominium leaders and the committee became actively involved in the communication process, adding credibility to the project but posing some limitation for individuals not having regular contact with the community structures. This was particularly dramatic for some condominiums in Emmaus.

3.4 Methodological instruments: Evaluation

Given the existence of a complete research component funded by WRC and extending beyond the project completion, many of the evaluation activities were passed onto that component. The independent nature of this component will also add credibility to the project results.

Henceforth, the evaluation effort was limited to community evaluation about project implementation.

3.5 Field Team: Profile

The social consultant hired LIMA-Rural Development Foundation did not have the experience necessary to implement this type of project in South Africa. The Management knew this condition and it was envisioned to provide the NGO with a specific training in this regard. Thus, the NGO role was seen not only as a provider of manpower, but also as an advisory body in terms of the social adaptations for the proposed methodology.

During project implementation, the social input from the NGO in terms of principles and procedures was not quite as expected, but their staff enthusiasm, dedication, flexibility and willingness to learn the methodology somehow surpassed this weakness.

3.6 Field Team: Training

The initial idea of bringing a social consultant to train the NGO in the proposed methodology was replaced by the initiative to send project participants to visit a similar project in La Paz, Bolivia.

Such a visit was quite successful from the institutional point of view, since participating officials gain a deep understanding of the project functioning and later support project implementation. However, the initial objective of providing the project team with the sufficient tools and knowledge for project implementation was not completely achieved. Only two senior staff from the NGO assist and one of them later resign to his position in the NGO. These factors hampered the passing of the methodology training to the project team on the ground, with many deficiencies having to be solved during the biweekly project team meetings and the provision of a seasoned technician into the project team.

3.7 Work Phase: Self Help vs. Payment for Work

The issue of the cash contribution was a very difficult one. In similar experiences using this methodology, the community is asked to provide hand labour for free, as a manner of expressing their interest in the project . However, it was deemed appropriate to introduce the cash contribution due to the lack of financial mechanisms to help the communities to connect to the system. Another factor taken into consideration was the precedent established by the “modus operandi” of the Water Section, that pays for every intervention in low-income communities.

The cash contribution yielded to a conflict in the community priority for completing the works, since it was not seen to be done because of the inherent beneficial for the community, but rather to obtain a payment. In a way shifted some member of the community’s perception from a sanitation project to a labour generation project. Additionally, it added an administrative cost to the NGO and the project team in dealing with payments and distributions thereof.

For a detailed analysis of the cash contribution please refer to the task completion report.

4. CONCLUSIONS

Different factors influenced the application of the methodology during the Shallow Sewerage project. Perhaps the more pressing one was the tight time frame and the lack of human resources specialised in social issues to provide a further insight into methodology modifications.

It is still early to qualify the full extend of the methodology departures, since the operational phase is just starting. Certainly the research component will produce independent and clear results about the community acceptance and ability to manage the system.

However, the departure from the methodology seems not to have affected in greater extend the final project, or the perceptions of the community, as can be evidenced by the community evaluation at project completion.

The implementation of similar projects to a greater scale will certainly contribute to apply the methodology with a full extent and to produce all social tools in a systematic manner. That would also allow to closely monitor and evaluate the impact of changes in the proposed methodology.