TOWARDS POLICY, STRATEGY AND DETAILED PROCEDURES FOR THE PROVISION OF SANITATION TO LOW-INCOME SETTLEMENTS IN JOHANNESBURG

Report to the
WATER RESEARCH COMMISSION

by

M B van Ryneveld

For

Johannesburg Water (Pty) Ltd

Project Leader : Paul Viljoen
Supervisor : Valitha Roos

WRC Report No 1192/1/03
ISBN No 1-77005-036-1

MAY 2003

EXECUTIVE SUMMARY

Introduction

A Sanitation Policy and detailed procedures in the form of a Sanitation Protocol for the provision of sanitation to low-income settlements were developed for Greater Johannesburg Metropolitan Council (GJMC) - now City of Johannesburg (CoJ) - under an earlier research project (GJMC, 2000a; Pegram et al., 2000) by Pula Strategic Resource Management (Pty) Ltd, with funding from the Eastern Metropolitan Local Council (EMLC) and the British Department for International Development Southern Africa (DFIDSA). The project was completed in early 2000, but due to political factors within GJMC during local government elections in December 2000, the process of establishing the Sanitation Policy and Protocol was temporarily suspended, and the Policy and Protocol were never formally accepted by GJMC. Subsequent to these events, the institutional environment has changed very substantially, and a very different institutional arrangement is now in place from that which was in place when the two documents were written, namely:

(a) the ring-fencing of water and sanitation services within the local authority; and
(b) the establishment of Johannesburg Water (Pty) Ltd.

The aim of this research project has been to *review* the Sanitation Policy and Protocol for appropriateness for use in CoJ as well as for more generic use in the urban and peri-urban areas of South Africa, in the light of developments in the intervening period since they were developed. The review has in fact been extended to take in a range of other policy and protocol documents that have been developed in this period. The intention is that this review should provide a basis for discussion of Johannesburg's policy, strategy and detailed procedures, as well as those of other local authorities.

Institutions as rules

In reviewing the Sanitation Policy and Protocol of CoJ, it is first necessary to place these documents within a broader framework, which is best described by the term 'institutions' or 'institutional' framework. The term is used on this project with a very specific meaning: that 'institutions' are viewed as 'rules' rather than as 'organisations', with the following more detailed explanation (World Bank, 1999: p.22, 23):

> The term *Institutions*, as it is used here, refers to sets of formal and informal rules governing the actions of individuals and organisations and the interactions of participants in the development process. Rules can be formal, taking the shape of constitutions, laws, regulations and contracts. Or they can be informal, like values and social norms.

The Sanitation Policy and Protocol therefore form part of a range of institutions for the provision of sanitation.

Policy, strategy and detailed procedure form a continuum in which the different elements are difficult to separate out:

(a) *Policy* implies general principle, not easily departed from, and therefore stable and not easily subject to change;
(b) *Strategy*, set within the framework of the policy, implies a plan of action necessitating a choice of timing, location, method and resources, in other words, 'what, when, where, how and with what resources'. It may be revised more regularly than policy; (say

annually, but with a horison of 5 or 10 years or even longer);

(c) *Detailed procedure*, implies detailed steps and techniques, which may be even more flexible than either policy or strategy.

The heart of policy generally lies in the policy principles. The policy principles set out both how sanitation *will* be provided, and by implication how sanitation will *not* be provided. The place where the tensions of policy are resolved is in strategy, where priorities are set and trade-offs made within specified time frames for the provision of sanitation (and water). The Water Services Development Plan (WSDP) (as required by the Water Services Act of 1997) is intended to be the primary strategic planning tool for the resolution of these priorities and trade-offs.

Recent policy, strategy and detailed procedure documents include:

(a) *An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council* (GJMC, 2000a); and associated *Sanitation Protocol* document (Pegram et al., end of project: Feb 2000);
(b) White Paper on Basic Household Sanitation (DWAF, Sept 2001);
(c) Ethekwini Sanitation Protocol (2002?);
(d) Sanitation Policy for the City of Johannesburg (CoJ, draft 2: Apr 2002b);
(e) Procedures being piloted by Johannesburg Water under their low-income settlements programme (current).

With respect to sanitation policy for Johannesburg, current initiatives based on the White Paper on Basic Household Sanitation appear sound. With respect to more detailed procedures, current pilot studies by Johannesburg Water have sought to gain an understanding of technical requirements and community dynamics as a first step. While sensibly following a pilot-and-programme approach and gaining essential experience in low-income settlements in Johannesburg, this initiative does need to be aware of three possible dangers:

(a) The lack of development at the pilot stage of a *clear framework through which demand can be expressed* carries the risk of not being able to mobilise community capacity, and of not being able to reverse the matter of non-payment;
(b) *Moving too quickly from pilot to full scale implementation programme* under pressure to deliver carries the risk of being unable to develop designs and procedures adequately, and runs the risk of rejection of particular levels of service by communities before Johannesburg Water (JW) has had the chance to get the systems right.
(c) A third possible danger is a longer term one rather than a short term one; and it may be argued to be outside the mandate of the water utility. Irrespective of whether it falls within the mandate of the utility or not, the consequences will impact profoundly on the utility: Unless *development takes place* in the low-income communities of Johannesburg, it is likely to prove extremely difficult to resolve the problems of non-payment and inability to pay currently being experienced - and prove difficult to turn consumers into customers. From the service provider side, this requires careful collaboration and planning together with other parties within the framework of the IDPs (Integrated Development Plans).

Key elements of policy are generally translated into legislation. However, it needs to be understood that while the legislation will generally seek to prevent what is clearly unacceptable, it will not necessarily enforce good practice. More specifically, it appears that while existing legislation and procedures do not *enforce* the principles of the White Paper on Basic Household Sanitation in a number of key respects, neither do they *prevent* the principles from being pursued. In other words, if such principles are *not* being followed in practice, there are reasons *other* than

legislation that are driving this action. What legislation and regulations primarily do is to *allocate powers and functions*, but not necessarily to spell out in detail all actions that must be taken. The legislation allows the discretion of the incumbent in making decisions in the absence of an explicit ruling. The policy principles are nevertheless a statement of good practice, which would be unwise simply to disregard.

Various governance problems identified include the following:

(a) 'Silo' approach to government;
(b) Co-operative government can be made to work, but there appears to be currently no formal mechanism for ensuring that it works;
(c) Legislation is currently in a state of constant change;
(d) Underfunded mandate;
(e) No clear policy; interpretation of the legislation inconsistent;
(f) Clear legislation, but there is no mechanism for enforcement, so that it is ineffectual;
(g) Clear legislation, but the administrative procedures are so onerous that the vehicle is ineffective.

Progressing from the more general governance difficulties listed above to more specific issues, the following appear to be particularly critical issues in the provision of sanitation to low-income settlements:

(a) In contrast with rural areas, decisions about service provision in the urban context are primarily about access to land - and the opportunities that accompany them. While a decision on the level of service for informal settlements - many of which may never become established townships - is made independently of the formal establishment procedures, it appears that decisions about the level of service of sanitation in urban areas are generally made - certainly in formal areas and areas to be formalised - *within the context of township establishment*. Servicing - certainly in formal areas and areas to be formalised - therefore accompanies the land registration - and housing procedure; and as such, is not an independent procedure over which the service provider has significant control. There appears to be a difference in approach between housing/planning and water services, with housing appearing to promote higher levels of service, but the service provider carrying the consequences of any non-payment.
(b) The second is between DWAF (Department of Water Affairs and Forestry) (water) and DEAT (Department of Environmental Affairs and Tourism) (environment) - as well as DTI (Department of Trade and Industry) (building regulations) - over *pollution from on-site sanitation systems*. It appears that while liquid waste - or waste with an impact on water - is controlled by DWAF, solid waste is controlled by DEAT.

While legislation and strategy are key drivers in the provision of services to low-income settlements, there are other tools that also serve as drivers. One such tool is that of performance indicators. The primary Key Performance Indicator (KPI) for CAPEX is generally timeous expenditure of capital budget. For contracts where the procedures are well-established, this is appropriate (although even here, the graph of expenditure over time follows the classic S-shape: starting more slowly and building up over time). For contracts in low-income areas, the same curve is not appropriate. CAPEX alone is simply too blunt an instrument to be used as a KPI in this situation.

May and Stark (1992) suggest that the establishment of operating procedures alone are unlikely to be sufficient to ensure good practice. They suggest that operating procedures need to be

combined with various other mechanisms that regulate the *individual professional*. Regulatory mechanisms for design professions are set out in a paper by May and Stark (1992) in relation to earthquake policy. These give some insight into the 'family'of institutions that need to be set up to ensure good practice, which includes various forms of *public and private regulation*.

The value or attitude of learning is selected to explore the place of values and attitudes in the range of institutions for the provision of sanitation to low-income communities. Educational theory may provide useful insights into how learning might happen.

Substantial knowledge about both the principles and practice of service provision to the poor is available. Notwithstanding that, municipal engineers in general appear to battle to get to grips with particularly the non-technical aspects.

With respect to identifying the institutions or rules for the provision of services to low-income settlements, it is important to note the long period of time over which the development of policies, strategies and detailed procedures has taken place. It also pertinent to note that most of the *de facto* rules for the provision of sanitation to low-income areas that go to make up the 'institution' are informally held, which makes it both time-consuming and difficult to identify them.

Finally, regardless of the degree to which the local authority complies with the intent of national policies, there appear to be two specific 'rules' with which the local authority is *compelled* to comply:

(a) The local authority as a whole must remain *financially sustainable*;
(b) The local authority must comply with applicable *environmental* legislation.

These two topics are addressed in more detail in the following sections.

Financial sustainability

As indicated in the previous section, one of the 'rules' with which a local authority[1] appears compelled to comply is that of financial sustainability. What this implies for the local authority is that:

(a) There must be a clear distinction between cost, price and subsidy; and
(b) For the operation of the local authority as a whole in the long term, the expression C#P+S *must* hold true (where C=cost, P=price and S=subsidy).

In other words, the price of the services provided by a local authority must be set at a value that will enable it to continue to provide these services on a financially sustainable basis. The price of the good or service may be reduced by the amount of internal cross-subsidy from richer to poorer consumers (normally by means of a rising block tariff) and/or by external subsidy (from a source outside the local authority). But whatever happens, total expenditure of the service provider must be covered by total income (from all sources, including external subsidy income). The matter is complicated by:

(a) the service provider's need to borrow in order to fund major capital works;
(b) C, P and S have further components (capital and operating; internal and bulk/connector; which can be expressed as one-off costs or can be translated into ongoing monthly or

[1] While this applies in the first instance to a local authority as a whole, the principle would apply equally to the operation of a service provider.

annual costs);

(c) The price may be reduced by the amount of subsidy. For Free Basic Water (FBW) the cost is subsidised in full so that demand is not tested for the basic amount.

Nevertheless, breakeven is where C = P + S, and in the long run, the utility must be able to cover its costs, otherwise (to state the obvious) it will go bankrupt.

At the planning stage, there are a number of more specific levels of detail at which costs can be determined:

(a) *Country-wide or regional estimates of average unit costs* e.g. Van Ryneveld (1995), or Palmer Development Group (1993 and 1994) - updated in Van Ryneveld (2000). These costs do not make provision for specific local conditions e.g. economies of scale of infrastructure (There are distinct differences between ERWAT and City of Johannesburg). They give a good 'first pass' overall understanding of the costs of different levels of service and what factors influence them, but generally have insufficient local detail for tariff-setting at local authority level;

(b) *Average unit costs for the particular local authority or service provider, derived from historical costs* e.g. as derived from annual reports or summary studies e.g. iGoli 2002 (GJMC, 2000b?). These may be refined to produce more detailed equivalent costs to (a). They may also be translated into a model that can check sensitivity of various parameters (as suggested in the costing framework; see Van Ryneveld, 2000). Their limitation is that they remain essentially static models, and are not able to model changes in costs and level of service distributions over a period of time.

(c) *Financial modelling of the service over a period of time* e.g. Palmer Development Group (1998a). This level of modelling would normally be undertaken for a large local authority for the construction of the WSDP. The approach is described in the Management Guidelines for Water Service Institutions (Palmer Development Group, 1998b).

(d) *Detailed GIS-based physical modelling* of the actual network extensions, which can test the effect of different layouts, settlement densities, levels of service etc e.g. Boutek model; see Biermann and Landre (2002). Some current masterplanning may provide some of this data.

(e) *Combinations of different aspects* would provide a high level of modelling ability. e.g. integration of dynamic cost and tariff modelling together with physical modelling, supplemented by willingness-to-pay studies and economic development models.

A graded effort can also be a wise approach i.e. start with a fairly simple study (e.g. review of theoretical understanding, combined with more specific data from previous local investigations) to gain an understanding of the problem, and then follow it with more detailed studies. Many key understandings can be obtained from fairly rudimentary planning. This permits scarce resources to be targeted at specifically identified problem areas as the investigation progresses.

For decision-making in a large metropolitan local authority such as Johannesburg, static modelling of costs can provide a first estimate, but dynamic modelling of costs, prices, subsidies etc over a period of time is necessary for decision-making regarding tariffs and levels of service.

Updated costs (regional estimates of average unit costs; see (a) above) repeat earlier assertions that the life cycle cost of a full level of service of water supply and sanitation in Gauteng is (on average) 3 to 4 times the cost of a basic level of service; and the cost of an intermediate level of service is 1½ to 2 times that of a basic level of service.

A first indication of unit costs for Johannesburg may be derived from summary figures given by CoJ itself as part of the iGoli 2002 initiative (GJMC, 2000b?) (average unit costs for the particular local authority or service provider, derived from historical costs; see (b) above) which yield figures of about R18 000 per connection for average replacement capital cost for a full level of service of water and wastewater. This falls squarely within the range of estimates for the average of Gauteng. It is also very much of the same order of magnitude as the total housing subsidy amount of R20 300 (for income category of 0 to R1 500 per month; Department of Housing, Gauteng, 2002).

While the costs of the DDPLG (Department of Development Planning and Local Government) Water and Sanitation Backlog Study (DDPLG, 2001) were not analysed in detail, it appears that while the estimates of operating cost as used in the study are not unreasonable, the estimates of capital cost are low as compared with figures for Gauteng presented in this study.

In the case of the Stretford x4 shallow sewer pilot project, JW deviated from the promulgated sewer tariffs in two respects:

(a) in using a volumetric based tariff of R1 per kilolitre of water consumed, instead of the flat rate of R37/household.month (2002/2003 tariffs). (The volumetric tariff is understood to cover only the purification cost, and consumers are given a rebate on the balance of the operation and maintenance cost because they maintain their own sewer system).
(b) in substantially reducing the impact fee for the bulk services contribution that is paid by consumers.

By comparison with the costs of services, these tariffs appear to be low. The matter is further complicated by various reciprocal contributions between the community and the service provider in respect of:

(a) the community contribution of labour for construction, operation and maintenance of the condominial sewers;
(b) payment to the community for labour;
(c) training provided to the community by JW in the execution of the tasks.

The monthly water and sewer tariffs for the intermediate level of service (shallow sewers) in the Stretford x4 pilot project were agreed with the community. Furthermore, there is merit in such tariff structures in that they are:

(a) simple;
(b) more affordable to low-income communities than the promulgated tariff,
(c) give consumers the benefit of the rising block tariff; and
(d) provide a rebate for in-kind community contributions to the construction, operation and maintenance of the sewer system.

What is not clear, however, is:

(a) whether consumers will in practice be able to restrict their consumption to below the free basic amount (i.e. 6kl/household.month), while using the intermediate level of service;
(b) whether the shallow sewer system will be able to operate satisfactorily on the return flow from the free basic amount of water used;
(c) whether - if consumption cannot be kept below the free basic amount (for whatever reason) - Johannesburg can afford to provide the intermediate level of service to residents for free, given that recovery of charges from existing low- income consumers is so low;
(d) whether - if extended to large numbers of households in Johannesburg - the provision of

services at these tariffs is financially sustainable for the provider in the long run.

On the matter of non-payment, Professor Schlemmer (Water Services Forum News, Sept 2000) said: "The underlying causes of non-payment are not clearcut, simple or singular" and "...nothing less than such integrated and co-ordinated strategies are likely to reduce the problem to manageable proportions." Furthermore, figures (Hartley, 2002: p.1) indicating that the accumulated debt in the country's four metropolitan areas amounted to R9.4billion and that the Johannesburg metropolitan councils had by far the largest debt - R4.56billion - give a clear indication that the problem of non-payment for municipal services remains a severe problem in the country as a whole and in Johannesburg in particular.

Environmental sustainability

There is a potential confusion between the procedures of:
(a) National Building Regulations (1985);
(b) Groundwater Protocol (1997);
(c) Water Use Authorisation Process (DWAF, 2000a) of the National Water Act (1998);
(d) Environmental impact procedures of the National Environmental Management Act (1998).

DWAF Water Quality Management decision-making hierarchy lays down four principles to give direction to decision-making in this regard:
(a) Prevention;
(b) Minimisation at source;
(c) Disposal according to the precautionary principle;
(d) Disposal according to the differentiated approach.
In similar manner to the general sanitation policy principles, these water quality management principles give somewhat limited assistance in deciding how decisions might be made in particular instances. They cannot easily be resolved in absolute terms; but rather have to be resolved through strategy. In order to give more specific direction to implementers such as local authorities, it is necessary for these principles to be resolved in some form of *national and regional water resources strategies*.

There is a lack of clarity on how the critical judgement as to whether groundwater will be used in the long term for drinking purposes or stockwatering (as required in the Groundwater Protocol) should be made. The issue at stake here is *not* whether there will be any *contamination* (because even limited contamination is likely to occur, certainly in the long term) but rather whether the aquifer is of *major strategic importance*. It is suggested that the issue is dependent on the outcome of the Water Quality Management decision-making hierarchy - and therefore of some form of national and regional water resources strategies - as mentioned above.

There is lack of clarity as to whether the polluter pays principle will be invoked against local authorities who are issued with permits by DWAF to discharge effluent to any water resources, if any pollution (in the definition of the National Water Act) were to occur as a result of this.

Developmental approaches

Developmental approaches to the provision of infrastructure in general and sanitation in particular are significantly at variance with what might be termed conventional engineering approaches. The past record of projects in low-income or developing areas has been poor, and unless significant attention is given to developmental approaches, projects in these areas are likely to fail.

There are several different ways, however, in which failure[2] can occur. Four are suggested as follows:

(a) *where a constructed facility falls down, blows up or fails physically in some catastrophic manner*. Failure is sudden, simple and obvious (although the exact causes of failure may not be); and it is usually a technical failure. Thankfully, such failures are rare.

(b) *where the service is nominally provided, but the infrastructure assets have physically deteriorated, with consequent reduced utility*. The results may be little different from the first case, but the period of time over which deterioration takes place is much longer. Although the failure is physical, it is usually a direct consequence of financial, social and/or institutional failure rather than technical failure.

(c) *where extension of basic services to all is delayed and significant backlogs persist*. In this case the consequences may not be the deterioration of any infrastructure assets, but rather (particularly in the case of water and sanitation services) poor environmental conditions and consequent health impact resulting in both illness and/or death. This situation is often associated with providing high levels of service to a few consumers, and little or no service to the rest.

(d) *where the infrastructure is provided, and remains in satisfactory working order, but consumes resources and fails to perform or deliver the developmental benefits that it is intended to deliver*. Infrastructure provision does not necessarily enable growth - or poverty reduction - to happen. If inappropriately high levels of service are provided, they may divert scarce resources away from more beneficial areas and retard growth. Such a failure is difficult to identify as it is a loss of opportunity rather than a direct failure.

International experience over recent decades indicates that while development is possible, it is neither inevitable nor easy. Furthermore, it is multi-faceted process, requiring several components to be in place both individually and together for development to succeed.

Further local experience "...confirms that the quality and financial sustainability of projects are almost always directly related to whether initial funding decisions were informed by consumer demand and the economic rationality in very specific contexts. Ill-considered projects, designed in isolation from specific community dynamics and demand, have mostly proven costly." (DBSA, 1998).

Samuel Paul (1987) suggests five objectives of community participation as follows:

(a) Cost sharing;

(b) Project efficiency;

---

[2] In engineering in general - and in this study in particular, the term 'failure' is used to mean any failure to meet required performance standards. This may even be fairly subtle such as excessive cracking or deflection of a structure. The term 'catastrophic failure' is reserved for when something actually falls down or blows up.

(c) Project effectiveness;
(d) Capacity building;
(e) Empowerment.

While Paul makes the point that particular objectives may not be 'right' or 'wrong' - nor are they necessarily mutually exclusive - the objectives at the 'empowerment' end of the spectrum do tend to promote development in low-income communities more than those at the 'cost sharing' end.

Further detail on capacity building and empowerment are provided by DBSA (1993) and Abrams (1992) respectively: the Development Impact Approach of DBSA for promoting *maximum use of local skills and resources*, and the concept of 'empowerment' of Abrams (1992), who suggested that for development to occur, communities need to 'gain the will to act', *take the initiative and make the decisions themselves*.

If a key to development is that communities should 'gain the will to act' and take responsibility for decision-making and action directed to their own development, then it is essential that a demand responsive rather than supply driven approach be followed in the provision of infrastructure.

World Bank (2002) defines the key characteristics of a demand responsive approach as follows:

1. Community members make informed choices about:
   (a) whether to participate in the project;
   (b) technology and service level options based on willingness to pay (based on the principle that more expensive systems cost more);
   (c) when and how their services are delivered;
   (d) how funds are managed and accounted for; and
   (e) how their services are operated and maintained.
2. Government plays a facilitative role, sets clear national policies and strategies, encourages broad stakeholder consultation and facilitates capacity building and learning;
3. An enabling environment is created for the participation of a wide range of providers of goods, services and technical assistance to communities, including the private sector, and non-government organizations; and
4. An adequate flow of information is provided to the community, and procedures are adopted for facilitating collective action decisions within the community (social intermediation).

The opposite of 'demand responsive' is 'supply-driven'. They form a continuum rather than two discrete states. Notwithstanding that, the key difference relates to where control lies: If the major decisions about level of service etc are retained by the supplier or provider, then it is supply-driven. If the major decisions - and consequent responsibilities - are carried by the user, then it is demand responsive.

From an *infrastructure provision* perspective, three major approaches are identifiable. It must be remembered that these are caricatures. At a time, they are appropriate and sound; held on to for too long, they are distorting and retrogressive. In fact, very often it is the erroneous interpretation of approaches that is damaging.

(a) *'Standards' approach*, characterised by adherence to (typically high) standards on (ostensibly) technical grounds alone.
(b) *'Strategic' approach*, where the emphasis shifts to a consideration of coverage + backlogs

+ financial sustainability, rather than absolute standards alone. While strategic planning is currently undertaken, decision-making within what is financially feasible tends to be retained by technical professionals.

(c) *Demand responsive approach*, which has many similar elements to the strategic approach, but where there is a change in the role of government, particularly planning and technical professionals, who are required to provide an enabling environment or a framework of rules through which demand can be expressed by communities on the ground, demand being demand at a price. It does not necessarily rule out the use of subsidies, but it does suggest changed roles: an enabling role for government and a more active implementing role for communities. The key is the establishment of a framework of clear, non-negotiable, transparent rules. Further suggested detail is given in the recommendations.

Recommendations

Institutions as rules

The following recommendations are made for resolution of the specific issues raised in the conclusions above:

(a) With respect to the apparent difference in approach between housing/planning and water services, it is recommended that mechanisms be explicitly set up to develop a clear and detailed vision for how spatial development, infrastructure development and economic development are going to take place in City of Johannesburg (CoJ) - translated into clear step-by-step strategy. The *Joburg 2030* vision (CoJ, Feb 2002a) does provide such a long term vision, but there does not yet appear to be a sufficiently detailed strategy in the short and medium term for translating this into action.

(b) In conjunction with the development of the more detailed strategy, it is also recommended that CoJ pursue with other spheres of government the implementation (e.g. offer the metro as a pilot site?) of a consolidated Municipal Infrastructure Grant (MIG), where such grant funding may be devolved to local authority level. While this would not in itself resolve any differences that there may be between parties at local authority level, it would at least focus the debate at that level, and reduce interference from other spheres of government.

(c) Irrespective of the legislative procedure followed in the township establishment process, the decision to accept a particular level of service of infrastructure - with all its financial and other consequences - appears to rest with the local authority/service provider alone, with approval formally being given in the *services agreement* between local authority/service provider and the developer. The local authority/service provider is strongly advised to be fully aware of the responsibility that it carries in this regard, and to ensure that it gives appropriate consideration to the long term consequences before entering into any such agreements. (Similar comments would apply in the case of informal settlements, where an agreement may be entered into directly with the community, in the absence of an agreement with a developer).

(d) On the matter of overlapping responsibilities over pollution from sanitation systems, it is recommended that this be resolved through multilateral discussions between the three departments (DWAF, DEAT and DTI and their provincial equivalents).

Further recommendation:

(e) It is recommended that the various Key Performance Indicators (KPI) being used for both organisations and individuals be reviewed to ensure that they promote co-ordinated development in general and conform to appropriate developmental outcomes for sanitation provision to low-income settlements in particular.

Financial sustainability

For the purposes of planning for financial sustainability, it is recommended that the following items be modelled dynamically over an extended period of time - together with demographics and economic development - in order to determine appropriate tariff levels and service provision strategies. This should at the same time form part of the preparation of the Water Services Development Plan (WSDP). What is recommended is a graded effort i.e. to start with a fairly simple study (e.g. review of theoretical understanding, combined with more specific data from previous local investigations) to gain an understanding of the problem, and then follow it with more detailed studies. Many key understandings can be obtained from fairly rudimentary planning. This permits scarce resources to be targeted at specifically identified problem areas as the investigation progresses[3].

(a) Determine *external subsidies* that are available for low-income consumers and ensure that provision is made for these in the tariffs;

(b) Determine the extent to which it is possible to provide an *internal cross-subsidy* of poorer consumers by increasing the tariffs to richer consumers over a period of time;

(c) Because bulk and connector services form such a significant portion of the costs - particularly of the higher levels of service - it is necessary to determine the amount of *spare capacity* that exists in the network, which can be treated as a sunk cost that does not have to be recovered from new consumers. One has to be cautious here to recognise the effect that this may have on future infrastructure requirements - and make appropriate provision for future expansion;

(d) Make provision for rehabilitation (or replacement) of ageing infrastructure;

(e) Assess the impact of rehabilitation on physical losses in the system;

(f) Assess the need for future improvements to the infrastructure or service where environmental standards may be raised (e.g. discharge requirements for wastewater treatment works);

(g) Envisage and plan for upgrading of levels of service (e.g. from basic to intermediate), for how this might happen, and what the cost implications are likely to be.

Whatever method of costing is used, it is recommended that there be a clear and detailed statement of what assumptions have been made in the costing and what the costs represent. For this purpose, the establishment of a 'costing framework' is recommended for use by several local authorities e.g. across the province, which would provide a set of rules or standard method by which costs might be calculated. This would permit a consistent - and auditable - comparison to be made of the costs of any water supply and sanitation option that might be proposed. What is more important, though, is that the local authority should over a period of time assemble a database of such costs for its own decision-making.

Assessment of demand is included under the 'Developmental Approaches' section.

---

[3] Several of these items are already being pursued by JW at present. The full list is nevertheless presented here for completeness.

Environmental sustainability

The following approach is recommended for addressing environmental sustainability of sanitation systems:

(a) In the very short term (say 2 or 3 years; say less than 10 years), adopt a *health* focus (ensure access to adequate sanitation for all in the short term):
  (i) ensure that basic (health-protecting) on-site sanitation is provided to all;
  (ii) ensure that health and hygiene education is provided to all;
  (iii) ensure that contaminants from both excreta and greywater do not surface (and so come into contact with people), but remain in the sub-surface;
  (iv) ensure that a clean water supply is provided;

(b) With respect to *short term environmental impact* (say 3 to 10 or 20 years):
  (i) minimise diffuse pollution by design for - and possible treatment of - greywater;
  (ii) assess (only) the long term impact of on-site sanitation i.e. assess the water resources (groundwater and surface water), estimate impacts and likely long term scenarios, together with long term planning for service provision and for development, using a mass balance/mass flow approach;
  (iii) establish baseline water quality status, and establish an ongoing monitoring system.

(c) With respect to *long term environmental impact* (say longer than 20 years):
  (i) While the aquifers may not be strategic now or in the short term future (say 10 to 20 years?), they may become of strategic importance in the medium to long term future (say 50 to 100 years?). There is therefore a need to develop a sound understanding of longer term behaviour of contaminants and their possible management, which is a combination of physical and social factors.
  (ii) Initiate longer term research and discussion into these matters. In particular, assess very carefully those short term interventions that may have long term impacts.

(d) Where further work is required is as follows:
  (i) water resources assessment of groundwater aquifers and an assessment of when they are likely to be used (from an assessment of demand).
  (ii) what remedial measures (or treatment measures) will need to be put in place to ensure that the water is safe for domestic and stock-watering purposes.
  (iii) clarification of the ownership of the *characteristics* of the groundwater resource i.e. its quality.
  (iv) clarification as to whether local authorities will be legally responsible for cleaning up the aquifer under the 'polluter pays principle' - even if it is given a permit to do so by DWAF (Similar clarification may be required for surface water resources as well).

Developmental approaches

There are a number of *overall components* to a framework through which demand might be addressed, which may be summarised as follows:

(a) *Regulation*: set by the local authority: a framework of non-negotiable rules, through which the provision of services can take place;

(b) *Support*: by the local authority to communities, mobilising those communities, supporting their decision-making and supporting the implementation of services.

(c) *Implementation - and decisions around implementation* - carried by communities

themselves or (which applies to implementation rather than decision-making) delegated by communities to agents appointed by them to carry this out on their behalf.

Within this framework, further detail is as follows:

(a) *Settlement location* within macro spatial planning;
(b) *Layout planning within a settlement* within the township establishment procedures. This generally includes the choice of level of service. It is essential that communities are involved in this decision-making. A review of existing township establishment procedures is essential if a demand responsive approach is to be pursued.
(c) Rules about what *bulk infrastructure* can be provided, what the lead times are for provision and the cost implications thereof;
(d) *Opportunities for labour-intensive construction + development of small contractors*;
(e) *Training grant* to promote the development and use of local skills and resources;
(f) *Tariff structure* and statement of *subsidies*;
(g) Rules surrounding *cut-offs*;
(h) Crucially, it is recommended that the service provider takes formal steps to assess customer demand for services, which may include the use of tools such as Contingent Valuation studies.

In *summary*, such a framework does the following:

(a) It clarifies the roles and responsibilities of the various players (water service authority, water service provider and community in the first instance; but also assists in clarifying the role of other spheres of government in the second instance)
(b) It clarifies the 'rules' under which the community can get sanitation.
(c) It clarifies the decisions that the community must make.
(d) It steers the community towards a contract between water service provider and community.

The establishment of a framework of rules through which demand can be expressed needs to be undertaken by means of pilot-and-programme approach, combined with significant investigation or research. Johannesburg is in the process of following such a pilot-and-programme approach.

References

Abrams, L.J. (1990) *Community Organisation, Rural Empowerment & Engineering,* Rural Advice Centre, March.

Abrams, L J (1992) Redefining rural development and the emerging role of new development organisations, *SAICE Congress*?.

Biermann, S M and Landre, M (2002) (forthcoming): The utilisation of engineering services bulk infrastructure components in integrated development planning, *Development Southern Africa*, 19, 2.

CoJ (City of Johannesburg) (2002a) *Joburg 2030*, Corporate Planning Unit, February.

CoJ (City of Johannesburg) (2002d) *Integrated Development Plan 2002/2003*, ǂhttp://www.goafrica.co.za/joburg/city_vision/idp.stm,

DBSA (1993) *Socio-economic Enhancement of Development Projects*, Construction and Development Series, Number 1, February, DBSA.

DBSA (1998) *Infrastructure: A Foundation for Development*, DBSA.

DDPLG (Department of Development Planning and Local Government, Gauteng) (2001)

Business Plan for the Elimination of the Backlog in Water and Sanitation Services in the Gauteng Province, Final Business Plan: 30 November 2001, prepared for Chief Directorate: Development Planning, Directorate: Planning Support Services, Subdirectorate: Engineering Services, November.

Department of Housing, Gauteng (2002) Housing subsidy details, §http://www.gpghousing.org.za/Subsidies.htm,

DWAF (1997) *A Protocol to Manage the Potential of Groundwater Contamination from On Site Sanitation,* National Sanitation Co-ordination Office and DWAF Directorate of Geohydrology, 1st Edition.

DWAF (2000a) *Water Use Authorisation process (individual applications),* Chief Directorate: Water Use and Conservation, Directorate: Water Quality Management, 1st Edition, Revision 3, December, ŧhttp://www.dwaf.gov.za/Dir_WQM/docsFrame.htm, see 'Policies, Procedures, Guidelines and Strategies' for document listing.

For actual licence application forms under the National Water Act of 1998, see ŧhttp://www.dwaf.gov.za/Projects/WARMS/Forms/Eng/L000218/lic.html,; for the specific form 'Licencing Part 2G' for on-site sanitation, see ...../L000218/DW779L2g(1).pdf,

DWAF (2001) *White Paper on Basic Household Sanitation*, prepared by the NSTT, September.

GJMC (Greater Johannesburg Metropolitan Council) (2000a?) *An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council*.

GJMC (Greater Johannesburg Metropolitan Council) (2000b?) *iGoli 2002 Report*, see ŧhttp://www.igoli.co.za/, for updated 2002 and 2010 versions.

Hartley, Wyndham (2002) *Article:* Local councils owed R22.2bn in service fees, *Business Day*, 7 May, p.1.

May, P J and Stark, N (1992) Design professions and earthquake policy*, The Professional Journal of the Earthquake Engineering Research Institute*, Theme Issue: Public Policy, Vol.8, No.1, February, pp.115-132.

Palmer Development Group in association with University of Cape Town Water Research Group (1993), Cost comparison of sanitation systems, In: Palmer Development Group in association with University of Cape Town Water Research Group (eds.) *Technical, Socio-Economic and Environmental Evaluation of Sanitation for Developing Urban Areas in South Africa*, Working Paper B6 of Water Research Commission Report No. 385/1/93, May.

Palmer Development Group (1994) *Costing of water supply systems*, working paper prepared for the Water Research Commission as part of a project titled Evaluation of Water Supply to Developing Urban Communities, May (draft).

Palmer Development Group (1998a) *Report on the Financial Modelling of Water Supply and Sanitation Services in the Southern Metropolitan Local Council*, June (quoted by Tomlinson)

Palmer Development Group (1998b) *Management Guidelines for Water Service Institutions (Urban)*, WRC Report No. TT98/98, January.

Paul, S (1987) *Community Participation in Development Projects: the World Bank Experience*, World Bank Discussion Papers No.6, The World Bank.

Pegram, G, Hartley, S, Coulsen, N, Wall, K and Otterman, A (2000) *A Protocol to Support Peri-Urban Sanitation Provision in the GJMC*, prepared for the Greater Johannesburg Metropolitan Council (GJMC), and funded by the Eastern Metro Local Council (EMLC) and the British Department for International Development Southern Africa (DfIDSA) through the National Sanitation Coordination Office (NaSCO), February.

Van Ryneveld, M.B. (1995) Costs and affordability of water supply and sanitation provision in

the urban areas of South Africa, *Water SA*, Vol.21, No.1, January, pp.1-14.
Van Ryneveld M B (2000) Life cycle costing of water supply and sanitation services in Gauteng: an update, *Water Services Forum*, Rand Water Head Office, Glenvista, Johannesburg, 19 July, 7 pp.
World Bank (1999) Introduction: New directions in development thinking, In: *World Development Report 1999/2000: Entering the 21st Century*, +http://www.worldbank.org/wdr/2000/pdfs/intro.pdf,, further details of the report available online at +http://www.worldbank.org/wdr/2000/fullreport.html,, alternative source +http://www.worldbank.org/html/extpb/digitalibrary.htm,, pp.13-30.
World Bank Water Supply and Sanitation (2002) *Key characteristics of demand responsive approach (DRA)* +http://www.worldbank.org/watsan/rural_dra.html,
Water Services Forum News (2000) *Article:* No easy answer to addressing non-payment, Issue No.3, September.

PREFACE

This report has of necessity been selective in what it has covered and what it has excluded in a field as broad and complex as provision of sanitation to low-income settlements. It has attempted to do two things: (a) to provide a fairly broad overview of the field, although falling short of being comprehensive; (b) to focus on what are considered to be the two mandatory topics for a local authority, namely financial and environmental sustainability. The result has been (a) a sacrifice of depth (and, in places, detailed evidence) for maintaining an argument over some breadth; and (b) the exclusion of certain crucially important topics (health and hygiene promotion, to mention one) in favour of those included. In doing this, the report does provide the broad outline of an approach that may be followed in the provision of sanitation to low-income settlements - at least in a number of critical areas - and within which more detailed procedures may be pursued.

This project has not attempted to address the matter of *informal settlements*, other than in the more general manner described above. The topic is currently being addressed by a separate project being undertaken by Afrosearch for Department of Water Affairs and Forestry on behalf of the National Sanitation Task Team, and will be aligned with the national sanitation strategy.

Notwithstanding these shortcomings, this report remains a contribution to the ongoing discussion on the topic.

Neither the *Sanitation Protocol* nor the *Sanitation Policy* prepared by Pegram et al. (GJMC, 2000a; Pegram et al., Feb 2000) was formally accepted by GJMC. Furthermore, while the initial intention of this research project had been to test the Protocol in a number of case studies in Johannesburg, this did not in fact take place as Johannesburg Water preferred to develop their own procedures independently of this research project. The Protocol has therefore not to date been implemented in practice in Johannesburg. It remains nevertheless a valuable contribution to the ongoing development of procedures for the provision of sanitation to low-income settlements in Johannesburg - and beyond - and has therefore been included as an appendix to this report, with the permission of DFIDSA and JW (as successor to GJMC on the Johannesburg Sanitation Protocol Project). The Protocol remains in the form in which it was completed in February 2000, under the authorship of Guy Pegram et al. An addendum to the Protocol (Addendum: Description of Sanitation Options) was never fully ratified by the Steering Committee of the earlier project (Crowder, J, Nov 2002 - personal communication), and has therefore been omitted from this report. A new Sanitation Policy for the City of Johannesburg was approved by the Mayoral Committee at the end of November 2002 (i.e. at a very late stage in this research project). It has also therefore been included as an appendix to the report, although it has been too late to refer to it in the body of the text.

ACKNOWLEDGEMENTS

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

"Johannesburg Sanitation Protocol: Pilot application of Johannesburg sanitation protocol and development of a generic South African urban sanitation protocol"

The Steering Committee responsible for this project consisted of the following persons:

Mr J Bhagwan	Water Research Commission (Chairperson)
Ms J Burke	City of Johannesburg: Environmental Quality Management (Secretary)
Ms J Crowder	Department of Water Affairs and Forestry/DfID
Ms V Roos	Johannesburg Water (Pty)Ltd
Mr P Viljoen	Johannesburg Water (Pty)Ltd
Mr J Guittet	Johannesburg Water (Pty)Ltd
Ms M Kuaho	City of Johannesburg Housing
Ms P Lakaje	City of Johannesburg Housing
Mr T Yenana	City of Johannesburg Development Planning
Mr D Jones	City of Johannesburg: Environmental Health
Mr D Gadd	Rand Water
Mr J Cattenach	Gauteng Province: Development Planning and Local Government
Mr T Myburgh	Gauteng Province: Department of Housing
Ms P Mabaso	Gauteng Province: Department of Health
Mr R Holden	Mvula Trust
Ms P Mei	Mvula Trust

The following members also attended the Steering Committee at earlier stages:

Mr AW Still	Johannesburg Water (Pty) Ltd
Ms P Guiffant	Johannesburg Water (Pty)Ltd
Mr R Dowie	Johannesburg Water (Pty) Ltd

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

In addition, both funding and permission to include as an appendix to this report 'A Protocol to Support Peri-urban Sanitation Provision in the GJMC' by Pegram et al. (2000), funded by the Eastern Metropolitan Local Council (now succeeded by Johannesburg Water Pty Ltd as promoter of the 'Johannesburg Sanitation Protocol' initiative) and Department for International Development (DfID), are gratefully acknowledged. Permission from City of Johannesburg to include as an appendix to the report the new 'Sanitation Policy for the City of Johannesburg (Nov 2002) is also gratefully acknowledged.

This project has made use of data from a range of individuals and institutions, for which the author would like to express his sincere thanks.

The author would also like to acknowledge the contribution of Phakamile Nqumshe, during a period of vacation work, to the background investigation on costing of sanitation, as well as his comment on the Sanitation Protocol.

TABLE OF CONTENTS

Pegram, G, Hartley, S, Coulsen, N, Wall, K and Otterman, A (2000) *A Protocol to Support Peri-Urban Sanitation Provision in the GJMC*, prepared for the Greater Johannesburg Metropolitan Council (GJMC), and funded by the Eastern Metro Local Council (EMLC) and the British Department for International Development Southern Africa (DfIDSA) through the National Sanitation Coordination Office (NaSCO), February.

City of Johannesburg (CoJ) (2002) *Sanitation Policy for the City of Johannesburg*, drafted by Jacky Burke, Environmental Planning and Management: CoJ, and approved by the Mayoral Committee on 28 Nov 2002.

LIST OF FIGURES

Figure **Page**

LIST OF TABLES

Table **Page**

LIST OF ABBREVIATIONS

AP	Aqua-privy
CAPEX	Capital expenditure
CMIP	Consolidated Municipal Infrastructure Programme
CoJ	City of Johannesburg Metropolitan Municipality
CoJ 2030	City of Johannesburg 2030 Vision Report
CP	Community Participation
DBSA	Development Bank of Southern Africa
DDPLG	Department of Development Planning and Local Government (Gauteng Province)
DEAT	Department of Environmental Affairs and Tourism
DFID	Department for International Development
DIA	Development Impact Approach
DTI	Department of Trade and Industry
DWAF	Department of Water Affairs and Forestry
E&TI	Engineering and Technical Information [library, City of Johannesburg]
FBS	Free Basic Sanitation
FBW	Free Basic Water
GJMC	Greater Johannesburg Metropolitan Council
HC	House connection
HR	Human Resources
IDP	Integrated Development Plan
JOWAM	Johannesburg Water Management Company
JW	Johannesburg Water (Pty) Ltd
KPI	Key Performance Indicator
LOS	Level of Service
MEC	Member of the Executive Committee
MIG	Municipal Infrastructure Grant
MLC	Metropolitan Local Council
NSTT	National Sanitation Task Team
O&M	Operation and Maintenance
OPEX	Operating expenditure
RQO	Resource Quality Objectives
RWQO	Resource Water Quality Objectives
SP	Stand-pipe
TACH	Total Annualised Cost per Household
UFW	Unaccounted for Water
VIP	Ventilated Improved Pit latrine
WB	Water-borne sanitation
WRC	Water Research Commission
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSP	Water Services Provider
YT	Yard tap

1 INTRODUCTION

1.1 Motivation

In the urban and peri-urban areas in South Africa, many people are without basic services of water supply and sanitation - particularly of sanitation. Within the urban context there is a perception by many that the only acceptable means of dealing with human excreta is *water-borne sanitation*. Within the City of Johannesburg (CoJ) this perception has been reinforced by the minimum level of service (LOS) adopted by CoJ of water-borne sanitation. However, in spite of this minimum LOS, many settlements remain without *any* adequate sanitation due to financial and capacity constraints. Furthermore, the interim provision of chemical toilets is proving very costly. There is therefore a need for policy, strategy and detailed procedures for the provision of sanitation to low-income settlements.

A Sanitation Policy and detailed procedures in the form of a Sanitation Protocol for the provision of sanitation to low-income settlements were developed for Greater Johannesburg Metropolitan Council (GJMC - now CoJ) under an earlier research project (GJMC, 2000a; Pegram et al., 2000) by Pula Strategic Resource Management (Pty) Ltd, with funding from the Eastern Metropolitan Local Council (EMLC) and the British Department for International Development Southern Africa (DFIDSA). The project was completed in early 2000, but due to political factors within GJMC during local government elections in December 2000, the process of establishing the Sanitation Policy and Protocol was temporarily suspended, and the Policy and Protocol were never formally accepted by GJMC.

Subsequent to these events, the institutional environment has changed very substantially, and a very different institutional arrangement is now in place from that which was in place when the two documents were written, namely:

(a) the ring-fencing of water and sanitation services within the local authority; and
(b) the establishment of Johannesburg Water (Pty) Ltd.

In addition, various other policy initiatives have advanced, notably the publication of the White Paper on Basic Household Sanitation (DWAF, Sept 2001) as well as the tabling of a new draft Sanitation Policy for Johannesburg (CoJ, April 2002b). There has also been interest expressed by *other local authorities* such as Durban and East London, and therefore a need for the development of a *generic* protocol for wider application in the urban and peri-urban areas of South Africa.

1.2 Aim of project and research products

The aim of this research project has been to *review* the Sanitation Policy and Protocol for appropriateness for use in CoJ as well as for more generic use in the urban and peri-urban areas of South Africa, in the light of developments in the intervening period since they were developed. The review has in fact been extended to take in a range of other policy and protocol documents that have been developed in this period. The intention is that this review should provide a basis for discussion of Johannesburg's policy, strategy and detailed procedures, as well as those of other local authorities.

The *research products* are '...a report or reports on the application of the protocol for specific application to Johannesburg and for general application in urban and peri-urban areas in South Africa and shall also address matters of strategy and policy.'

1.3 Time frame for the project

The research contract between Water Research Commission and Johannesburg Water (on behalf of Greater Johannesburg Metropolitan Council (GJMC), now City of Johannesburg (CoJ)) extended over a period of 1 year and 4 months from 1 March 2001 to 30 June 2002. Work by Mark van Ryneveld under the sub-contract with Johannesburg Water (JW) commenced in April 2001, with the final report being submitted to WRC in December 2002.

1.4 Project staff

Mark van Ryneveld, sub-contracted by Johannesburg Water has acted as the primary researcher on the project, with Paul Viljoen of the Low Income Settlements section of Johannesburg Water as Project Leader, and Valitha Roos as overall supervisor.

1.5 Brief outline of the report

The report introduces the topic of policy and detailed procedure with a more general discussion of institutions, considered to consist not of 'organisations' as much as 'rules' or 'ways of doing things'. The report goes on to discuss policy, strategy and procedures in general terms, explaining the differences between them, and follows with a brief review of the various policy and procedure documents currently being used or under consideration.

From this investigation, there appear to be two specific 'rules' with which a local authority is compelled to comply:
(a) The local authority as a whole must remain *financially sustainable*;
(b) The local authority must comply with applicable *environmental* legislation.
Each of these two topics is then addressed in turn.

While compliance with these two matters appears mandatory, there are a number of other matters that constitute good practice in the provision of sanitation to low-income communities - loosely termed *developmental approaches* - that also require consideration. These are then reviewed in the subsequent chapter, followed by conclusions and recommendations.

2 'INSTITUTIONS' AS 'RULES'

2.1 Institutions

In reviewing the Sanitation Policy and Protocol of CoJ, it is first necessary to place these documents within a broader framework, which is best described by the term 'institutions' or 'institutional' framework. The term is used on this project with a very specific meaning: that 'institutions' are viewed as 'rules' or 'ways of doing things' rather than 'organisations', following the notion of institutions introduced in the new institutional economics (World Bank, 1999: p.22, 23):

> The term *Institutions*, as it is used here, refers to sets of formal and informal rules governing the actions of individuals and organisations and the interactions of participants in the development process.
>
> Rules can be formal, taking the shape of constitutions, laws, regulations and contracts. Or they can be informal, like values and social norms.

The Sanitation Policy and Protocol therefore form part of a range or suite of institutions for the provision of sanitation. This project has sought to locate these two elements within that broader range of institutions for promoting the successful provision of sanitation to low-income settlements.

In the course of this project, the term 'protocol' was used with two slightly different meanings: the first was 'the interaction of participants within the state bureaucracy' which is in fact a key element of 'institutions' as used above; the second is 'a set of detailed procedures', as used in the Sanitation Protocol. In order to avoid this potential confusion, the term 'institutions' has been used for the first meaning, the term 'detailed procedures' for the second meaning, and the term 'protocol' reserved for the 'Sanitation Protocol' *document*.

2.2 General discussion of policy, strategy and detailed procedure

What are policy, strategy and detailed procedure?
Policy, strategy and detailed procedure form a continuum in which the different elements are difficult to separate out. Part of the reason for this is that while overall policy is usually set by government at a *national* level covering approaches to be followed by all across the nation, policy, strategy and detailed procedure can in fact be set in *all* spheres of government and all departments (although limited to their domain of responsibility). The ability of government to operate well depends - amongst other things - on its ability to set clear rules and to set up an enabling environment for activities lower down in the hierarchy. While the intention is that these various policies, strategies and procedures should form a hierarchy of nested decision frameworks in distinct fields, this is not always the case.

While accepting that policy, strategy and detailed procedure form a continuum in which the different elements are difficult to separate out, it is nevertheless desirable to identify a progression from policy to strategy to detailed procedure. The following is suggested:

1. *Policy* implies general principle, not easily departed from, and therefore stable and not

easily subject to change.

2. *Strategy*, set within the framework of the policy, implies a plan of action necessitating a choice of timing, location, method and resources, in other words, 'what, when, where, how and with what resources'. It may be revised more regularly than policy (say annually, but with a horison of 5 or 10 years or even longer).
3. *Detailed procedure*, set within the framework of both policy and strategy, implies detailed steps and techniques, which may be even more flexible than either policy or strategy.

At different levels of detail, all three elements are required to:

1. systematise and make accessible the written and previously unwritten rules and procedures of service provision;
2. ensure consistency; and
3. provide a reasoned and auditable record to support decisions made and priorities chosen.

What is the significance of policy?

The heart of policy generally lies in the policy principles. The policy principles set out both how sanitation *will* be provided, and by implication how sanitation will *not* be provided; what *will* be done, but also what will *not* be done. The second aspect about policy principles is that they are often a statement of a goal that one strives towards rather than something that one attains. A third aspect of policy principles is that some of them may be inherently in tension. It is therefore not possible to satisfy all principles simultaneously and in full. This implies priorities and trade-offs that are not resolved in the policy itself.

Why does one need strategy?

The place where the tensions of policy are resolved is in strategy, where priorities are set and trade-offs made within specified time frames. As the situation changes, so the priorities and trade-offs - and therefore the strategy - change. The Water Services Development Plan (WSDP) (as required by the Water Services Act of 1997) is intended to be the primary strategic planning tool for the resolution of these matters.

Why does one need detailed procedure?

There would appear to be at least two key reasons for the introduction of detailed procedure:

1. to *establish a methodology* for the provision of sanitation to low-income settlements;
2. to *support and equip personnel* responsible for provision of sanitation to low-income settlements.

What is unclear is to what extent these procedures should have to be systematised - and converted into a formal handbook (such as the Sanitation Protocol document) - and what should be the expectation of the prior formal education and/or professional registration process of personnel.

2.3 Existing examples of policy, strategy and detailed procedure and brief review

What examples of policy, strategy and detailed procedure are available for the provision of sanitation to low-income settlements?

There have been several developments, many of them subsequent to the start of this study (April 2001), that are pertinent to the topic. Particular policy, strategy and detailed procedure documents include:

1. *An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council* (GJMC, 2000a); and associated *Sanitation Protocol* document (Pegram et al., end of project: Feb 2000);
2. *White Paper on Basic Household Sanitation* (DWAF, Sept 2001);
3. *Ethekwini Sanitation Protocol* (2002?);
4. *Sanitation Policy for the City of Johannesburg* (CoJ, draft 2: Apr 2002b);
5. *Procedures being piloted by Johannesburg Water under their low-income settlements programme (current).*

These are addressed in chronological order as follows:

An Evolving Sanitation Policy Framework for GJMC (GJMC, 2000a) and associated *Sanitation Protocol* document (Pegram et al., Feb 2000):
Both the earlier Johannesburg Sanitation Policy and Protocol documents were developed in an extremely difficult political environment. The prevailing policy at the time contradicted several of the principles in the current White Paper on Basic Household Sanitation. The Policy and Protocol documents were an attempt to establish procedures *on the ground* within a contrary policy environment. The difficulties of pursuing such an approach are extreme, as it entails working contrary to the rules of the bureaucracy. Neither Policy nor Protocol could therefore appeal to supportive national policies and legislation as the more recent policy document has done.

The earlier Johannesburg policy attempted to link settlement characteristics to levels of service. While a very reasonable approach, and providing a rational basis for decision-making, it was, however, weak on eliciting an expression of demand from the community, and did not establish a strong framework through which demand might be expressed. (This topic is expanded upon in Chapter 5).

The key principles of the earlier Johannesburg Sanitation Protocol appear to be as follows:
1. to guide a choice of level of service for sanitation, based on:
   (a) capacity of the community and the local authority;
   (b) financial viability;
   (c) environmental protection.
2. rapid appraisal, together with the community, using the mechanism of a joint team.

The earlier Johannesburg Sanitation Protocol document was strong on advocacy, although in similar but slightly different ways to the Policy document also did not pursue the establishment of a strong framework through which demand might be expressed. Once such a framework has been established, the Protocol may well provide a suitable basis for further detailed procedures.

There also appear to be some very high level decisions in the current protocol that may be inappropriate for the current target personnel to make, or which are difficult to systematise adequately. Two possible responses to this can be suggested:
1. assign the whole task to a more highly qualified person;
2. simplify the decision-making.

A combination of the two may be advisable:
1. classify the tasks;
2. simplify the procedures (differentiate between background/support documentation and primary instructions; and pursue detailed background supporting work);

3. assign tasks to the appropriate level;
4. provide mechanism/channels for back-up/support;
5. ensure that personnel are appropriately equipped to function at the level expected.

White Paper on Basic Household Sanitation (DWAF, Sept 2001)
In brief, the policy principles of the White Paper on Basic Household Sanitation are sound, and conform to generally accepted good practice. They are listed as follows:

1. Sanitation improvement must be demand responsive, supported by an intensive Health and Hygiene Programme;
2. Community Participation;
3. Integrated planning and development;
4. Sanitation is about environment and health;
5. Basic Sanitation is a human right;
6. The provision of access to sanitation services is a local government responsibility;
7. "Health for All" rather than "all for some";
8. Equitable regional allocation of development resources;
9. Water has an economic value;
10. Polluter pays principle;
11. Sanitation services must be financially sustainable;
12. Environmental integrity.

The policy principles are the core of the policy document. It needs to be recognised that most if not all of the principles are matters of degree. No-one in their right mind would admit, for example, to *not* supporting community participation, integrated development, financial sustainability or environmental integrity! The principles are of such a nature that everyone can claim to support them regardless of their actions. A more detailed explanation of exactly what these principles mean - and don't mean - and how they are to be translated into practice would be useful, although beyond the scope of this particular project.

Ethekwini Protocol (2002?)
The Ethekwini Protocol appears to have resolved many of the conflicts between different parties by setting out a flow chart of decisions and responsibilities. This provides a framework within which more detailed procedures can be pursued.

Sanitation Policy for the City of Johannesburg (CoJ, draft 2: Apr 2002b)
The most recent (draft) sanitation policy for Johannesburg follows the form of the national policy. This simplifies matters considerably, promotes coincidence between national and local policy initiatives, and provides a sound way forward.

Procedures being piloted by JW under their low-income settlements programme (current)
The current case studies in Johannesburg have sought to gain an understanding of technical requirements and community dynamics as a first step. While sensibly following a pilot-and-programme approach and gaining essential experience in low-income settlements in Johannesburg, this initiative does need to be aware of three possible dangers:

1. The lack of development at the pilot stage of a *clear framework through which demand can be expressed* carries the risk of not being able to mobilise community capacity, and

of not being able to reverse the matter of non-payment.

2. *Moving too quickly from pilot to full scale implementation programme* under pressure to deliver carries the risk of being unable to develop designs and procedures adequately, and runs the risk of rejection of particular levels of service by communities before JW has had the chance to get the systems right.
3. A third possible danger is a longer term one rather than a short term one; and it may be argued to be outside the mandate of the water utility. Irrespective of whether it falls within the mandate of the utility or not, the consequences will impact profoundly on the utility: Unless *development takes place* in the low-income communities of Johannesburg, it is likely to prove extremely difficult to resolve the problems of non-payment and inability to pay currently being experienced - and prove difficult to turn consumers into customers. From the service provider side, this requires careful collaboration and planning together with other parties within the framework of the Integrated Development Plans (IDPs).

Pilot studies currently underway by JW include (amongst others):

1. Stretford x4 (intermediate LOS);
2. Kapok (VIPs);
3. Thulamntwana (although not a specific pilot study as present, it has a long history of involvement by Johannesburg)

2.4 More detailed analysis of institutions for the provision of sanitation to low-income communities

Policy, strategy and procedures are all intended to form a suite of institutions that provides the means for the successful provision of sanitation to low-income communities. To be of use, they must direct practice. At this point, therefore, it is necessary to leave aside the various documents and to look instead at the actual decisions being made and procedures followed.

In order to determine the procedures that are currently followed in the provision of sanitation to low-income settlements, it is necessary to ask the following questions:

1. *What decisions* are to be made (and in what *sequence*) in the establishment of a township and in delivery of services (whether temporary or permanent). What *funding/subsidies* can be obtained and how? What permits are necessary, for what, and how are they obtained?
2. *Who carries responsibility* for these decisions? Where there are overlapping responsibilities, what is the *hierarchy* of decision-making? (i.e. who takes priority over whom and in what circumstances).
3. *On what legislation, regulations or other authority* does their responsibility rest? If it rests on *interpretation* of this legislation or regulations etc, who has given the interpretation? Is there conflicting legislation?
4. What policy *principles* will guide these decisions? Where are they obtainable?
5. Who are the key *people* responsible for these decisions and what are their contact details?
6. What *procedures* (including forms, details of submission etc) are to be followed in obtaining a ruling or decision, and what are the procedures for appeal?
7. What *committees or initiatives* are responsible for what matters?

A listing of items that make up 'institutions' includes:

1. Legislation;
2. Policies and White papers (e.g. White Paper on Basic Household Sanitation (DWAF, Sept 2001));
3. Subsidy rules;
4. Committees and initiatives (e.g. DDPLG Backlog Study, (DDPLG, Nov 2001));
5. Explanatory documents (e.g. various simplified DWAF guides);
6. Strategic planning tools (e.g. WSDPs or Water and Sewer Masterplans);
7. Individual officials, their departments and organisational relationships;
8. Values and attitudes (e.g. culture of learning, or culture of service).

Unremarkably, but nevertheless very significantly, it appears that the procedures that are being followed in most - but not all - instances are following legislation and associated regulations at national, provincial and local level, together with contracts entered into by government with private parties (e.g. between local authority and service provider). Some of the pertinent legislation is listed in the tables below, in two different ways:

1. Grouped in columns by lead departments;
2. Listed in a single column and allocated to departments in several columns.

Neither list is exhaustive of either the legislation or of departments; but is indicative, nevertheless, of the considerable complexity involved.

TABLE 2.1:
MATRIX OF LEGISLATION BY DEPARTMENT/DISCIPLINE AND SPHERE OF GOVERNMENT (Legislation listed by department/discipline)

	DWAF/water and sanitation	Housing	DCD/DPLG i.e. local govt	DEAT/DACEL i.e. environment
National	Legislation: ●Water Services Act (Act 108 of 1997) ●National Water Act (Act 36 of 1998)	Legislation: ●Housing Act (Act 107 of 1997)	Legislation: ●Municipal Structures Act (Act 117 of 1998) ●Municipal Systems Act (Act 32 of 2000) ●Municipal Structures Amendment Act (Act 33 of 2000)	Legislation: ●National Environmental Management Act (Act 107 of 1998)
Provincial				
Local				●Johannesburg Municipality Water Pollution Control Bylaws, AN1659 of 17 Jun 1992 ●Standard Water Supply Bylaws AN21of 5 Jan 1977 ●Johannesburg Refuse & Solid Waste Bylaws, AN249 of 29 Mar 1961 ●Sanitation Bylaws, AN195 of 10 Mar 1965 (sewerage) Others: ●Public Health Bylaws

TABLE 2.2:
MATRIX OF LEGISLATION BY DEPARTMENT/DISCIPLINE AND SPHERE OF GOVERNMENT (Legislation listed in a single column)

	water and sanitation	*housing*	*local govt*	*planning + land affairs*	*environ*	*health*	*finance*
National:							
Health Act (Act 63 of 1977)						●	
Environment Conservation Act (Act 73 of 1989)					●		
National Building Regulations and Building Standards Act (Act 103 of 1977) *Regulations:* Government Gazette: Regulation Gazette No.3805, 1 Mar 1985; Government Gazette Vol.237, No.9613, 1 Mar 1985) *[Q: Is this the most recent? What about Standards Act 30 of 1982?]*		(In fact, Trade and Industry)					
Less Formal Townships Establishment Act, 1991				●?			
Development Facilitation Act (Act 67 of 1995)			●				
Constitution of the Republic of South Africa (Act 108 of 1996)	●	●	●	●	●	●	●
Housing Act (Act 107 of 1997)		●					
Water Services Act (Act 108 of 1997)	●						
National Water Act (Act 36 of 1998) *Implementation:* 1 Oct 1998, 1 Oct 1999 *Regulations:* (a) Regulations on use of water for mining and related activities aimed at the protection of water resources (GN704, GG20119 of 4 Jun 1999) (b) Establishment of the Water Management Areas and their Boundaries as a Component of the National Water Resource Strategy in terms of Section 5(1) of the National Water Act 36 of 1998 (GN1160, GG20491 of 1 Oct 1999) (c) General authorisations in terms of Section 39 of the National Water Act 36 of 1998 (GN1191, GG20526 of 8 Oct 1999) (d) Regulations requiring that a water use be registered (GNR1352, GG20606 of 12 Nov 1999)	●						
National Environmental Management Act (Act 107 of 1998)					●		
Local Government: Municipal Structures Act (Act 117 of 1998)			●				
National Water Amendment Act (Act 45 of 1999)	●						
Promotion of Administrative Justice Act (Act 3 of 2000)							
Local Government: Municipal Systems Act (Act 32 of 2000)			●				
Local Government: Municipal Structures Amendment Act (Act 33 of 2000)			●				

	water and sanitation	*housing*	*local govt*	*planning + land affairs*	*environ*	*health*	*finance*
Division of Revenue Act (Act 5 of 2002) (enacted annually)							●
Provincial:							
Town Planning and Townships Ordinance (15 of 1986) - *to be repealed with the commencement of the Development and Planning Act*				●?			
Gauteng Land Administration Act (Act 11 of 1996)			●				
Gauteng Development and Planning Bill			●				
Local:							
Sanitation Bylaws, AN195 of 10 Mar 1965 (sewerage)	●				●	●	
Standard Water Supply Bylaws AN21of 5 Jan 1977	●						
Johannesburg Municipality Water Pollution Control Bylaws, AN1659 of 17 Jun 1992					●		

Other legislation includes:

1. Provision of Certain Land for Settlement Act, 1993;
2. Extension of Tenure and Security Act, 1997;
3. Communal Property Association Act, 1996;
4. Interim Protection of Land Rights Act, 1996;
5. Land Reform (Labour Tenants) Act, 1996;
6. Upgrading of Land Tenure Rights Act, 1991 (amended in 1996);
7. Protection of Illegal Evictions from, and Unlawful Occupation of Land Act, 1998;
8. Physical Planning Act 125 of 1991;
9. Physical Planning Act 88 of 1967;
10. Land Survey Act 9 of 1927;
11. Lake Areas Development Act 39 of 1975;
12. Hazardous Substances Act 15 of 1973.

Other departments, not included in the above table, but which specifically form part of the National Sanitation Task Team (NSTT; see later in this chapter), include:

1. Education;
2. Public Works.

How are policy, strategy and detailed procedure enforced?

While legislation is the primary tool for the enforcement certainly of policy, it needs to be understood that while the legislation will generally seek to prevent what is clearly unacceptable, it will not necessarily enforce good practice. Often, key objectives of a policy may not be explicitly legislated. This does not mean that they are not critically important. Their importance is simply assumed, and their implementation is left to the discretion of the other spheres of government. The corollary of this is that while it is necessary to act within the letter of the law, it is often insufficient to do so. A question that has been frequently asked is whether national policy - as set out in say the White Paper on Basic Household Sanitation (DWAF, Sept 2001) - is mandatory. The answer is that some of it is, but several of the key areas are not. National government will obviously encourage and provide support for activities in line with the national

policy; but apart from that, it is in fact a statement of good practice, which would be unwise simply to disregard.

Unless particular policies and desired approaches are specifically translated into legislation, regulations or contracts, they remain in effect discretionary. Nevertheless, it appears that while existing legislation and procedures do not *enforce* the principles of the White Paper on Basic Household Sanitation in a number of key respects (for example), neither do they *prevent* the principles from being pursued. In other words, if such principles are *not* being followed in practice, there are reasons *other* than legislation that are driving this action.

It needs to be understood that what legislation and regulations primarily do is to *allocate powers and functions*, but not necessarily to spell out in detail all actions that must be taken. The legislation allows the discretion of the incumbent in making decisions in the absence of an explicit ruling. Allocation of powers and functions or responsibility derives from:

1. Constitution;
2. Acts of Parliament, and associated Regulations;
3. Provincial Legislation;
4. Bylaws or local government legislation.

In a number of instances, the legislation does in fact set out a number of *guiding principles*. A good example of this is the Development Facilitation Act (Act 67 of 1995), which provides general principles for land development. Section 3.(1)(c) and (h) provides a useful indication:

> (c) Policy, administrative practices and laws should promote *efficient and integrated land development* in that they *[italics - and comment - added]-*
>
> 1. Promote the *integration* of the social, economic, institutional and physical aspects of land development;
> 2. promote *integrated land development* in rural and urban areas in support of each other;
> 3. *optimise the use of existing resources* including such resources relating to agriculture, land minerals, bulk infrastructure, roads, transportation and social facilities; *[i.e. least cost + max benefit of resources?]*
> 4. *promote diverse combination of land uses*, also at the level of individual erven or subdivisions of land; *[e.g. business added to residential, particularly in previous township areas?]*
> 5. *discourage the phenomenon of "urban sprawl"* in urban areas and contribute to the development of more compact towns and cities;
> 6. contribute to the *correction of the historically distorted spatial patterns of settlement* in the Republic and to the *optimum use of existing infrastructure in excess of current needs*; *[i.e. spare capacity]* and
> 7. encourage environmentally sustainable land development practices and processes
>
> (h) Policy, administrative practices and laws should promote *sustainable land development at the required scale* in that they should *[italics added]-*
>
> 1. promote land development which is within the *fiscal, institutional and administrative means* of the Republic;
> 2. promote the establishment of *viable communities*;
> 3. promote sustained *protection of the environment*;
> 4. meet the *basic needs* of all citizens in an *affordable* way; and
> 5. ensure the *safe utilisation* of land by taking into consideration factors such as geological formations and hazardous undermined areas.

The Constitution has set out the roles and responsibilities of different spheres of government More specifically, the Constitution has placed on local government the responsibility for ensuring that basic services are provided to its inhabitants. Beyond that, local authorities are free to make their own plans using the vehicle of their Integrated Development Plans (IDPs) and Water Services Development Plans (WSDPs) (for water). The Constitution and water-related legislation allows fairly wide bounds within which decisions may be taken.

Particular governance problems of a general nature that can be identified are as follows:

1. *'Silo' approach to government*

   One of the difficulties is that sanitation straddles several government departments. The eight national departments comprising the National Sanitation Task Team (NSTT) include:

   (a) Water Affairs and Forestry;
   (b) Education;
   (c) Environmental Affairs and Tourism;
   (d) Health;
   (e) Provincial and Local Government;
   (f) Housing;
   (g) Public Works;
   (h) Finance and National Treasury.

   Each department has its own policy, some of them with overlapping responsibilities. For example, Water Affairs and Forestry (DWAF), Housing and Provincial and Local Government all have policies that determine what subsidies will be provided for what water and sanitation services, together with rules for accessing them. However, it appears *not* to be the water-related legislation that is in itself problematic, but rather the *interaction* between legislation of different departments and spheres of government, with legislation on the planning side across all fields appearing to be more seriously problematic.

2. *Co-operative government can be made to work, but there appears to be currently no formal mechanism for ensuring that it works*

   In particular, there needs to be a dispute resolution mechanism for resolving deadlocks between different parties, and a seat of appeal.

3. *Legislation is currently in a state of constant change*

   Legislation is increasingly the primary 'driver' for decision-making (and management). But it is coming through in 'waves': Various drafts of the White Paper, then final White Paper (accepted by Cabinet), followed by the Act, then the Regulation, then the Amended Act, then the Amended Regulation. By that time, there is new legislation out in a related field.

4. *Underfunded mandate*

   This is the situation where the department or entity that makes a decision is not the entity which has to carry the consequences. In particular, it appears that Housing strongly promotes full water-borne sanitation for housing projects (even if it falls short of insisting on it). Householders on the other hand all too often cannot afford the running costs of the services, but the water department of the local authority has to 'pick up the tab'. Amounts can be crippling.

5. *No clear policy; interpretation of the legislation inconsistent*
   In many cases, it appears that the legislation simply assigns responsibility for something to a particular department and person, without clarifying the principles and procedures by which the decisions will be taken e.g. Water Affairs and Forestry (DWAF) is 'custodian of the country's water resources'. The National Water Act of 1998 covers all possible actions to do with water (technically including whether you build a pit latrine in your back yard). There is a licencing procedure in place (DWAF, 2000a), however different sections of DWAF appear to follow different procedures.

6. *Clear legislation, but there is no mechanism for enforcement, so that it is ineffectual*
   The Water Services Act of 1997 requires a local authority to submit a Water Services Development Plan (WSDP). Although not always explicit, it is intended to be the primary strategic tool for the provision of water (and sanitation) services, health and hygiene education, financial sustainability, environmental sustainability and development of local skills and resources. The legislation merely requires local authorities to *submit* a WSDP. They are being checked by central government before funds are disbursed, but in practice there is very limited answerability.

7. *Clear legislation, but the administrative procedures are so onerous that the vehicle is ineffective*
   This is a variant on 6 above, where the administrative procedures are too onerous for the capacity of the bureaucracy.

In contrast, principles of good legislation are suggested to be as follows:

1. There must be clear responsibilities, and no two people or parties both with responsibility for deciding on the same matter.
2. The principles on which decisions should be based must be clear.
3. There must be enforcement i.e. appropriate inducement to ensure that the law is obeyed.
4. The law must be unambiguous.
5. Those taking decisions must take responsibility - and be held accountable - for the consequences of their decisions.

Progressing from the more general governance difficulties listed above to more specific issues, the following appear to be particularly critical issues in the provision of sanitation to low-income settlements:

1. In contrast with rural areas, decisions about service provision in the urban context are primarily about access to land - and the opportunities that accompany them. While a decision on the level of service for informal settlements - many of which may never become established townships - is made independently of the formal establishment procedures, it appears that decisions about the level of service of sanitation in urban areas are generally made - certainly in formal areas and areas to be formalised - *within the context of township establishment*. Servicing - certainly in formal areas and areas to be formalised - therefore accompanies the land registration - and housing procedure; and as such, is not an independent procedure over which the service provider has significant control. There appears to be a difference in approach between housing/planning and water services, with housing appearing to promote higher levels of service, but the service provider carrying the consequences of any non-payment.
2. The second is between DWAF (water) and DEAT (environment) - as well as DTI (building regulations) - over *pollution from on-site sanitation systems*. It appears that while liquid waste - or waste with an impact on water - is controlled by DWAF, solid

waste is controlled by DEAT.

Resolution of these two issues is suggested as follows:

1. For the first issue, what appears to be needed is a clear and detailed vision for how spatial development, infrastructure development and economic development are going to take place - translated into clear step-by-step strategy. The *Joburg 2030* vision (CoJ, Feb 2002a) does provide such a long term vision, but there does not yet appear to be a sufficiently detailed strategy in the short and medium term for translating this into action. (For further details of existing strategy, see the CoJ IDP (CoJ, 2002d)).

   A consolidated Municipal Infrastructure Grant (MIG) devolved to local authority level would help in resolving this (in that it would reduce interference from other spheres of government), but any differences that there may be between different parties at local authority level would *still* have to be resolved.

   Irrespective of the legislative procedure followed in the township establishment process, the decision to accept a particular level of service of infrastructure - with all its financial and other consequences - appears to rest with the local authority/service provider alone, with approval formally being given in the *services agreement* between local authority/service provider and the developer. The local authority/service provider is strongly advised to be fully aware of the responsibility that it carries in this regard, and to ensure that it gives appropriate consideration to the long term consequences before entering into any such agreements. (Similar comments would apply in the case of informal settlements, where an agreement may be entered into directly with the community, in the absence of an agreement with a developer).
2. The second issue can be resolved through multilateral discussions between the three departments (DWAF, DEAT and DTI and their provincial equivalents).

2.5 Performance indicators as tools to direct performance

In pursuing improved accountability and effectiveness of government, *Key Performance Indicators (KPIs)*, which are slightly less formal than legislation, are increasingly being used as a tool to direct performance of government departments as a whole, individual employees (usually senior officials) as well as private service providers. In many cases, they are formally written into employment or service contracts.

Under the Local Government: Municipal Systems Act (Act 32 of 2000), the following general key performance indicators are set and prescribed by the Minister after consultation with MECs and organised local government (Department of Provincial and Local Government, 2002?):

1. The percentage of households with access to basic level of water, sanitation, electricity and solid waste removal;
2. The percentage of households earning less than R1 100 per month with access to free basic services;
3. The percentage of a municipality's capital budget actually spent on capital projects identified for a particular financial year in terms of the municipality's integrated development plan;
4. The number of jobs created through municipality's local economic development initiatives including capital projects;
5. The number of people from employment equity target groups employed in the three highest levels of management in compliance with a municipality's approved employment equity plan;
6. The percentage of a municipality's budget actually spent on implementing its workplace

skills plan; and
7. Financial viability as expressed by the ratios in the gazette.

While these indicators are generally positive, they can, if misused, direct performance to inappropriate targets. On a local authority scale, the targets for the JW utility have been described in City's Development Plan (CoJ, 2002c):

City Development Plan 2001
In the section on Utilities in the City Development Plan 2001, the following summary is given for Johannesburg Water under the sub-headings (i) Function/outlook; (ii) Problem statements; (iii) Outcome; (iv) Strategies; (v) Outputs and targets.
The summary is quoted here in full to provide additional background:

i. Function/outlook
Johannesburg Water (JW) is the newly formed utility company mandated to provide water and sanitation services to the residents of Johannesburg. JW has taken over the assets from council necessary to undertake this. Over 2500 employees of the city have transferred to JW. JW purchases water in bulk from Rand Water, and then reticulates it to the residents and businesses of Johannesburg through a network of over 8000 km of distribution pipes and over 100 reservoirs and water towers.

Further, JW collects all waste-water through a network of sewers, and treats this at one of six treatment plants before discharging back into the river system. JW does not undertake the commercial function of metering, billing and collection. This is executed by the Finance Department (Revenue). JW will be assuming control of these functions for water services over a period of time - probably a two-year period.

JW has entered into a management contract with an operating consortium - JOWAM (comprising Ondeo Services, France - part of the Suez group, and its subsidiaries Northumbrian Water Group, UK, and WSSA - RSA). Under this contract a team of twelve people initially - reducing to two over time - will provide expertise in critical areas whilst the capacity of the utility is being developed. JOWAM assume some of the operational risk under this performance based contract and in practice fill various executive management functions within JW for periods ranging from 18 months to 5 years. An independent Board of Directors appointed by the city in its capacity as the sole shareholder governs JW.

ii. Problem statements
The major problems facing JW are:
1. Capacity within the organisation to address the challenges
2. Lack of data to allow for effective management and monitoring. Measurement is lacking in all respects
3. Unaccounted for water (UFW) is too high. UFW measures the amount of water purchased - from Rand Water - and not resold by JW. At this stage this is estimated at over 40%, made up of physical system losses as well as commercial losses. Commercial losses include under-billings on deemed consumption customers, non-billings, meter calibration errors, and theft
4. High level of non-payment
5. Unacceptable level of environmental non-compliance
6. Poor customer interface and customer relationship management
7. Inadequacy of delivery in certain informal areas

iii. Outcome

Affordable access to clean running water and hygienic sanitation for all to improve quality of life.

iv. Strategies

Key strategies include:

1. Capacity building within organisation through training, restructuring and focus, and targeted recruitment
2. Targeted and increasing investment progamme in rehabilitation and asset replacement and network expansion
3. Metering all formal areas
4. Introduction of free essential water programme from 1July 2001
5. Assume responsibility for full customer management
6. Use procurement to promote empowerment and labour intensive construction

v. Outputs and targets

Outputs	***Targets***
Unaccounted for water	Reduction from 43% to 24% over five years
Operations	Reduction in environmental spillages on a per annum basis. Initially the measurement system has to be developed. Restructuring all operations to achieve focus Improved monitoring of water quality Plant utilization improvement - initially to set in place a measurement system, then to agree targets. Most important is the sludge handling facilities
Customer services	To establish an interim call centre for non account complaints by July 2001 To develop the capacity to take over the 10000 top customers by October 2001 To develop the plan to take over the remaining customers by December 2001 To take over and re-bid the meter reading contracts become accountable to JW by November 2001
Human Resources	To restructure the entire organisation by September 2001 To regrade the new structure by December 2001 To address the parity problems by December 2001 To develop a number of policy reports from July 2001 To comply with the requirements of the Equity Act, Skills Development Act, etc
Capex and Development Planning	To provide an efficient service to developers and planners To deliver the capital programme efficiently and timeously. The total programme for 2001/2001 is over R180m
Social Programme	To commence the delivery of essential free water from July 2001 To utilise the farms to provide opportunities for eco-tourism and social upliftment
Customer charter	June 2002
Contingency management plan	June 2002
Procurement policy	August 2001
Base year data report	February 2002
Operations and maintenance plan	February 2002

Management information plan	December 2001
GIS evaluation report & plan	December 2001
Procurement guidelines	August 2001
Strategic business plan	January 2002

Suitability of performance indicators in the provision of sanitation to low income settlements: The primary Key Performance Indicator (KPI) for CAPEX (capital expenditure) is generally 'timeous expenditure of capital budget'. For situations where the procedures are well-established, this is appropriate (although even here, the graph of expenditure over time follows the classic S-shape: starting more slowly and building up over time). For low-income areas, the same curve is not entirely appropriate. Provision of services to low-income areas follows a much slower S-curve. At the same time, however, the slower S-curve must be accompanied by a bell-shaped 'systems development curve' which reflects significant investment in getting the 'systems' up and running in the early stages of the project. In fact, CAPEX is a *poor* indicator of good performance in these early stages. If rate of spend of CAPEX early on in the project is high, it may indicate that insufficient effort has been allocated to getting the designs and systems right. In the early stages, money spent on systems development is a better indicator of performance.

CAPEX alone is simply too blunt an instrument to be used as a KPI in this situation. If one is at the 'mature' end of an S-curve, then it is acceptable; however, if one is still in the (steep) middle part of the curve, then it is likely to be inappropriate. After 5 years, JW may well still be midway through its CAPEX programme. A better measure would therefore be a weighted KPI based partially on 'system development expenditure' - including HR development expenditure - and partially on capital expenditure.

An industrial engineering model (characterised by slow and careful development of model and prototype before moving into full production) may be a more appropriate model than the civil engineering model.

2.6 General regulatory mechanisms for personnel as distinct from institutional procedures

The various policies, strategies and procedures listed earlier in the chapter (see section 2.3) are reminiscent of the various guidelines for the design of civil engineering services for residential townships that came out in the 1980s and 1990s. Both groups of documents are a serious attempt at codification of good practice. Whether it is possible to do the same in urban development as it is in structural engineering (where codification is well established) remains to be seen. May and Stark (1992), make a more significant point: They suggest that the establishment of operating procedures alone are unlikely to be sufficient to ensure good practice. They suggest that the operating procedures need to be combined with various other mechanisms that regulate the *individual professional*. Regulatory mechanisms for design professions are set out in a paper by May and Stark (1992) in relation to earthquake policy. These give some insight into the 'family'

of institutions that need to be set up to ensure good practice.

TABLE 2.3:
REGULATORY MECHANISMS FOR DESIGN PROFESSIONALS (May and Stark, 1992)

Mechanism	***Function***	***Comments***
Public regulation:		
State licencing or registration of professionals within each profession	Gatekeeper function: establishes minimum education and knowledge	Only directly affects new entrants to the profession
State professional practices act	Conduct code: Avoid negligent practices and protect consumers (Before-the-fact protection)	Notification and enforcement are weak links in ensuring compliance
Permit processes for individual structures	Regulate practice: Ensure minimum code compliance	Limited by quality of plan review and applicability of codes
Private regulation:		
Civil torts - liability and private lawsuits	Consumer protection: Compensate for negligent professional practice (after-the-fact)	Undermined by unclear responsibilities and practice standards
Professional association "self regulation"	Professional responsibility and education: Maintain integrity of the profession	Willingness and ability to police diverse profession often difficult
Peer review panels for designs of individual structures	Regulate practice: Ensure building integrity	Administratively difficult and costly to apply to numerous structures.

The fundamental question remains: How does one ensure good practice in the provision of sanitation to low-income communities? Can it be systematised? What is suggested in this study is that one needs a multiple approach, of which policy, strategy and procedures are but one component.

Policy, strategy and procedure fall within a vertical family of categories (i.e. levels of detail within a discipline). There would be similarities in other fields (silos) e.g. housing or health. The areas that appear to be missing include:
On the *public* side:
1. Establish licencing requirements for practitioners;
2. Establish licencing requirements for practices (this is really the route of the new Built Professions Act);
3. Establish mandatory codes of practice for this work.

On the *private* side:
1. Clarify matters of responsibility and practice standards, which would permit private lawsuits against negligence;
2. Strengthen professional association 'self-regulation';
3. Establish peer review panels for designs.

While the full range of interventions may be appropriate to a developed country such as the United States, South Africa is in a somewhat different situation. There may well be simply too few skills available in the country, too thinly spread. Rather than follow a route of heavier licencing, it may well be more appropriate for South Africa to pursue voluntary approaches that mobilise additional resources in *support* of professionals rather than increase the burdens.
While the form that such support might take requires further investigation and discussion, one aspect that appears crucial for personnel operating in low-income settlements is the promotion of certain values and attitudes. One such value or attitude is that of *learning*.

2.7 Values and attitudes as components of institutions

The value or attitude of learning is selected to explore the place of values and attitudes in the range of institutions for the provision of sanitation to low-income settlements.

How can learning be encouraged?
The development of good practice in the provision of sanitation to low-income areas requires an attitude of learning. In many cases, it may require the relinquishment of strongly-held approaches which while appropriate in certain circumstances, may prove inappropriate elsewhere. Educational theory may provide useful insights into how such learning might happen:

In relation to teaching, Shulman (1999) explains this as follows:

> When I began teaching learning theory, our conception of learning was fairly simple. For any given learning situation, the "inside" of the learner was treated as more or less empty; learning was understood as the process of getting the knowledge that was outside the learner - in books, theories, the mind of the teacher - to move inside. We tested for the success of learning by giving tests to look inside the heads of our students to see if what had previously been outside was now there.....
>
> ... We now understand that learning is a *dual* process in which, initially, the inside beliefs and understandings must come out, and only then can something outside get in. It is not that prior knowledge must be expelled to make room for its successors. Instead, these two processes - the inside-out and the outside-in movements - alternate almost endlessly. To prompt learning, you have got to begin with the process of going from inside out....
>
> ...Our first principle, therefore begins with the assertion that we must take seriously what the students have already learned. To take *learning* seriously, we need to take *learners* seriously.
>
> ...An interesting surprise is that once what is inside gets out, it seldom just sits there; in a setting where serious activity and/or discussion is possible, that knowledge is enriched and elaborated by social interactions with people who have also experienced their own processes of getting what's inside out. Thus, learners construct their sense of the world by applying their old understandings to new experiences and ideas. That new learning is enriched enormously by the ways in which people wrestle with those ideas on the "outside" before they bring those ideas back inside and make them their own. This explains why one of the most important remedies for combatting the illusion of understanding and the persistence of misconceptions is to support learners in the active, collaborative, reflective reexamination of ideas in a social context.
>
> Learning is least useful when it is private and hidden; it is most powerful when it becomes public and communal. Learning flourishes when we take what we think we know and offer it as community property among fellow learners so that it can be tested, examined, challenged, and improved before we internalize it.

Both Shulman (1999) and Gus Gerrans (1986) quote cognitive educational psychologist, David Ausubel (1968). A first quote is as follows:

> If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.

A second quote of Ausubel, commenting on the importance of considering what he called children's preconceptions, suggests that they are "amazingly tenacious and resistant to extinction..." and that "...unlearning of preconceptions might well prove to be the most determinative single factor in the acquisition and retention of subject matter knowledge."

In relation to the teaching of Development Engineering in the undergraduate curriculum, three key lessons learned - and considered relevant here - are (Van Ryneveld and McCutcheon, 1997):

1. to introduce the material early in the curriculum and to continue exposure to this or similar material throughout the subsequent years of the degree programme;
2. to introduce Development Engineering to students through topics with which they are more familiar, particularly management and municipal design
3. to concentrate on developing the abilities of students, particularly their descriptive problem solving abilities as much as their knowledge of development issues.

Substantial knowledge about both the principles and practice of service provision to the poor is available. Notwithstanding that, municipal engineers in general appear to battle to get to grips with particularly the non-technical aspects.

There appear to be a number of reasons:

1. *strongly held beliefs*, which do not coincide with what is considered by many to be good practice, about (a) objectives of service delivery to the poor; (b) methods; (c) measures of success;
2. lack of '*scaffolding*' i.e. broad base of knowledge of this and allied fields, making it difficult to identify 'common ground';
3. *incentives* (e.g. reward systems; some may be laid down in contractual obligations; others may be set in the values and 'ways of operating' of the organisations by whom they are employed).

How are these three matters addressed?:

1. *Incentives* in many ways are the easiest to change. It requires identifying the rules in contracts and institutional procedures, and attempting to be very explicit in amending these to ensure that they move behaviour in the desired direction. In amending the rules, one needs to be very careful that one has identified the real levers of power, otherwise the changes will be ineffective.
2. *Scaffolding* is not that difficult to address. It simply requires a lot of time and resources. It is a bit like developing one's general knowledge.
3. *Strongly held beliefs* are difficult to dislodge. To do this, one needs (a) a supportive *environment*, where views can be stated and questions asked without ridicule or recrimination; (b) other *people* who are willing to do the same.

2.8 Comment on the identification of institutions

There are two points to be made in this regard. The first is to note the long period of time over which the development of policies, strategies and detailed procedures has taken place. A chronology of events leading to this project is as follows:

8 June 1999	Start of previous contract to develop policy/guidelines and protocol (Pegram et al.)
1 July 1999	Workshop identifying parameters to be addressed in development of the guideline.
6 October 1999	Meeting between Dept of Housing Gauteng Province and GJMC on sanitation standards.
12 November 1999	Workshop to review draft guidelines for GJMC
28 February 2000	End of project to develop policy/guideline+protocol (Pegram et al.).
1 March 2000	Original start date for follow-on WRC-funded case study project.
4-5 September 2000	International Workshop on Sanitation for Low Income Areas for the Greater Johannesburg Water and Sanitation Utility (World Bank etc).
3 October 2000	Workshop/meeting at Thulamntwana (Jacky Burke).
January 2001	Johannesburg Water (JW) utility established as an independent company with CoJ as sole shareholder.
1 April 2001	Five-year management contract with JOWAM at JW came into effect.
December 2002	Submission of final report on this research contract to WRC.

It also pertinent to note that most of the *de facto* rules for the provision of sanitation to low-income areas that go to make up the 'institution' are informally held. Furthermore, even when they *are* formally set out, there are many areas that remain open to interpretation. Taken together with low staffing levels in government as a result of financial constraints, simply identifying these formal and informal rules is a formidable exercise for those both inside and outside the bureaucracy.

Regardless of the degree to which the local authority complies with the intent of national policies, there appear to be two specific 'rules' with which the local authority is *compelled* to comply:

1. The local authority as a whole must remain *financially sustainable*;
2. The local authority must comply with applicable *environmental legislation*.

These two topics are addressed in more detail in the following chapters.

2.9 Conclusions

1. In reviewing the Sanitation Policy and Protocol of CoJ, it is first necessary to place these documents within a broader framework, which is best described by the term 'institutions' or 'institutional' framework. The term is used on this project with a very specific meaning: that 'institutions' are viewed as 'rules' or 'ways of doing things' rather than 'organisations', with the following more detailed explanation (World Bank, 1999: p.22, 23):

   > The term *Institutions*, as it is used here, refers to sets of formal and informal rules governing the actions of individuals and organisations and the interactions of participants in the development process. Rules can be formal, taking the shape of constitutions, laws, regulations and contracts. Or they can be informal, like values

and social norms.

The Sanitation Policy and Protocol therefore form part of a range or suite of institutions for the provision of sanitation.

2. Policy, strategy and detailed procedure form a continuum in which the different elements are difficult to separate out:
   (a) *Policy* implies general principle, not easily departed from, and therefore stable and not easily subject to change;
   (b) *Strategy*, set within the framework of the policy, implies a plan of action necessitating a choice of timing, location, method and resources, in other words, 'what, when, where, how and with what resources'. It may be revised more regularly than policy; (say annually, but with a horison of 5 or 10 years or even longer);
   (c) *Detailed procedure*, implies detailed steps and techniques, which may be even more flexible than either policy or strategy.
3. The heart of policy generally lies in the policy principles. The policy principles set out both how sanitation *will* be provided, and by implication how sanitation will *not* be provided. The place where the tensions of policy are resolved is in strategy, where priorities are set and trade-offs made within specified time frames. The Water Services Development Plan (WSDP) (as required by the Water Services Act of 1997) is intended to be the primary strategic planning tool for the resolution of these priorities and trade-offs.
4. Recent policy, strategy and detailed procedure documents include:
   (a) *An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council* (GJMC, 2000a); and associated *Sanitation Protocol* document (Pegram et al., end of project: Feb 2000);
   (b) White Paper on Basic Household Sanitation (DWAF, Sept 2001);
   (c) Ethekwini Sanitation Protocol (2002?);
   (d) Sanitation Policy for the City of Johannesburg (CoJ, draft 2: Apr 2002b);
   (e) Procedures being piloted by Johannesburg Water under their low-income settlements programme (current).
5. With respect to sanitation policy for Johannesburg, current initiatives based on the White Paper on Basic Household Sanitation appear sound. With respect to more detailed procedures, current pilot studies by Johannesburg Water have sought to gain an understanding of technical requirements and community dynamics as a first step. While sensibly following a pilot-and-programme approach and gaining essential experience in low-income settlements in Johannesburg, this initiative does need to be aware of three possible dangers:
   (a) The lack of development at the pilot stage of a *clear framework through which demand can be expressed* carries the risk of not being able to mobilise community capacity, and of not being able to reverse the matter of non-payment;
   (b) *Moving too quickly from pilot to full scale implementation programme* under pressure to deliver carries the risk of being unable to develop designs and procedures adequately, and runs the risk of rejection of particular levels of service by communities before JW has had the chance to get the systems right.
   (c) A third possible danger is a longer term one rather than a short term one; and it may be argued to be outside the mandate of the water utility. Irrespective of whether it falls within the mandate of the utility or not, the consequences will impact profoundly on the utility: Unless *development takes place* in the low-income communities of Johannesburg, it is likely to prove extremely difficult to resolve the problems of non-payment and inability to pay currently being

experienced - and prove difficult to turn consumers into customers. From the service provider side, this requires careful collaboration and planning together with other parties within the framework of the IDPs.

6. Key elements of policy are generally translated into legislation. However, it needs to be understood that while the legislation will generally seek to prevent what is clearly unacceptable, it will not necessarily enforce good practice. More specifically, it appears that while existing legislation and procedures do not *enforce* the principles of the White Paper on Basic Household Sanitation in a number of key respects, neither do they *prevent* the principles from being pursued. In other words, if such principles are *not* being followed in practice, there are reasons *other* than legislation that are driving this action. What legislation and regulations primarily do is to *allocate powers and functions*, but not necessarily to spell out in detail all actions that must be taken. The legislation allows the discretion of the incumbent in making decisions in the absence of an explicit ruling. The policy principles are nevertheless a statement of good practice, which would be unwise simply to disregard.

7. Various governance problems identified include the following:
   (a) 'Silo' approach to government;
   (b) Co-operative government can be made to work, but there appears to be currently no formal mechanism for ensuring that it works;
   (c) Legislation is currently in a state of constant change;
   (d) Underfunded mandate;
   (e) No clear policy; interpretation of the legislation inconsistent;
   (f) Clear legislation, but there is no mechanism for enforcement, so that it is ineffectual;
   (g) Clear legislation, but the administrative procedures are so onerous that the vehicle is ineffective.

8. Progressing from the more general governance difficulties listed above to more specific issues, the following appear to be particularly critical issues in the provision of sanitation to low-income settlements:
   (a) In contrast with rural areas, decisions about service provision in the urban context are primarily about access to land - and the opportunities that accompany them. While a decision on the level of service for informal settlements - many of which may never become established townships - is made independently of the formal establishment procedures, it appears that decisions about the level of service of sanitation in urban areas are generally made - certainly in formal areas and areas to be formalised - *within the context of township establishment*. Servicing - certainly in formal areas and areas to be formalised - therefore accompanies the land registration - and housing procedure; and as such, is not an independent procedure over which the service provider has significant control. There appears to be a difference in approach between housing/planning and water services, with housing appearing to promote higher levels of service, but the service provider carrying the consequences of any non-payment.
   (b) The second is between DWAF (water) and DEAT (environment) - as well as DTI (building regulations) - over *pollution from on-site sanitation systems*. It appears that while liquid waste - or waste with an impact on water - is controlled by DWAF, solid waste is controlled by DEAT.

9. While legislation and strategy are key drivers in the provision of services to low-income settlements, there are other tools that also serve as drivers. One such tool is that of performance indicators. The primary Key Performance Indicator (KPI) for CAPEX is generally 'timeous expenditure of capital budget'. For situations where the procedures

are well-established, this is appropriate (although even here, the graph of expenditure over time follows the classic S-shape: starting more slowly and building up over time). For contracts in low-income areas, the same curve is not appropriate. CAPEX alone is simply too blunt an instrument to be used as a KPI in this situation.

10. May and Stark (1992) suggest that the establishment of operating procedures alone are unlikely to be sufficient to ensure good practice. They suggest that operating procedures need to be combined with various other mechanisms that regulate the *individual professional*. Regulatory mechanisms for design professions are set out in a paper by May and Stark (1992) in relation to earthquake policy. These give some insight into the 'family'of institutions that need to be set up to ensure good practice, which includes various forms of *public and private regulation*.
11. The value or attitude of learning is selected to explore the place of values and attitudes in the range of institutions for the provision of sanitation to low-income communities. Educational theory may provide useful insights into how learning might happen.
12. Substantial knowledge about both the principles and practice of service provision to the poor is available. Notwithstanding that, municipal engineers in general appear to battle to get to grips with particularly the non-technical aspects.
13. With respect to identifying the institutions or rules regarding the provision of services to low-income settlements, it is important to note the long period of time over which the development of policies, strategies and detailed procedures has taken place. It also pertinent to note that most of the *de facto* rules for the provision of sanitation to low-income areas that go to make up the 'institution' are informally held, which makes it both time-consuming and difficult to identify these rules.
14. Finally, regardless of the degree to which the local authority complies with the intent of national policies, there appear to be two specific 'rules' with which the local authority is *compelled* to comply:
    (a) The local authority as a whole must remain *financially sustainable*;
    (b) The local authority must comply with applicable *environmental* legislation.

    These two topics are addressed in more detail in the following chapters.

2.10 Recommendations

The following recommendations are made for resolution of the specific issues raised in conclusion 8 above:

1. With respect to the apparent difference in approach between housing/planning and water services, it is recommended that mechanisms be explicitly put in place to develop a clear and detailed vision for how spatial development, infrastructure development and economic development are going to take place in CoJ - translated into clear step-by-step strategy. The *Joburg 2030* vision (CoJ, Feb 2002a) does provide such a long term vision, but there does not yet appear to be a sufficiently detailed strategy in the short and medium term for translating this into action.
2. In conjunction with the development of the more detailed strategy, it is also recommended that CoJ pursue with other spheres of government (particularly National Treasury, e.g. by offering the metro as a pilot site) the implementation of a consolidated Municipal Infrastructure Grant (MIG), where grant capital funding from a range of sources may be devolved to local authority level. While this would not in itself resolve any differences that there may be between parties at local authority level, it would at least focus the debate at that level, and reduce interference from other spheres of government.
3. Irrespective of the legislative procedure followed in the township establishment process,

the decision to accept a particular level of service of infrastructure - with all its financial and other consequences - appears to rest with the local authority/service provider alone, with approval formally being given in the *services agreement* between local authority/service provider and the developer. The local authority/service provider is strongly advised to be fully aware of the responsibility that it carries in this regard, and to ensure that it gives appropriate consideration to the long term consequences before entering into any such agreements. (Similar comments would apply in the case of informal settlements, where an agreement may be entered into directly with the community, in the absence of an agreement with a developer).

4. On the matters of overlapping responsibilities over pollution from sanitation systems, it is recommended that this be resolved through multilateral discussions between the three departments.

Further recommendation:

5. It is recommended that the various Key Performance Indicators (KPIs) being used for both organisations and individuals be reviewed to ensure that they promote co-ordinated development in general and conform to appropriate developmental outcomes for sanitation provision to low-income settlements in particular.

3 FINANCIAL SUSTAINABILITY

3.1 Introduction

As indicated in the previous chapter, one of the 'rules' with which a local authority[1] appears compelled to comply is that of financial sustainability. What this implies for the local authority is that:

1. There must be a clear distinction between cost, price and subsidy; and
2. For the operation of the local authority as a whole in the long term, the expression C#P+S *must* hold true (where C=cost, P=price and S=subsidy).

In other words, the price of the services provided by a local authority must be set at a value that will enable it to continue to provide these services on a financially sustainable basis. The price of the good or service may be reduced by the amount of internal cross-subsidy from richer to poorer consumers (normally by means of a rising block tariff) and/or by external subsidy (from a source outside the local authority). But whatever happens, total expenditure of the service provider must be covered by total income (from all sources, including external subsidy income). The matter is complicated by:

1. the service provider's need to borrow in order to fund major capital works;
2. C, P and S have further components (capital and operating; internal and bulk/connector; which can be expressed as one-off costs or can be translated into ongoing monthly or annual costs;
3. The price may be reduced by the amount of subsidy. For Free Basic Water (FBW) the cost is subsidised in full so that demand is not tested for the basic amount.

Nevertheless, breakeven is where C = P + S, and in the long run, the utility must be able to cover its costs, otherwise (to state the obvious) it will go bankrupt.

3.2 Levels of detail in assessing financial sustainability

One needs to understand the reasons for costing, and not confuse them. Qasim (1992) puts it like this:

> Estimating costs for any project is a broad and complex task. It requires experience, engineering judgment, hard work, and to some extent, guesses based on familiarity with the project and the area. Reliable construction and operation and maintenance (O&M) cost data on any water treatment project are essential for planning, design, and construction. Estimating costs is required during project planning as well as during design and construction. Different degrees of accuracy are needed for each phase.
>
> During the planning phase, preliminary cost estimates are developed for major project components and often for alternative process trains. These cost estimates are used to compare and evaluate process alternatives. Therefore they must be accurate enough so that sound decisions concerning alternative selections can be made.

[1] While this applies in the first instance to a local authority as a whole, the principle would apply equally to the operation of a service provider.

At the planning stage, there are a number of more specific levels of detail at which costs can be determined:

1. *Country-wide or regional estimates of average unit costs* e.g. Van Ryneveld (1995), or Palmer Development Group (1993 and 1994) - updated in Van Ryneveld (2000). These costs do not make provision for specific local conditions e.g. economies of scale of infrastructure (There are distinct differences between ERWAT and CoJ). They give a good 'first pass' overall understanding of the costs of different levels of service and what factors influence them, but generally have insufficient local detail for tariff-setting at local authority level;
2. *Average unit costs for the particular local authority or service provider, derived from historical costs* e.g. as derived from annual reports or summary studies e.g. iGoli 2002. These may be refined to produce more detailed equivalent costs to the country-wide/regional estimates above. They may also be translated into a model that can check sensitivity of various parameters (as suggested in the costing framework; see Van Ryneveld, 2000). Their limitation is that they remain essentially static models, and are not able to model changes in costs and level of service distributions over a period of time.
3. *Financial modelling of the service over a period of time* e.g. Palmer Development Group (1998a). This modelling was done for the Southern MLC (Metropolitan Local Council) before ring-fencing of the JW utility. This level of modelling would normally be undertaken for a large local authority for the construction of the WSDP. The approach is described in the Management Guidelines for Water Service Institutions (Palmer Development Group, 1998b)
4. *Detailed GIS-based physical modelling* of the actual network extensions, which can test the effect of different layouts, settlement densities, levels of service etc e.g. Boutek model; see Biermann and Landre (2002). Some current master planning may provide some of this data.
5. *Combinations of different aspects* would provide a high level of modelling ability. e.g. integration of dynamic cost and tariff modelling together with physical modelling, supplemented by willingness-to-pay studies and economic development models.

As a general comment it is desirable to allocate effort to planning in a balanced manner, avoiding unnecessary detail in one area and insufficient detail in another, and so ensuring that all key questions are suitably addressed in an even manner e.g. if non-payment is a major problem, then it is unwise to sink all resources into water and sewer master planning, leaving no resources for willingness-to-pay studies.

A graded effort can also be a wise approach i.e. start with a fairly simple study (e.g. review of theoretical understanding, combined with more specific data from previous local investigations) to gain an understanding of the problem, and then follow it with more detailed studies. Many key understandings can be obtained from fairly rudimentary planning. This permits scarce resources to be targetted at specifically identified problem areas as the investigation progresses.

3.3 Regional estimates of unit costs for Gauteng

Unit cost figures for Gauteng for 2000 produced by Van Ryneveld (2000) and based on figures produced by Palmer Development Group (1993 and 1994) are given in Table 3.1 below (see footnote on p.30 for list of abbreviations).

TABLE 3.1: COSTS OF DIFFERENT LEVELS OF SERVICE OF WATER SUPPLY AND SANITATION IN GAUTENG 2000 (Van Ryneveld, 2000; after Palmer Development Group et al., 1993 and Palmer Development Group, 1994)

WATER SUPPLY

	water usage [l/cap.d]	*water usage [l/site.d]*	*cap 1993 [R/site]*	*o&m 1993 [R/site.a]*	*cap 2000 [R/site]*	*o&m 2000 [R/site.a]*	*cap 2000 [R/site.m.]*	*o&m 2000 [R/site.m.]*	*tot 2000 [R/site.m.]*
SP									
Internal			750		1290		8.16		8.16
Bulk & connector	40	220	867	99	1491	170	9.43	14.17	23.60
Total			1617	99	2781	170	17.58	14.17	31.76
YT									
Internal			1143		1966		12.43		12.43
Bulk & connector	90	495	1950	321	3354	552	21.20	45.96	67.16
Total			3093	321	5320	552	33.63	45.96	79.59
HC - normal									
Internal			1567		2695		17.04		17.04
Bulk & connector	150	825	3251	386	5592	663	35.35	55.28	90.63
Total			4818	386	8287	663	52.39	55.28	107.67
HC - high									
Internal			2071		3562		22.52		22.52
Bulk & connector	300	1650	6501	541	11182	930	70.69	77.52	148.21
Total			8572	541	14744	930	93.21	77.52	170.73

SANITATION

			cap 1992 [R/site]	*o&m 1992 [R/site.a]*	*cap 2000 [R/site]*	*o&m 2000 [R/site.a]*	*cap 2000 [R/site.m.]*	*o&m 2000 [R/site.m.]*	*tot 2000 [R/site.m.]*
BU									
Internal			600	15	1134	28	7.17	2.36	9.53
Emptying/treatment				253		478		39.85	39.85
Total			600	268	1134	507	7.17	42.21	49.38
VIP									
Internal			1500	27	2835	51	17.92	4.25	22.18
Emptying/treatment				30		57		4.73	4.73
Total			1500	57	2835	108	17.92	8.98	26.90
AP									
Internal			1200	63	2268	119	14.34	9.92	24.26
Emptying/treatment				30		57		4.73	4.73
Total			1200	93	2268	176	14.34	14.65	28.99
WB									
Internal			2500	45	4725	85	29.87	7.09	36.96
Bulk & connector			1200	128	2268	242	14.34	20.16	34.50
Total			3700	173	6993	327	44.21	27.25	71.46

WATER SUPPLY AND SANITATION

					cap 2000 [R/site]	*o&m 2000 [R/site.a]*	*cap 2000 [R/site.m.]*	*o&m 2000 [R/site.m.]*	*tot 2000 [R/site.m.]*
SP + VIP									
Internal service					4125	51	**26.08**	4.25	30.33
Bulk & connector					1491	227	**9.43**	18.90	28.33
Total					5616	278	35.51	**23.15**	**58.66**
YT + AP									
Internal					4234	119	**26.77**	9.92	36.69
Bulk & connector					3354	608	**21.20**	50.68	71.89
Total					7588	727	47.97	**60.60**	**108.58**
HC(normal) + WB									
Internal					7420	85	**46.91**	7.09	54.00
Bulk & connector					7860	905	**49.69**	75.44	125.13
Total					15280	990	96.60	**82.53**	**179.13**
HC(high) + WB									
Internal					8287	85	**52.39**	7.09	59.48
Bulk & connector					13450	1172	**85.03**	97.68	182.71
Total					21737	1257	137.42	**104.77**	**242.19**

In graphical form, the current costs of different levels of service of water supply and sanitation in Gauteng are given in Figure 3.1 below (see footnote for list of abbreviations)[2]:

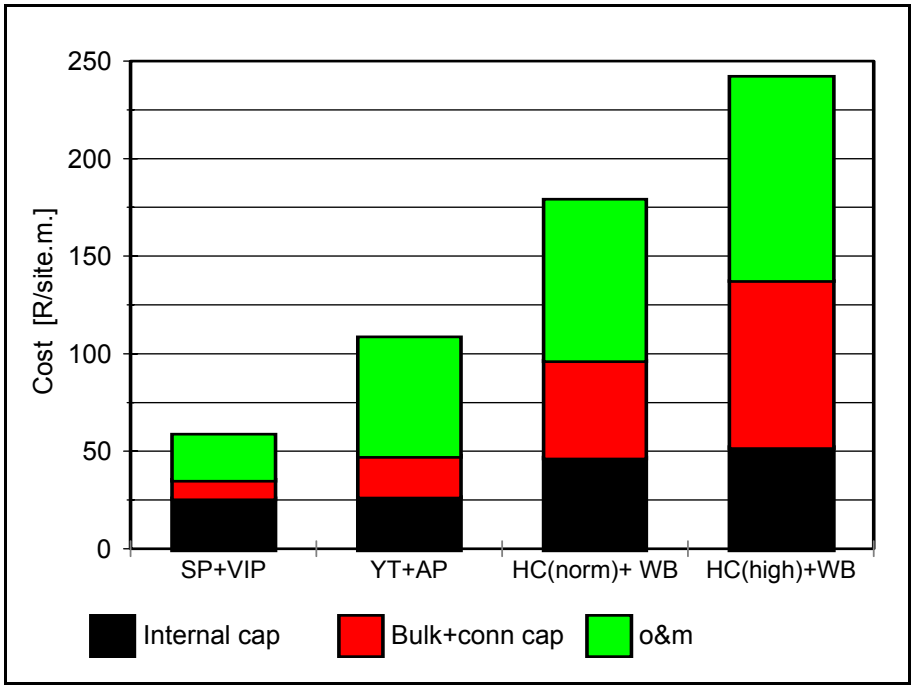


FIGURE 3.1: HOUSEHOLD COST OF WATER AND SANITATION FOR DIFFERENT LEVELS OF SERVICE IN GAUTENG
[R/site.month 2000 costs]
(Van Ryneveld, 2000, after Palmer Development Group et al., 1993 and Palmer Development Group 1994)

A number of comments/observations may be made about the above figures:

1. The figures for bulk infrastructure and connector infrastructure are calculated pro rata on water usage (or sewage flow). They are therefore sensitive to whatever values are assumed for these flows e.g. a figure of 90 l/cap.d or 495l/site.d (assuming 5.5 persons/site) has been used for water usage for the intermediate level of service of water supply. This translates to 14.85 say 15kl/site.month. This is somewhat higher than the figure of 12kl/site.month that has been used in the later calculations (in Table 3.3)
2. Based on the figures given in Table 3.1, the capital costs of the internal service for a basic level of service (standpipe and VIP = R4 125) are very similar - in fact only fractionally lower - than the equivalent cost of an intermediate level of service (yard tap and aquapivy; R4 234). Where the difference comes in, though, is with the capital cost of the bulk and connector service as well as the operation and maintenance costs, where in both

---

[2] SP+VIP = stand-pipe and Ventilated Improved Pit latrine
YT+AP = yard tap and aqua-privy
HC(norm)+WB = house connection (normal water usage) and (full) water-borne sanitation
HC(high)+WB + house connection (high water usage) and (full) water-borne sanitation

cap = capital cost
o&m = operation and maintenance cost
[l/cap.d] = litres per capita (i.e. per person) per day
[R/site.a] = Rands per site per annum (i.e. per year)
[R/site.m.] = Rands per site per month

cases the cost of the intermediate level of service is significantly higher. The result of this is that the full life cost of an intermediate level of service is clearly higher (1.85 times in Table 3.1; say 1½ to 2 times) than the cost of a basic level of service.

3.4 Average unit costs for Johannesburg, derived from summary historical costs

A first indication of unit costs for Johannesburg may be derived from summary figures given by Greater Johannesburg Metropolitan Council (GJMC; now CoJ) itself as part of the iGoli 2002 initiative as follows (GJMC, 2000b?):

TABLE 3.2:
INFRASTRUCTURE PROVISION CHARACTERISTICS AND COSTS FOR WATER AND WASTEWATER SERVICES (GJMC, 2000b?)

		Water	***Wastewater***
a	Operating expenditure	R1 368 million	R546 million
b	Gross income	R1 428 million	R533 million
c	Network	8 760 km	11 290 km
d	Capacity	1 153 Ml/d	862 Ml/d
e	Replacement value	R3 380 million	R5 610 million
f	Service connections (unmetered connections included 152 765)	506 517	490 468
g	Service backlogs	R836 million	R1 455 million
h	Staff	963	1 507

On the basis of these figures, the actual unit costs of new infrastructure in Johannesburg is as follows:

TABLE 3.3:
COSTS FOR WATER AND WASTEWATER SERVICES, based on Table 3.2 above (after GJMC, 2000b)

		Water	***Wastewater***
j	Average capacity per connection (d/f)	2.28 kl/d or 68.3 kl/month	1.76 kl/d or 52.7 kl/month
k	Gross operating profit/loss (b-a)	R60 million (profit)	-R13 million (loss)
l	Operating expenditure (cost) per connection (a/f)	R2 700/connection.a or R225/month	R1 113/connection.a or R93/month
m	Replacement value (replacement capital cost) per connection (e/f)	R6 673/connection	R11 438/connection
n	Operating expenditure (cost) per kl of capacity (a/(d*360*1000))	*(R3.30/kl)*	*(R1.76/kl)*
p	Replacement value (replacement capital cost) per kl/d of capacity (e/(d*1000))	R2 931/kl.d or R18.53/mo per kl/d	R6 508/kl.d or R41.15/mo per kl/d
q	Total monthly cost at 12kl/mo (0.4kl/d) water + 0.75*12=9kl/mo (0.3kl/d) wastewater	*(R39.60*+R7.41=*R47.01)*	*(R21.12*+R12.35=*R33.47)*
r	Total monthly cost at 12kl/mo (0.4kl/d) water + 0.75*12=9kl/mo (0.3kl/d) wastewater; increased by a factor of (1/(1-0.42)) i.e 1.72 to allow for UFW	*(R80.86)*	*(R57.57)*

It must be stressed that these figures are indicative. There are several matters that could not be clarified about the figures. A number of cautionary comments therefore need to be made:

1. It had been assumed in the above calculation that 'operating expenditure' did *not* include interest and redemption on capital. In fact, it is understood that it *does* include interest and redemption on capital; in which case the capital has been counted twice in the calculation of a consolidated monthly figure for water plus wastewater services; and the total number given in Table 3.3 is therefore incorrect - i.e. too high. The *extent* to which these numbers are too high could not, however, be readily ascertained. The numbers affected have been indicated in brackets and italics in the table.
2. There is a difference between 'capacity' and 'water supplied to consumers'. Because of unaccounted for water (which was estimated at some 43% under the iGoli 2002 study), there is also a very substantial difference between water purchased from the bulk supplier (Rand Water) and water sold to consumers.
3. Because of the relatively high proportion of commercial and industrial users in Johannesburg, the average figures (either cost or water use) may not be indicative of *domestic* consumers.
4. Because the costs (both capital and operating) of bulk water supplied by Rand Water have been included in the 'operating expenditure' of Johannesburg's water service, this cost is somewhat higher than might be expected, and the equivalent capital cost commensurately lower.

Nevertheless, it may be observed that the average replacement value (replacement capital cost) per connection (e/f) for Johannesburg (given in Table 3.3) of R6 673 + R11 438 = R18 111 say R18 000 per connection for a full level of service of water and wastewater falls squarely in the range of values (R15 280 for normal water use and R21 737 for high water use) for capital costs of water supply and sanitation given by Van Ryneveld (2000) which are given in Table 3.1. It is also very much of the same order of magnitude as the total housing subsidy amount of R20 300 (for income category of 0 to R1 500 per month; Department of Housing, Gauteng, 2002).

The intention of these very rough calculations is:

1. to give some substantiation of ball-park costs, based on figures provided by CoJ just before the establishment of JW;
2. to highlight the relative magnitude of the costs of different levels of service;
3. to highlight the kind of data that is required and how actual costs might be constructed;
4. to highlight critical areas where further work is required.

3.5 Costs derived from DDPLG Backlog Study

Another initiative that has given an insight into costs is the Backlog Study initiative of Department of Development Planning and Local Government (DDPLG) (Nov 2001). While the costs are not analysed in detail here, it appears that while the estimates of operating cost as used in the study are not unreasonable, the estimates of capital cost are low as compared with figures by Palmer Development Group and Van Ryneveld in Table 3.1.

More importantly, it is essential that:

1. *there is clear distinction between cost (C), price (P) and subsidy (S)*
   Quite simply - as indicated earlier - breakeven is where C = P + S. What complicates the matter further is that C, P and S have further components (capital and operating; internal and bulk/connector; these can be expressed as one-off costs or can be translated into

ongoing monthly or annual costs).

2. *all long term costs of the operation are clearly accounted for*.
   It is imperative for decision-making purposes that *all* long term costs of the operation (including profits, dividends, future liabilities for maintenance, pollution etc) be included, not just the cost of the construction. Local authorities who provide services based on an analysis such as this one *will* carry *all* costs of services provided - whether accounted for in the analysis or not. A detailed list of items is included in the next section.

3.6 A listing of items that need to be catered for in a determination of life cycle costs

In the calculation of life cycle costs for different levels of service of sanitation, there are a number of parameters or characteristics that need to be established. All will affect the calculation of cost to a greater or lesser degree, and allowance must be made for them when comparing costs of different levels of service, to ensure that one is comparing like with like. A tentative list is as follows:

Planning characteristics:

1. number of people per site [persons/site] and number of people per household [persons/household];
2. unit water consumption [l/cap.d];
3. size of urban area (metropolis, city, small town etc);
4. water resource characteristics (how far away, altitude difference from source to site, etc);
5. average or marginal costs (i.e. whether the costs are of a new development or the average for a city or urban area as a whole);
6. high-income or low-income areas, or average of the two;
7. 'greenfield' site or 'infill' site (bulk and connector infrastructure may already be in place);
8. layout characteristics, including erf size and shape, and ratio of gross to net areas (e.g. residential property vs gross area, including roads and other items such as schools, hospitals etc);
9. nature of residential area (e.g. flats, town houses, single dwelling);
10. nature of subsoil conditions (e.g. rock, high water table, loose sand etc);
11. topography (very hilly or very flat);
12. allocation of water losses (and sewer infiltration);
13. allocation of non-residential water use.

Engineering characteristics (over and above the planning characteristics):

1. quality of construction, operation and maintenance, to give a 'benchmarked' quality of service;
2. water pressures, including reliability;
3. treatment standards, including reliability;
4. sizing of reticulation to accommodate peak flows (i.e. average flow to peak flow ratio, as well as design/allowance for high flows);
5. means of dealing with replacement/major upgrade of aged infrastructure;
6. average operating level (e.g. at capacity of at some lower utilisation), and the length of time over which the design conditions will develop at a particular site.

Financial factors:

1. base date (both year and date, preferably day and month e.g. 30 June 2000) for costs, and how it is arrived at if costs are averaged over a financial year, say;
2. inflation rate;
3. interest rate;
4. unit time (e.g. per month, per year etc) and time of the month (in advance or in arrears) for repayment;
5. payback period, design life and/or actual life of infrastructure, for converting capital to ongoing cost;
6. relative size of labour, plant, materials components; as well as energy costs etc used as indicators of inflation rate for escalating or de-escalating costs;
7. economic climate (e.g. boom or recession, which affects competition for work).

Inclusion of externalities:

1. pollution from sanitation systems;
2. health impact.

More detailed questions - with specific reference to Johannesburg - on how the cost of different functions are treated, including items particularly relevant to low income settlements

1. How are the following costs recorded and allocated? (a) capital costs: on-site, reticulation, connector, treatment; (b) operating costs: on-site maintenance, bulk water, reticulation, collection/emptying, connector service, treatment.
2. How are the following items recorded and allocated? (a) interest and redemption on capital/loans (+loan details)p; (b) head office costs; (c) metering, billing + collection; (d) training; (e) supervision of consultants; (f) supervision of construction; (g) capacity of infrastructure; (h) written-off capacity (i.e. will never reach capacity because of poor location); (i) cost attached to risk of failure of infrastructure (e.g. 5 year flood instead of 10 year flood); (j) Water Service Authority (WSA) functions that are effectively carried out by JW as Water Service Provider (WSP) on an agency basis; (k) the dividend (R100m?) to be paid to CoJ; (l) Local Authority reserves (if they exist); (m) VAT+skills levies etc; (n) pension fund (is it fully funded?)+medical aid? (o) major rehabilitation of infrastructure; (p) bad debts.
3. Has any distinction been made between 'setting up' or 'restructuring' costs (i.e. extraordinary costs associated with setting up JW) and ongoing 'normal' business costs?

Questions - with specific reference to Johannesburg - relating to the source of information, how it is recorded, and how it is co-ordinated with the management function

1. It has been indicated that JW does not have what it considers to be a reliable asset register. What indication can be given of the form that the register to be constructed might take?
2. What are the JW 'cost centres' ? This is meant in the most general sense - i.e.where costs are allocated to particular functions or management groupings. Depots? Departments?
3. How is this integrated into management? What are the lines of reporting? To what extent are these aligned with outcomes required under the CoJ/JW agreement?
4. Where have the costs been published in the past (Annual reports; are they held in E&TI library; are they going to be replaced by the JW Annual Report, and in what form?)
5. Is JW following any norms from Dept of Finance or anyone else as to how it accounts for the value of capital assets, allowance for rehabilitation, bad debts etc?
6. What legislation does JW follow in its municipal accounting practices?

3.7 Conversion of capital costs to equivalent monthly costs

For illustrative purposes, further detail is given here of one particular parameter, based on several other common financial parameters. It is given as an example of such parameters, their use in construction of further parameters, and the sensitivity of cost to changes in these assumptions.

An important requirement for making comparisons of different levels of service, which have different ratios of capital and operating cost, is to be able to translate a once-off (capital) cost to an ongoing (say annual) cost, which is in the same format as the operating cost.

This may be done using the following formula:

$$Annualised\ cost = Once\text{-}off\ cost \times \frac{i(1+i)^N}{(1+i)^N - 1} \qquad \ldots\ldots\ldots\ldots\ldots\ (1)$$

Variables are as follows:

N repayment period
r interest rate
f inflation rate
i discount rate, which is calculated according to the formula:

$$i = \left(\frac{1+r}{1+f} - 1\right) \qquad \ldots\ldots\ldots\ldots\ldots\ (2)$$

TABLE 3.4:
PARAMETERS USED IN CALCULATION OF ANNUALISED COSTS

Interest rate	r	0.20
Inflation rate	f	0.15
Real discount rate	i	0.04348
Project life [years]	N	20
	(1+i)^N	2.34244
Annualised cost factor		0.07587

The difference between interest and inflation rates has remained at about 5% irrespective of fluctuations in inflation. For values of inflation between 5% and 15% (and interest rate 5% above inflation), the TACH factor (applied to capital cost to convert it to an annual cost) varies from 0.0759 to 0.0786. Costs are therefore not particularly sensitive to variations in inflation - as long as the relationship between interest and inflation remains constant.

3.8 What actual tariffs have been used by JW?

The official tariffs for the City of Johannesburg that are currently in place - given in Tables 3.5 and 3.6 below - make provision for *all* levels of *consumption*, but make no distinction between different levels of *service*. They are nominally assumed to be based on a full level of service.

TABLE 3.5:
TARIFF BANDS FOR WATER AND SEWER IN JOHANNESBURG 2002/2003 (<300m² plot size; excluding VAT)

Water use band [kl]	*Water tariff [R/kl]*	*Sewer tariff [R]*	*Total tariff [R]*
0 to 6	0	37	R37
6+ to10	R2.49/kl	37	R37 +R2.49/kl
10+ to 15	R9.96 +R4.48/kl	37	R46.96 +R4.48/kl
15+ to 20	R32.36 +R5.00/kl	37	R69.36 +R5.00/kl

This tariff structure translates to the following actual values:

TABLE 3.6:
TARIFFS FOR WATER AND SEWER IN JOHANNESBURG 2002/2003 (<300m² plot size; excluding VAT)

Water used [kl]	*Water tariff [R]*	*Sewer tariff [R]*	*Total tariff [R]*
6	0	37	37
10	9.96	37	46.96
15	32.36	37	69.36
20	57.36	37	86.90

In the case of the Stretford x4 shallow sewer pilot project, JW deviated from the promulgated sewer tariff of R37 per month and accepted a volumetric based tariff of R1 per kilolitre of water consumed. The volumetric tariff is understood to cover only the purification cost, and consumers are given a rebate on the balance of the operation and maintenance cost because they maintain their own sewer system.

In tabular form, these tariffs are as follows:

TABLE 3.7:
TARIFF BANDS FOR WATER AND SEWER IN STRETFORD x4 SHALLOW SEWER PILOT PROJECT, JOHANNESBURG 2002/2003 (<300m² plot size; excluding VAT)

Water use band [kl]	*Water tariff [R/kl]*	*Sewer tariff [R/kl of water consumed]*	*Total tariff [R]*
0 to 6	0	0	0
6+ to10	R2.49/kl	R1/kl	R3.49/kl
10+ to 15	R9.96 +R4.48/kl	R4.00 +R1/kl	R13.96 +R5.48/kl
15+ to 20	R32.36 +R5.00/kl	R9.00 +R1/kl	R41.36 +R6.00/kl

This tariff structure translates to the following actual values:

TABLE 3.8:
TARIFFS FOR WATER AND SEWER IN STRETFORD x4 SHALLOW SEWER PILOT PROJECT, JOHANNESBURG 2002/2003 (<300m² plot size; excluding VAT)

Water used [kl]	*Water tariff [R]*	*Sewer tariff [R]*	*Total tariff [R]*
6	0	0	0
10	9.96	4	13.96
15	32.36	9	41.36
20	57.36	14	71.36

The other key deviation of the Stretford x4 shallow sewer pilot project tariff from the promulgated tariff is in the magnitude of the impact fee of bulk services contribution that is paid by consumers. In Stretford x4, the connection fee has been set at the nominal amount of R100 per connection for the prepaid meter, whereas the normal connection fee, which *accompanies* the tariffs, would be very significantly higher than that (approximately R600[3] for the bulk and connector portion alone of the connection fee for an intermediate level of service for both water and wastewater in 1989/90 (Van Ryneveld, 1995: Table 3, p.6); estimated at well over double that - say R1 500 - in present day terms).

As indicated earlier, the matter is further complicated by various reciprocal contributions between the community and the service provider in respect of:

1. the community contribution of labour for construction, operation and maintenance of the condominial sewers;
2. payment to the community for labour;

---

[3] In the 1989/90 financial year, the connection fee or capital contribution for *bulk and connector services* in Johannesburg was approximately R812/kl.d of water usage and R985/kl.d for sewage flow respectively (figures de-escalated from 1990/91). For water usage of 12kl/month (0.4kl/d) and sewage flow of 0.75*12=9kl/month (0.3kl/d) for an intermediate level of service, the capital contribution would have been approximately 0.4*812 (=R324)+ 0.3*985 (=R296) = R620 say R600 in 1989/90, well over double that - say 2.5 or 3 times that - if escalated to 2002 = say R1 500 in 2002. This connection fee is payable to the local authority. Costs of *internal services* - R4234 for YT+AP internal water and sanitation services in 2000, say R4 000 (see Table 3.1, p.31) - would come on top of that and be paid to the developer. What subsidies cover which of these costs - and to what extent - requires more careful analysis.

3. training provided to the community by JW in the execution of the tasks.

The monthly water and sewer tariffs for the intermediate level of service (shallow sewers) in the Stretford x4 pilot study were agreed with the community. Furthermore, there is merit in such tariff structures in that they are:

1. simple;
2. more affordable to low-income communities than the promulgated tariff,
3. give consumers the benefit of the rising block tariff; and
4. provide a rebate for in-kind community contributions to the construction, operation and maintenance of the sewer system.

What is not clear, however, is:

1. whether consumers will in practice be able to restrict their consumption to below the free basic amount (i.e. 6kl/household.month), while using the intermediate level of service;
2. whether the shallow sewer system will be able to operate satisfactorily on the return flow from the free basic amount of water used;
3. whether - if consumption cannot be kept below the free basic amount (for whatever reason) - Johannesburg can afford to provide the intermediate level of service to residents for free, given that recovery of charges from existing low- income consumers is so low;
4. whether - if extended to large numbers of households in Johannesburg - the provision of services at these tariffs is financially sustainable for the provider in the long run.

For satisfactory and sustainable provision of the intermediate levels of service, all of the questions in the above section will need to be addressed.

3.9 What do we know about the problem of non-payment?

At the March 2000 Water Services Forum, organised by Rand Water, several presentations were made relating to the issues of non-payment, including presentations by Professor Lawrence Schlemmer of Markdata and Professor Bill Johnson of the Helen Suzman Foundation '...on the results of recent studies to strategically assess this ...issue' (Water Services Forum News, Sept 2000).

The magnitude of the problem was indicated by statistics presented (Water Services Forum News, Sept 2000) that non-payment for services in the Gauteng area, including illegal connections is currently costing each local authority around an average of R10 million each year or 25% of its income from water.

'The underlying causes of non-payment are not clearcut, simple or singular' said Professor Schlemmer (Water Services Forum News, Sept 2000). 'Results from the interviews show a good understanding by local authorities, metropolitan councils and water utilities of the problems behind payment default. These include poverty, minimal pressure to pay for water, unemployment, the historical boycott culture, the non-payment climate and the arrears trap. Added to this already long list are inconsistent credit control measures, lack of susceptibility to bureaucratic pressure, weakness of community structures and ineffectual leadership...' With respect to solutions, Schlemmer suggested a carefully formulated indigent policy; and '[c]oupled to an indigent policy', he went on to say '...is the need for affordable levels of service so the authorities can escape the structural problems associated with services at too high a level for the market to bear'. In closing, Schlemmer said that '...nothing less than such integrated and co-ordinated strategies are likely to reduce the problem to manageable proportions'.

The magnitude - and seriousness - of the local authority debt situation was highlighted by Provincial and Local Government Minister Sydney Mufamadi in response to a parliamentary question recently. He said that in 1999 about 62% of local authorities reported their outstanding debt to be R8.8billion. A year later 54% reported and the accumulated debt climbed to R11.7billion. Last year 88% of local authorities reported their financial details, bringing the amount owed for services to R22.2billion (Hartley, 2002: p.1). Director of municipal finance monitoring, Louise Miller, said that the improved reporting accounted for the dramatic increase in the past two years. She also said that the accumulated debt in the country's four metropolitan areas amounted to R9.4billion. The Johannesburg metropolitan councils had by far the largest debt - R4.56billion (Hartley, 2002: p.1).

These figures give a clear indication that the problem of non-payment for municipal services remains a severe problem in the country as a whole and in Johannesburg in particular.

3.10 Key matters to be addressed in detailed modelling for financial sustainability

For the purposes of decision-making more detailed modelling - essentially as required for preparation of Water Services Development Plans (WSDPs) - the following matters need to be addressed:

1. *External subsidies* that are available for low-income consumers need to be determined and provision for these in the tariffs ensured.
2. The relative total costs of these different consumer groups or service level groups need to be determined, to assess the extent to which it is possible to provide an *internal cross-subsidy* of poorer consumers by increasing the tariffs to richer consumers. A sensitivity analysis needs to be carried out to assess the impact of cross-subsidies over a period of time.
3. Because bulk and connector services form such a significant portion of the costs - particularly of the higher levels of service - the amount of *spare capacity* that exists in the network needs to be determined, which can be treated as a sunk cost that does not have to be recovered from new consumers. One has to be cautious here to recognise the effect that this may have on future infrastructure requirements - and make appropriate provision for future expansion.
4. Provision needs to be made for rehabilitation (or replacement) of ageing infrastructure. Much of the infrastructure in Johannesburg has been in place for periods of time approaching its design life. This means that even though the majority of households are provided with infrastructure, it will be necessary to spend significant sums of money on *rehabilitating or replacing existing infrastructure*. Provision therefore needs to be made for both the rehabilitation/replacement of ageing infrastructure as well as the extension of new infrastructure to households who are currently unserved or underserved (i.e. with low levels of service that may require upgrading).
5. Rehabilitation of ageing infrastructure is likely to reduce physical losses in the system; and together with other Unaccounted for Water (UFW) and cost recovery programmes, is likely to increase the efficiency of the utility, which in turn will *reduce the need for tariff increases*. The effects of this need to be assessed.
6. A further requirement may be for *improvements* to the infrastructure or service where environmental standards may be raised (e.g. discharge requirements for wastewater treatment works).

7. Plans for upgrading of levels of service (e.g. from basic to intermediate), how this is envisaged to happen, and what the cost implications are need to be thought through and developed.

All of the above need to be modelled over a extended period of time - together with demographics and economic development in order to determine appropriate tariff levels and service provision strategies.

This - on the financial side - is the essence of what is required by the WSDPs.

3.11 Conclusions

1. As indicated in the previous chapter, one of the 'rules' with which a local authority[4] appears compelled to comply is that of financial sustainability. What this implies for the local authority is that:
   (a) There must be a clear distinction between cost, price and subsidy; and
   (b) For the operation of the local authority as a whole in the long term, the expression C#P+S *must* hold true (where C=cost, P=price and S=subsidy).

   In other words, the price of the services provided by a local authority must be set at a value that will enable it to continue to provide these services on a financially sustainable basis. The price of the good or service may be reduced by the amount of internal cross-subsidy from richer to poorer consumers (normally by means of a rising block tariff) and/or by external subsidy (from a source outside the local authority). But whatever happens, total expenditure of the service provider must be covered by total income (from all sources, including external subsidy income). The matter is complicated by:
   (a) the service provider's need to borrow in order to fund major capital works;
   (b) C, P and S have further components (capital and operating; internal and bulk/connector; which can be expressed as one-off costs or can be translated into ongoing monthly or annual costs;
   (c) The price may be reduced by the amount of subsidy. For Free Basic Water (FBW) the cost is subsidised in full so that demand is not tested for the basic amount.

   Nevertheless, breakeven is where C = P + S, and in the long run, the utility must be able to cover its costs, otherwise (to state the obvious) it will go bankrupt.
2. At the planning stage, there are a number of more specific levels of detail at which costs can be determined:
   (a) *Country-wide or regional estimates of average unit costs* e.g. Van Ryneveld (1995), or Palmer Development Group (1993 and 1994) - updated in Van Ryneveld (2000). These costs do not make provision for specific local conditions e.g. economies of scale of infrastructure (There are distinct differences between ERWAT and City of Johannesburg). They give a good 'first pass' overall understanding of the costs of different levels of service and what factors influence them, but generally have insufficient local detail for tariff-setting at local authority level.
   (b) *Average unit costs for the particular local authority or service provider, derived from historical costs* e.g. as derived from annual reports or summary studies e.g.

---

[4] While this applies in the first instance to a local authority as a whole, the principle would apply equally to the operation of a service provider.

iGoli 2002 (GJMC, 2000b?). These may be refined to produce more detailed equivalent costs to (a). They may also be translated into a model that can check sensitivity of various parameters (as suggested in the costing framework; see Van Ryneveld, 2000). Their limitation is that they remain essentially static models, and are not able to model changes in costs and level of service distributions over a period of time.

(c) *Financial modelling of the service over a period of time* e.g. Palmer Development Group (1998a). This level of modelling would normally be undertaken for a large local authority for the construction of the WSDP. The approach is described in the Management Guidelines for Water Service Institutions (Palmer Development Group, 1998b).

(d) *Detailed GIS-based physical modelling* of the actual network extensions, which can test the effect of different layouts, settlement densities, levels of service etc e.g. Boutek model; see Biermann and Landre (2002). Some current masterplanning may provide some of this data.

(e) *Combinations of different aspects* would provide a high level of modelling ability. e.g. integration of dynamic cost and tariff modelling together with physical modelling, supplemented by willingness-to-pay studies and economic development models.

A graded effort can also be a wise approach i.e. start with a fairly simple study (e.g. review of theoretical understanding, combined with more specific data from previous local investigations) to gain an understanding of the problem, and then follow it with more detailed studies. Many key understandings can be obtained from fairly rudimentary planning. This permits scarce resources to be targeted at specifically identified problem areas as the investigation progresses.

For decision-making in a large metropolitan local authority such as Johannesburg, static modelling of costs can provide a first estimate, but dynamic modelling of costs, prices, subsidies etc over a period of time is necessary for decision-making regarding tariffs and levels of service.

3. Updated costs (regional estimates of average unit costs; see (a) above) repeat earlier assertions that the life cycle cost of a full level of service of water supply and sanitation in Gauteng is (on average) 3 to 4 times the cost of a basic level of service; and the cost of an intermediate level of service is 1½ to 2 times that of a basic level of service.

4. A first indication of unit costs for Johannesburg may be derived from summary figures given by CoJ itself as part of the iGoli 2002 initiative (GJMC, 2000b?) (average unit costs for the particular local authority or service provider, derived from historical costs; see (b) above), which yield figures of about R18 000 per connection for average replacement capital cost for a full level of service of water and wastewater. This falls squarely within the range of estimates for the average of Gauteng. It is also very much of the same order of magnitude as the total housing subsidy amount of R20 300 (for income category of 0 to R1 500 per month; Department of Housing, Gauteng, 2002).

5. While the costs of the DDPLG Water and Sanitation Backlog Study (DDPLG, 2001) were not analysed in detail, it appears that while the estimates of operating cost as used in the study are not unreasonable, the estimates of capital cost are low as compared with figures for Gauteng presented in this study.

6. Whatever method of costing is used, it is essential that there be a clear and detailed statement of what assumptions have been made in the costing and what the costs represent. For this purpose, a ‘costing framework’ may be useful, which would provide a set of rules or standard method by which costs might be calculated. This would permit a consistent - and auditable - comparison to be made of the costs of any water supply and

sanitation option that might be proposed.

7. In the case of the Stretford x4 shallow sewer pilot project, JW deviated from the promulgated sewer tariffs in two respects:
   (a) in using a volumetric based tariff of R1 per kilolitre of water consumed, instead of the flat rate of R37/household.month (2002/2003 tariffs). (The volumetric tariff is understood to cover only the purification cost, and consumers are given a rebate on the balance of the operation and maintenance cost because they maintain their own sewer system).
   (b) in substantially reducing the impact fee for the bulk services contribution that is paid by consumers.

   By comparison with the costs of services, these tariffs appear to be low. The matter is further complicated by various reciprocal contributions between the community and the service provider in respect of:
   (c) the community contribution of labour for construction, operation and maintenance of the condominial sewers;
   (d) payment to the community for labour;
   (e) training provided to the community by JW in the execution of the tasks.

   The monthly water and sewer tariffs for the intermediate level of service (shallow sewers) in the Stretford x4 pilot study were agreed with the community. Furthermore, there is merit in such tariff structures in that they are:
   (a) simple;
   (b) more affordable to low-income communities than the promulgated tariff,
   (c) give consumers the benefit of the rising block tariff; and
   (d) provide a rebate for in-kind community contributions to the construction, operation and maintenance of the sewer system.

   What is not clear, however, is:
   (a) whether consumers will in practice be able to restrict their consumption to below the free basic amount (i.e. 6kl/household.month), while using the intermediate level of service;
   (b) whether the shallow sewer system will be able to operate satisfactorily on the return flow from the free basic amount of water used;
   (c) whether - if consumption cannot be kept below the free basic amount (for whatever reason) - Johannesburg can afford to provide the intermediate level of service to residents for free, given that recovery of charges from existing low-income consumers is so low;
   (d) whether - if extended to large numbers of households in Johannesburg - the provision of services at these tariffs is financially sustainable for the provider in the long run.

8. On the matter of non-payment, Professor Schlemmer (Water Services Forum News, Sept 2000) said: “The underlying causes of non-payment are not clearcut, simple or singular” and “...nothing less than such integrated and co-ordinated strategies are likely to reduce the problem to manageable proportions.” Figures (Hartley, 2002: p.1) indicating that the accumulated debt in the country’s four metropolitan areas amounted to R9.4billion, and that the Johannesburg metropolitan councils had by far the largest debt - R4.56billion - give a clear indication that the problem of non-payment for municipal services remains a severe problem in the country as a whole and in Johannesburg in particular.

9. For the purposes of decision-making more detailed modelling - essentially as required for preparation of Water Services Development Plans (WSDPs) - the following matters need to be addressed:
   (a) Determine *external subsidies* that are available for low-income consumers and

ensure that provision is made for these in the tariffs;

(b) Determine the extent to which it is possible to provide an *internal cross-subsidy* of poorer consumers by increasing the tariffs to richer consumers over a period of time;

(c) Because bulk and connector services form such a significant portion of the costs - particularly of the higher levels of service - it is necessary to determine the amount of *spare capacity* that exists in the network, which can be treated as a sunk cost that does not have to be recovered from new consumers. One has to be cautious here to recognise the effect that this may have on future infrastructure requirements - and make appropriate provision for future expansion;

(d) Make provision for rehabilitation (or replacement) of ageing infrastructure;

(e) Assess the impact of rehabilitation on physical losses in the system;

(f) Assess the need for future improvements to the infrastructure or service where environmental standards may be raised (e.g. discharge requirements for wastewater treatment works);

(g) Envisage and plan for upgrading of levels of service (e.g. from basic to intermediate), for how this might happen, and what the cost implications are likely to be.

All of the above need to be modelled over a extended period of time - together with demographics and economic development in order to determine appropriate tariff levels and service provision strategies. This - on the financial side - is the essence of what is required by the WSDPs.

4 ENVIRONMENTAL SUSTAINABILITY

4.1 Introduction

As indicated in Chapter 2, the second of the 'rules' with which a local authority appears compelled to comply is that of environmental sustainability.

This chapter seeks to identify the principles and procedures to be followed by a local authority seeking to provide on-site sanitation in significant numbers at relatively high densities (of the order of 30-50 houses/ha) to households in urban and peri-urban areas. This would include obtaining the necessary environmental authorisations to do so.

Whereas the previous topic of financial sustainability falls mainly *within* the responsibility of the local authority (even if split between Water Services Authority (WSA) and Water Services Provider (WSP)), a *significant part* of this topic falls *outside* the responsibility of the local authority, in the domain of the national Department of Water Affairs and Forestry (DWAF). The reason for this is that DWAF is the formal custodian of the country's water resources and therefore carries responsibility for key policy decisions in this area.

4.2 Applicable legislation and responsibility

At the outset, it is necessary to distinguish between 'regulation'/ 'statutory requirements' and 'support'. These procedures concentrate first on the regulatory/statutory requirements, and thereafter on guidelines/support requirements.

The requirements for control of environmental impact of on-site sanitation are legislation-driven, the primary legislation appearing to the National Water Act of 1998. There is, however, some overlap with other environmental legislation, which means that more than one national department carries responsibility in this area.

DWAF guideline documents applicable to this topic include the following (in chronological order):

Xu, Y and Braune, E (1995) *A Guideline for Groundwater Protection for the Community Water Supply and Sanitation Programme,* DWAF Community Water Supply and Sanitation, 1st Edition.

DWAF (1997) *A Protocol to Manage the Potential of Groundwater Contamination from On Site Sanitation,* National Sanitation Co-ordination Office and DWAF Directorate of Geohydrology, 1st Edition.

DWAF (1999) *Managing the Water Quality Effects of Settlements: The National Strategy,* Policy Document U1.1, DWAF Directorate: Water Quality Management, 1st Edition.

DWAF (2000a) *Water Use Authorisation process (individual applications),* DWAF Chief Directorate: Water Use and Conservation, 1st Edition, Revision 3, December.

DWAF (2000b) Policy and Strategy for Groundwater Quality Management in South Africa, 1st Edition.

What is also significant is the date at which these guidelines were produced. Some are prior to the latest national legislation; others are subsequent to it - and therefore can be considered to be more applicable.

The Water Use Authorisation Process (DWAF, Dec 2000a), which rests on the National Water Act of 1998, appears to be the most current procedure. In it, the following procedure of departmental consultation is set out. Note that environmental impact of on-site sanitation falls primarily (although not exclusively) under section 21(g).

TABLE 4.1:
DWAF CONSULTATION PROCEDURE UNDER THE WATER USE AUTHORISATION PROCESS (DWAF, Dec 2000)

Water Use	Description	Primary Responsible Officer (PRO: 🗣), DWAF LWUD (✓) & Directorates for Consultation (👥)									
		Regions			Head Office						
		SD:WQM	SD:GH	SD:WU	D:WU	D:WQM	D:SES	D:GH	D:CD	D:WRP	D:H
21(a)	Taking of water from a water resource (Surface water)	👥	👥	🗣	✓	👥	👥	👥		👥	
	Taking of water from a water resource (Groundwater)	👥	🗣	👥	👥	👥		✓		👥	
	Taking of water from a government water works: s112	👥		🗣	✓	👥				👥	
21(b)	Storing of water (not containing waste)			🗣	✓		👥		👥	👥	
21(c)	Impeding or diverting the flow of water in a water course (note: all river diversions are dealt with under s21(i) and structures capable of containing, storing or impounding water is dealt with under s21(b))				👥	👥	✓& 🗣		👥		
21 (d)	Engaging in a stream flow reduction activity	👥	👥	🗣	✓			👥		👥	
21(e)	Engaging in a controlled activity: s37(1)(a) irrigation of any land with waste or water containing waste generated through any industrial activity or by a waterwork	🗣	👥	👥	👥	✓		👥		👥	
	Engaging in a controlled activity: s37(1)(b) an activity aimed at the modification of atmospheric precipitation						👥				✓& 🗣
	Engaging in a controlled activity: s37(1)(c) a power generation activity which alters the flow regime of a water resource			🗣	✓		👥				
	Engaging in a controlled activity: s37(1)(d) intentional recharging of an aquifer with any waste or water containing waste	🗣	👥		👥	✓		👥			
21(f)	Discharging waste or water containing waste into a water resource	🗣		👥	👥	✓		👥			
21(g)	Disposing of waste in a manner which may impact on a water resource (includes "storing" of water that does contain waste = disposal to atmosphere)	🗣	👥			✓		👥	👥		
21(h)	Disposing of water which contains waste from, or which was heated in, any industrial or power generation process	🗣		👥	👥	✓					
21 (i)	Altering the bed banks, course, or characteristics of a watercourse. (This includes altering the course of a watercourse, previously referred to as river diversions.)	👥			👥	👥	✓& 🗣		👥		
21(j)	Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity, or for the safety of people	🗣	👥		👥	✓		👥			
21((k)	Using water for recreational activities					👥	✓& 🗣		👥		

Abbreviations:
WU = Water Utilisation; WQM = Water Quality Management; SES = Social & Ecological Services; GH = Geohydrology; CD = Civil Design; H = Hydrology; WRP = Water Resource Planning; D = Directorate; SD = Subdirectorate.

The specific personnel who may be involved in this decision-making are listed with their contact details in Table 4.2, and are included as illustrative of the number of individuals who may be involved to a greater or lesser degree in the decision-making process on behalf of DWAF.

TABLE 4.2:
RELEVANT DWAF PERSONNEL INVOLVED IN DECISION-MAKING IN RELATION TO ENVIRONMENTAL SUSTAINABILITY OF SANITATION SYSTEMS IN GAUTENG

Name	*Designation*	*Tel*	*Cell*	*e-mail*
Hinsch, Manda, Ms	Deputy Director: Water Quality Management (Urban Development)	(012) 336 7548	(082) 808 9938	tba@dwaf.gov.za or manda@dwaf.gov.za
Bosman, Carin, Ms	Assistant Director: Water Quality Management (Urban Development and Agriculture?)	(012) 336 7556	(082) 809 5417	ted@dwaf.gov.za or carin@dwaf.gov.za
Boyd, Lee, Mrs	Assistant Director: Water Quality Management (Urban Development and Agriculture?)	(012) 336 7277	(082) 801 4709	tbg@dwaf.gov.za or boydla@dwaf.gov.za
Fayazi, Morteza	Principal Hydrologist: Gauteng	(012) 392 1382	(082) 809 5726	fayazim@dwaf.gov.za
Keet, Marius	Deputy Director: Water Quality Management, Gauteng South	(012) 392 1306	(082) 807 3522	keetm@dwaf.gov.za
Venter, Peet	? Water Quality Management, Gauteng North			
Maluleke, Jabu	Assistant Director: Water Quality Management, Gauteng North	(012) 392 1409	(082) 807 5720	malulej@dwaf.gov.za
Aleobua, Bonniface	Deputy Director: Groundwater (Services)	(012) 336 8262	(082) 807 5719	wad@dwaf.gov.za
vd Westhuizen, JLJ (Sakkie)	Director: Water Quality Management	(012) 336 7541		taa@dwaf.gov.za
Selepe, Marcus	Assistant Director: Water Quality Management (Dense Settlements?), Gauteng South	(012) 392 1372	(082) 806 8429	
vd Westhuizen, Walter	Chief Engineer: West (Upper Vaal), Water Utilisation,Gauteng (registering and licencing)	(012) 392 1305	(082) 807 3527	vdwestw@dwaf.gov.za
Smit, Hennie	Regional Director: Gauteng	(012) 392 1301/2	(082) 802 5715	smith@dwaf.gov.za
Bredenhann, Leon	Deputy Director: Water Quality Management (Waste Management)	(012) 336 7552	(082) 808 0502	tea@dwaf.gov.za
Braune, Eberhard	Director: Geohydrology	(012) 336 7860	(082) 808 5952	waa@dwaf.gov.za

4.3 Decision-making at DWAF

Notwithstanding these documented procedures, there remain a number of uncertainties around how regulations may be applied. The DWAF Water Quality Management decision-making hierarchy (DWAF, 2002a; Directorate: Water Quality Management, Chief Directorate: Water use and Conservation), which is intended to give direction in such situations, is quoted in full as

follows:

1. *Prevention of pollution:*
Prevent waste production and pollution of water resources wherever possible. "Prevention is better than cure"

2. *Minimisation of pollution at source:*
Minimise unavoidable waste production through:
- Recycling/ Re-use of waste or water containing waste;
- Detoxifying;
- Neutralisation; and/ or
- Treatment of waste streams; and/ or
- Introduction of cleaner technologies and best management practices ("Housekeeping").

3. *Disposal of waste and/or discharge of water containing waste according to the precautionary principle:*
If there exists no alternatives to the disposal of waste and/ or the discharge of water containing waste, the precautionary principle applies.

In the instance of the discharge of water containing waste, the Waste Discharge Standards, as set by the Department of Water Affairs and Forestry (currently the General, Special and Special Standards for Phosphate), applies as the minimum requirement.

In the instance of the disposal of waste, the Minimum Requirements for waste disposal, as set by the Department of Water Affairs and Forestry, applies as the minimum requirement.

(Such disposal of waste and/ or discharge of water containing waste will only be allowed if the receiving environment has the capacity to assimilate the additional waste load.)

4. *Disposal of waste and/ or discharge of water containing waste according to the differentiated approach:*
If the minimum requirements, mentioned above, are insufficient to ensure the fitness for use of the receiving water environment, stricter standards will be enforced in accordance with the differentiated approach.

Relaxation from compliance with the minimum requirements, mentioned above, will only as a last resort be considered if the receiving environment has the capacity to assimilate the additional waste load. Relaxation would have to be justified on the basis of technology, economic and socio-political considerations.

The differentiated approach takes account of catchment specific conditions and includes the determination of Resource Quality Objectives (RQOs), Resource Water Quality Objectives (RWQOs) and the setting of standards that must ensure compliance to both RQOs and RWQOs. The levels at which the above in-stream objectives will be set, will be determined through the application of a Management Classification System for the particular water resource.

The hierarchy may be summarised by the following key words/phrases:
1. Prevention;
2. Minimisation at source;
3. Disposal according to the precautionary principle;
4. Disposal according to the differentiated approach.

In similar manner to the general sanitation policy principles, these water quality management principles give somewhat limited assistance in deciding how decisions might be made in *particular* instances. They cannot easily be resolved in absolute terms; but rather have to be resolved through strategy. In order to give more specific direction to implementers such as local authorities, it is necessary for these principles to be resolved in *national and regional water resources strategies*.

4.4 Application of the Groundwater Protocol

The most specific - and currently used (even if possibly out of date) - guideline for environmental impact of on-site sanitation is the Groundwater Protocol (DWAF, 1997).

The Groundwater Protocol only applies to situations where (a) the on-site sanitation is located on what is classified as a 'Major' aquifer system; and (b) '...groundwater [is] used or [is] likely to be used to supply the village or town with water for domestic or stock-watering purposes'.

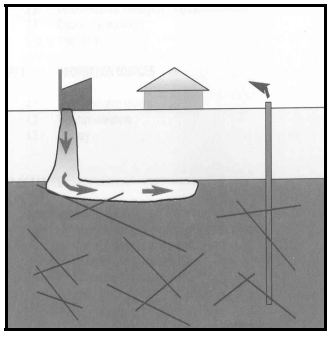


FIGURE 4.1: DIAGRAM OF CONTAMINANT PATH (DWAF, 1997)

The situation that the Groundwater Protocol is aimed at is illustrated in Figure 4.1. This is the case where there is a risk of pollution by on-site sanitation of water extracted from aquifer for drinking or stock-watering purposes.

While there may be a number of cases where this situation does occur, groundwater is not the major source of domestic drinking water in Johannesburg, and this is therefore not really the problem that a metropolitan local authority such as CoJ is facing. If there are boreholes, they are likely to be sited at more than 50 or 75m from the pit latrine sites. There is therefore unlikely to be a risk of contamination of groundwater that is to be extracted for use. These cases will nevertheless need to be checked and documented. (Whether this is the function of the Water Service Authority (WSA) or Water Service Provider (WSP) is unclear at this stage).

The procedure is described in the flowchart for the Groundwater Protocol as follows:

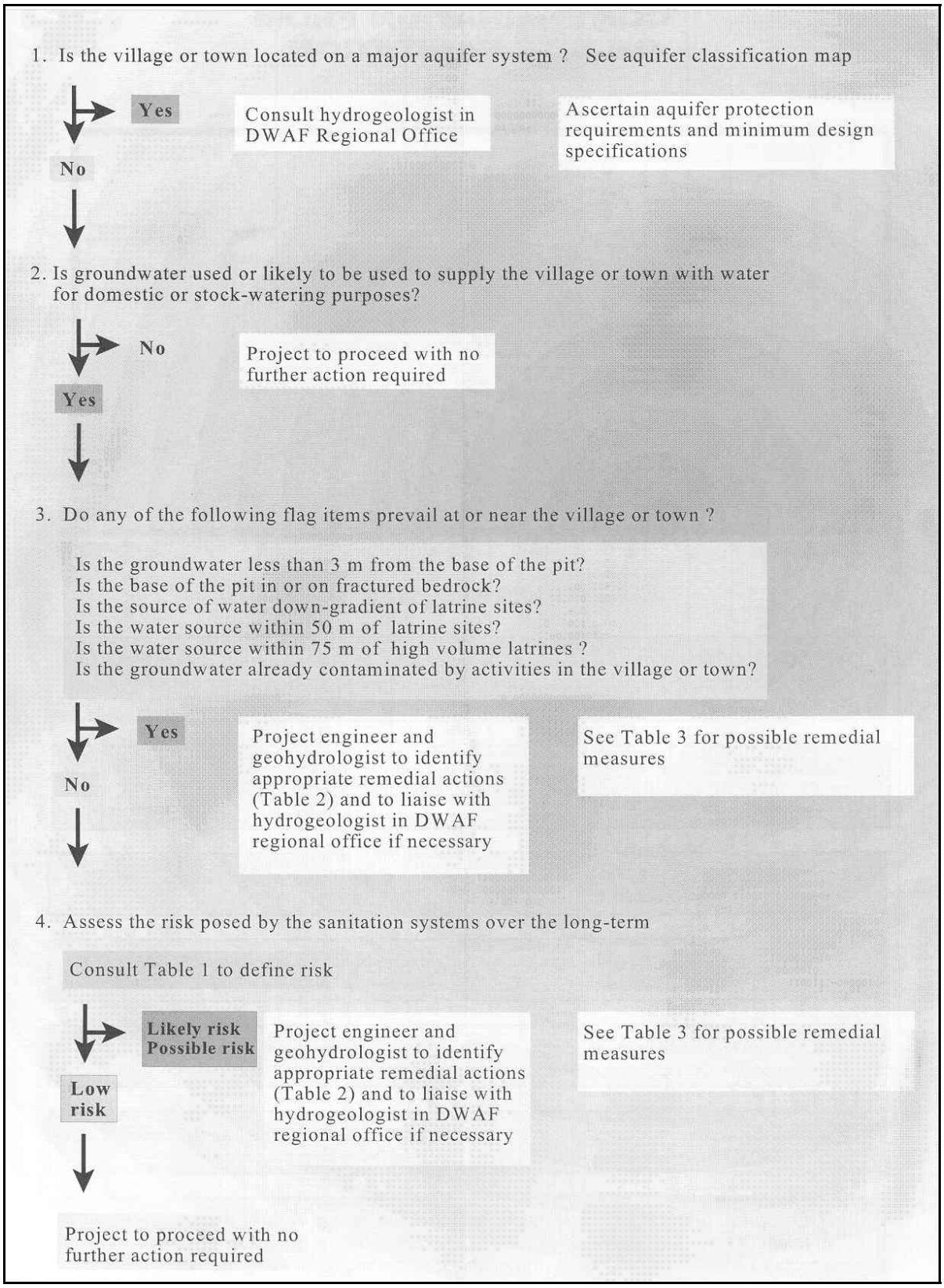


FIGURE 4.2:
GROUNDWATER PROTOCOL FLOWCHART (DWAF, 1997)

Further comments on the Groundwater Protocol are as follows:

1. On-site sanitation is currently being used in the short term across the country - particularly in 'Minor' or 'Poor' aquifer systems. Gauteng should not really be treated any differently. On the basis of the Groundwater Protocol (no groundwater used for domestic purposes in the short term say 10 to 20 years?), on-site sanitation should be permitted. The issue at stake here is *not* whether there will be any *contamination* (because even limited contamination is likely to occur, certainly in the long term) but rather whether the aquifer is of *major strategic importance*.
2. How one proceeds in dolomitic ground is less clear: It is not necessarily the case that water-borne sanitation will be more suitable than on-site sanitation. Any development on dolomitic ground carries risk with it: (a) risk of sinkholes; (b) risk of contamination of the dolomitic groundwater resource. Leaks from water-borne sanitation - which tend to be concentrated and to have much stronger flows - may well pose a far greater risk of either sinkholes or pollution than flows from on-site sanitation. Whether any further development on dolomitic areas should be permitted at all is a matter for careful consideration.

A suggested approach for addressing environmental sustainability of sanitation systems is as follows:

1. In the very short term (say 2 or 3 years; say less than 10 years), adopt a *health* focus (ensure access to adequate sanitation for all in the short term):
   (a) ensure that basic (health-protecting) on-site sanitation is provided to all;
   (b) ensure that health and hygiene education is provided to all;
   (c) ensure that contaminants from both excreta and greywater do not surface (and so come into contact with people), but remain in the sub-surface;
   (d) ensure that a clean water supply is provided;
2. With respect to *short term environmental impact* (say 3 to 10 or 20 years):
   (a) minimise diffuse pollution by design for - and possible treatment of - greywater;
   (b) assess (only) the long term impact of on-site sanitation i.e. assess the water resources (groundwater and surface water), estimate impacts and likely long term scenarios, together with long term planning for service provision and for development, using a mass balance/mass flow approach;
   (c) establish baseline water quality status, and establish an ongoing monitoring system.
3. With respect to *long term environmental impact* (say longer than 20 years):
   (a) While the aquifers may not be strategic now or in the short term future (say 10 to 20 years?), they may become of strategic importance in the medium to long term future (say 50 to 100 years?). There is therefore a need to develop sound understanding of longer term behaviour of contaminants and their possible management, which is a combination of physical and social factors.
   (b) Initiate longer term research and discussion into these matters. In particular, assess very carefully those short term interventions that may have long term impacts.
4. Where further work is required is as follows:
   (a) water resources assessment of groundwater aquifers and an assessment of when they are likely to be used (from an assessment of demand).
   (b) what remedial measures (or treatment measures) will need to be put in place to ensure that the water is safe for domestic and stock-watering purposes.
   (c) clarification of the ownership of the *characteristics* of the groundwater resource i.e. its quality.

(d) clarification as to whether local authorities will be legally responsible for cleaning up the aquifer under the 'polluter pays principle' - even if it is given a permit to do so by DWAF (Similar clarification may be required for surface water resources as well).

4.5 Groundwater and surface water catchments

Maps indicating groundwater and surface water catchments in South Africa and Gauteng are as follows:

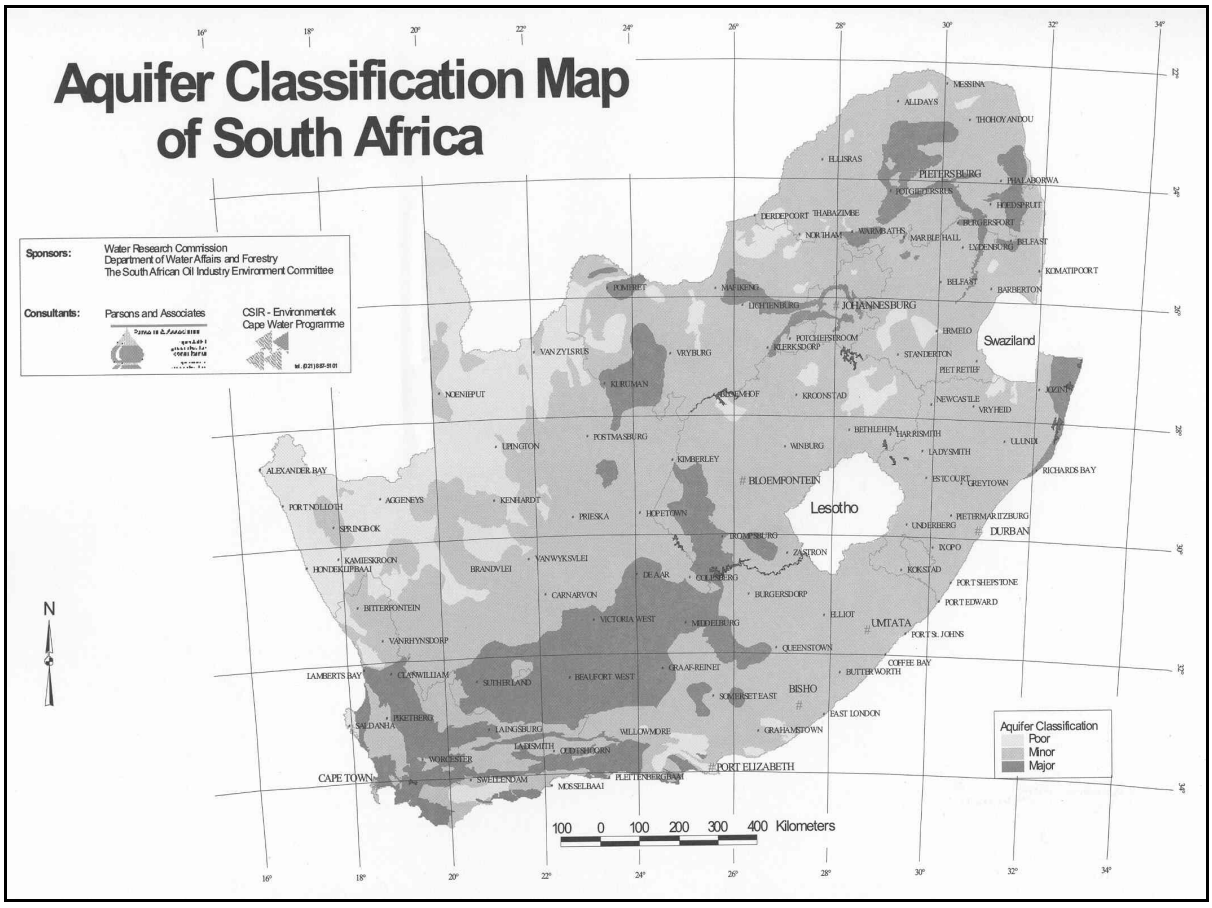


FIGURE 4.3:
AQUIFER CLASSIFICATION MAP OF SOUTH AFRICA (DWAF, 1997)

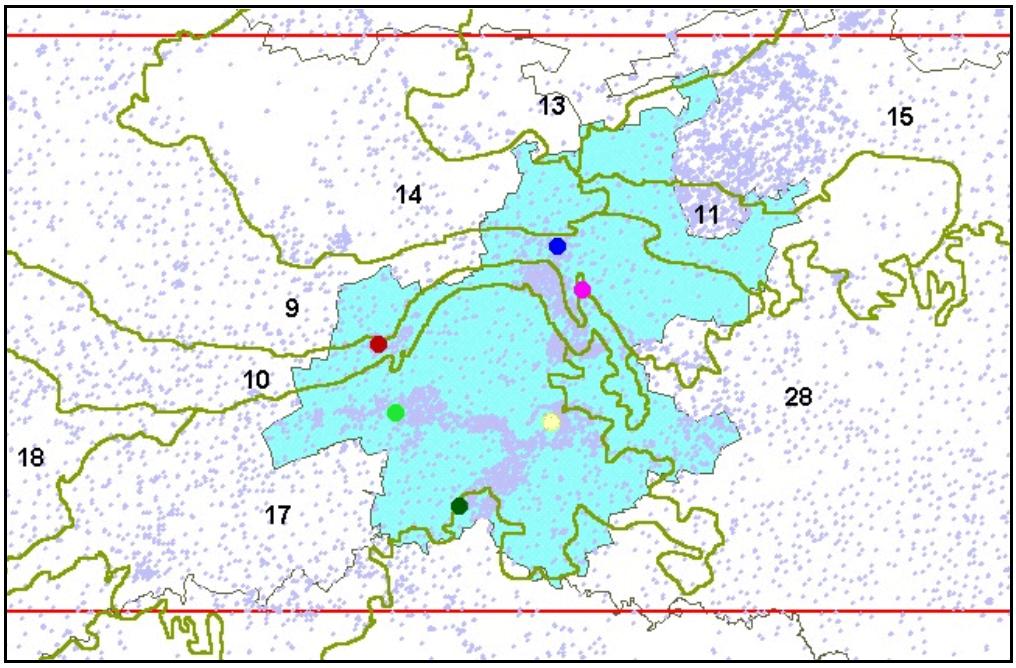


FIGURE 4.4:
MAP INDICATING GROUNDWATER CATCHMENTS IN GAUTENG PROVINCE, AND BOREHOLE LOCATION (DWAF, 2002b)

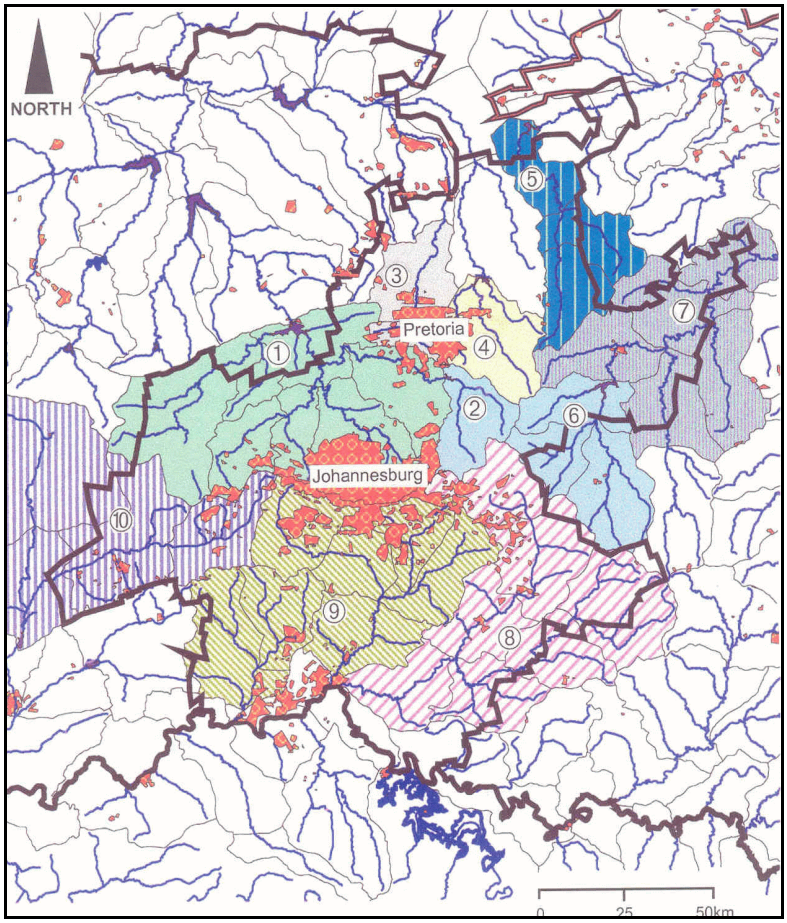


FIGURE 4.5: SURFACE WATER IMPOUNDMENT CATCHMENTS IN GAUTENG (Van Ryneveld et al., 2001)

4.6 Other legislation covering environmental impact of on-site sanitation systems

While the primary legislation covering the use of on-site sanitation is the National Water Act of 1998, the matter also appears to be covered under the National Building Regulations. The relevant extract is included below in full.

While the general objectives of the regulations set out in clause (1) appear quite reasonable, some of the detail following appears to be considerably more prescriptive than certainly the Groundwater Protocol, which is a potential source of confusion.

Extract from:
RSA (1985) Government Notice: Department of Trade and Industry No. R.441, 1 March 1985: National Building Regulations and Building Standards Act, 1977, Government Gazette: Regulation Gazette No.3805, Vol. 237, No.9613, 1 March 1985, pp.70-72, 98

P16. CONSERVANCY TANKS, SEPTIC TANKS AND FRENCH DRAINS

(1) Any conservancy tank or septic tank to be used on a site for the reception of sewage shall—

(a) be designed and constructed so that it will be impervious to liquid;

(b) be so sited—

(i) that there will be a ready means of access for the clearing of such a tank;

(ii) as not to endanger the structure of any building or any services on the site; and

(c) be so designed that it is not likely to become a source of nuisance or a danger to health.

(2) Any septic tank shall subject to the requirements contained in subregulation (7), discharge to a french drain.

(3) Any septic tank shall—

(a) where it is to serve a dwelling house or dwelling unit be of a designed capacity of not less than 1,7 m^3 and be capable of receiving the relevant sewage flow given in Table 2.

(b) where it is to serve any building, not being a dwelling house or dwelling unit, be of a designed capacity not less than three times the daily flow, from such building, using the per capita sewage flow given in Table 3 or such other flow as may be determined by the local authority where not so given.

(c) be so constructed that—

(i) it is provided with a means of access for the purpose of emptying and cleaning; and

(ii) the depth in such tank below the outlet invert shall be not less than 1,0 m and there shall be an airspace of not less than 200 mm between the surface of the liquid contained therein and the underside of the top cover of such tank.

TABLE 2

SEWAGE FLOWS FROM VARIOUS DWELLING HOUSES OR DWELLING UNITS

1	2
Number of bedrooms	Sewage flow litres per day
2	700
3	900
4	1 100
5	1 400

TABLE 3

SEWAGE FLOW FROM BUILDINGS NOT BEING DWELLING HOUSES OR DWELLING UNITS

1	2
Type of establishment	Litres per person per day
Boarding houses	110
(Additional kitchen wastes for non-resident boarders)	23
Hotels without private baths	110
Hotels with private baths	140
Restaurants (toilet & kitchen wastes per patron)	20
Tourist camps or caravan parks with central bathhouse	90
Day schools	37
Day workers at offices per shift	90
Hospitals	500
Factories (litres per person per shift, exclusive of industrial wastes)	140
Swimming baths	9
Motels (per bed)	90
Drive-in theatres (per car space)	9

(4) No industrial effluent shall be allowed to flow into any septic tank.

(5) Any conservancy tank shall, subject to the clearing services provided by the local authority in question—

(a) have a capacity as prescribed by such local authority;

(b) be constructed with means of access for cleaning;

(c) be provided with a means for clearing as prescribed by such local authority.

(6) Any french drain which is to receive effluent or any evapotranspirative bed shall—

(a) be so constructed and located as not to cause the pollution of any spring, stream, well or other source of water which is used, or is likely to be used, for drinking, domestic or kitchen purposes;

(b) have a capacity, be so constructed and contain suitable material so as to adequately receive and dispose of any effluent flowing into it; and

(c) be not less than 3 m from any building or boundary of the site on which it is situated.

(7) (a) The ground in which it is proposed to construct a french drain shall be tested for percolation in accordance with the method set out in Schedule 2 of this Part.

(b) Where, after testing in accordance with Schedule 2 of this Part, the site has been found suitable for the use of a french drain, such french drain shall be constructed to such dimensions that the rate of application of effluent to the infiltration area, within such french drain, does not exceed the values given in column 2 of Table 4 as appropriate to the percolation rate given in column 1 of such table.

TABLE 4

RATES OF PERCOLATION AND EFFLUENT APPLICATION

1	2
Percolation rate: Average time for 25 mm fall of test water level	Rate of application of effluent to subsoil infiltration areas, litres per m^2 of french drain wall area per day
0–3 minutes	108 maximum
3–5 minutes	108—100
6–10 minutes	99—80
11–15 minutes	79—65
16–20 minutes	64—53
21–26 minutes	52—40
27–30 minutes	39—33
Over 30 minutes	Not permitted

Note: Intermediate values to be obtained by interpolation.

(c) No french drain shall be constructed in any ground where—

(i) such ground has a percolation rate exceeding 30 minutes;

(ii) any effluent may flow out due to the contours of or the strata forming such ground;

(iii) the site to be affected by such effluent is of insufficient size to accommodate the soaking away of the effluent;

(iv) the level of the water table is or may be such as to prevent adequate percolation; or

(v) any site may be affected by the presence of such french drain.

(8) An evapotranspirative bed may, subject to the provisions of section 10 of the Act, be installed instead of a french drain.

SCHEDULE 2

IN-SITU PERCOLATION TEST FOR SOILS

1. For the purposes of establishing the suitability of any soil in which the construction of a french drain is to be carried out the following test procedure and evaluation shall be carried out by the owner of the site in question.

2. (a) There shall be excavated, on such site, a test hole or, where necessary, a number of holes uniformly spaced, to a depth estimated for the proposed french drain.

(b) The bottom 300 mm of such hole shall have a diameter of 300 mm or have a plan shape 300 mm square.

(c) The sides of such bottom part shall be roughened to provide a natural infiltration surface.

(d) Any loose material shall be removed from the bottom of such hole and shall be replaced by a 50 mm thick layer of gravel to prevent scouring when such hole is filled with water.

3. (a) Such hole or holes shall be filled with water to a height of not less than 300 mm above such gravel and maintained at such a level for a period of not less than 4 hours.

(b) If such water soaks away immediately it shall be replaced with water to a height of 150 mm above such gravel.

(c) The drop in level of such water as it soaks away over a period of 30 minutes shall be measured: Provided that, if all the water percolates away before such 30 minutes, the actual time taken for this to occur shall be measured.

(d) From the time taken for such water level to drop 25 mm the percolation shall be calculated: Provided that where a number of holes are tested the average percolation rate for the site shall be calculated and such average shall be used as the percolation rate for the french drain effluent.

4. Where such percolation rate is less than 30 minutes the soil on site shall be deemed suitable for the excavation, construction and use of a french drain.

4.7 Conclusions

1. There is potential confusion between the procedures of:
   (a) National Building Regulations (1985);
   (b) Groundwater Protocol (1997);
   (c) Water Use Authorisation Process (DWAF, 2000a) of the National Water Act (1998);
   (d) Environmental impact procedures of the National Environmental Management Act (1998).
2. DWAF Water Quality Management decision-making hierarchy lays down four principles to give direction to decision-making in this regard:
   (a) Prevention;
   (b) Minimisation at source;
   (c) Disposal according to the precautionary principle;
   (d) Disposal according to the differentiated approach.

   In similar manner to the general sanitation policy principles, these water quality management principles give somewhat limited assistance in deciding how decisions might be made in particular instances. They cannot easily be resolved in absolute terms; but rather have to be resolved through strategy. In order to give more specific direction to implementers such as local authorities, it is necessary for these principles to be resolved in some form of *national and regional water resources strategies*.
3. There is a lack of clarity on how the critical judgement as to whether groundwater will be used in the long term for drinking purposes or stockwatering (as required in the Groundwater Protocol) should be made. The issue at stake here is *not* whether there will be any *contamination* (because even limited contamination is likely to occur, certainly in the long term) but rather whether the aquifer is of *major strategic importance*. It is suggested that the issue is dependent on the outcome of the Water Quality Management decision-making hierarchy - and therefore of some form of national and regional water resources strategies - as mentioned above.
4. There is lack of clarity as to whether the polluter pays principle will be invoked against local authorities who are issued with permits by DWAF to discharge effluent to any water resources, if any pollution (in the definition of the National Water Act) were to occur as a result of this.

4.8 Recommendations

The following approach is recommended for addressing environmental sustainability of sanitation systems:

1. In the very short term (say 2 or 3 years; say less than 10 years), adopt a *health* focus (ensure access to adequate sanitation for all in the short term):
   (a) ensure that basic (health-protecting) on-site sanitation is provided to all;
   (b) ensure that health and hygiene education is provided to all;
   (c) ensure that contaminants from both excreta and greywater do not surface (and so come into contact with people), but remain in the sub-surface;
   (d) ensure that a clean water supply is provided;
2. With respect to *short term environmental impact* (say 3 to 10 or 20 years):
   (a) minimise diffuse pollution by design for - and possible treatment of - greywater;
   (b) assess (only) the long term impact of on-sanitation i.e. assess the water resources

(groundwater and surface water), estimate impacts and likely long term scenarios, together with long term planning for service provision and for development, using a mass balance/mass flow approach;

(c) establish baseline water quality status, and establish an ongoing monitoring system.

3. With respect to *long term environmental impact* (say longer than 20 years):

(a) While the aquifers may not be strategic now or in the short term future (say 10 to 20 years?), they may become of strategic importance in the medium to long term future (say 50 to 100 years?). There is therefore a need to develop sound understanding of longer term behaviour of contaminants and their possible management, which is a combination of physical and social factors.

(b) Initiate longer term research and discussion into these matters. In particular, assess very carefully those short term interventions that may have long term impacts.

4. Where further work is required is as follows:

(a) water resources assessment of groundwater aquifers and an assessment of when they are likely to be used (from an assessment of demand).

(b) what remedial measures (or treatment measures) will need to be put in place to ensure that the water is safe for domestic and stock-watering purposes.

(c) clarification of the ownership of the *characteristics* of the groundwater resource i.e. its quality.

(d) clarification as to whether local authorities will be legally responsible for cleaning up the aquifer under the 'polluter pays principle' - even if it is given a permit to do so by DWAF (Similar clarification may be required for surface water resources as well).

5 DEVELOPMENTAL APPROACHES

5.1 The problem of failure of conventional approaches to infrastructure provision

Developmental approaches to the provision of infrastructure in general and sanitation in particular are significantly at variance with what might be termed conventional engineering approaches. The past record of projects in low-income or developing areas has been poor, and unless significant attention is given to developmental approaches, projects in these areas are likely to fail.

Ross et al (2001: p.9) describe the problem as follows:

> Among the most visible and distressing symptoms of a collapsed infrastructure is a network of ruined roads. The visitor to a number of large African cities, such as Nairobi, is immediately struck by the sight of broad roads, *of clearly superior design, engineering and capacity in their origins and intended states*, that are now covered with potholes, large areas of stripped surface, wholly degraded shoulders, and puddles of standing water resulting from the deterioration of drainage systems. *[italics added]*

While not as visible as transportation infrastructure (most water infrastructure is underground and out of sight!), the deterioration of water and sanitation infrastructure can be quite as serious.

There are several different ways, however, in which failure[1] can occur. Four are suggested as follows:

1. The first is where *a constructed facility falls down, blows up or fails physically in some catastrophic manner*. Failure is sudden, simple and obvious (although the exact causes of failure may not be); and it is usually a technical failure. Thankfully, such failures are rare.
2. The second is graphically described above, namely where *the service is nominally provided, but the infrastructure assets have physically and visibly deteriorated, with consequent reduced utility*. The results may be little different from the first case, but the period of time over which deterioration takes place is much longer. Although the failure is physical, it is usually a direct consequence of financial, social and/or institutional failure rather than technical failure.
3. A third is less visible. It is where *extension of basic services to all is delayed and significant backlogs persist*. In this case the consequences may not be the deterioration of any infrastructure assets, but rather (particularly in the case of water and sanitation services) poor environmental conditions and consequent health impact resulting in both illness and/or death. This situation is often associated with providing high levels of service to a few consumers, and little or no service to the rest.
4. A fourth is even less visible, but quite as serious: It is *where the infrastructure is provided, and remains in satisfactory working order, but consumes resources and fails*

[1] In engineering in general - and in this study in particular, the term 'failure' is used to mean any failure to meet required performance standards. This may even be fairly subtle such as excessive cracking or deflection of a structure. The term 'catastrophic failure' is reserved for when something actually falls down or blows up.

to perform or deliver the developmental benefits that it is intended to deliver. Infrastructure provision does not necessarily enable growth - or poverty reduction - to happen. If inappropriately high levels of service are provided, they may divert scarce resources away from more beneficial areas and retard growth. Such a failure is difficult to identify as it a loss of opportunity rather than a direct failure.

5.2 Key elements of a developmental approach to the provision of infrastructure in low-income communities

In providing a brief overview of Development Engineering - or developmental approaches to infrastructure provision - Van Ryneveld and McCutcheon (1997), set out a number of principles as follows:

1. Neither civil engineering nor infrastructure provision are practised in a vacuum. One needs to consider the context in which one is operating from two different angles: (a) as a set of conditions that affect the manner in which the project can be carried out; (b) as the situation which the project is intended to improve.
2. This leads to a re-evaluation of what constitutes 'project success'. Development Engineering requires one to accept a broadening of one's understanding of 'project success' to beyond the purely technical. A good indication of the dimensions of project success is given by the dimensions of the World Bank project appraisal (Baum, 1982; Baum and Tolbert, 1985), together with an understanding that for a project to be successful, it must be successful in all these dimensions (regardless of who carries primary responsibility for them):
   (a) economic;
   (b) financial;
   (c) technical;
   (d) institutional;
   (e) social;
   (f) environmental.
3. There are two other themes that ...[are] critical in developing areas. The first of these is that in developing areas, the *process* of providing physical infrastructure must be considered alongside the *product*. If the objective of providing physical infrastructure is 'development', then the building up of local capacity through the use of local skills and resources in the provision of that physical infrastructure is something that needs to be considered.
4. The second of these themes in the provision of physical infrastructure for developing areas is that of a *life cycle perspective*, which means that planning, design, construction, operation and maintenance all need to be considered.

A more recent World Bank report (1999) provides a useful overview of new directions in development thinking: It points out that “the experience of recent decades demonstrates that while development is possible, it is neither inevitable nor easy.” (World Bank, 1999: p.14).

While the complexity of the development process has long been recognised, various development processes have focused on particular processes at the expense of others - what is sometimes termed the ‘search for the magic bullet - or silver bullet’ (i.e. the single item that solves the ‘problem’). The World Bank puts it like this:

> "...over the years, various development processes have been singled out as 'first among equals' in terms of their impact. The conceptual frameworks for development of the last 50 years, especially in their popularised versions, tended to focus too heavily on the search for a single key to development. When a particular key failed to open the door to development at all times and places, it was set aside in the search for a new one."

There are several components that need to be in place, both individually and together. Without all aspects being in place - both individually and together - development initiatives tend to fail. World Bank (1999: p.20) expresses it like this:

> "Sustainable development is a multi-faceted process, involving multiple instruments and goals...Strong interlinkages connect these goals, so that progress toward one is frequently dependent on progress toward others"

DBSA (Development Bank of Southern Africa) (1998: p.5) has suggested that "...development is about people. Its ultimate aim is to improve the quality of people's lives, especially that of the poor, in a sustainable manner." DBSA goes on to suggest the key dimensions of development to be:

1. economic growth;
2. income growth;
3. sustainable livelihoods;
4. environmental sustainability;
5. institutional capacity.

The report goes on to explain how infrastructure supports development, and notes the importance of social and institutional dimensions in addition to the more obvious economic ones. The report goes on further to discuss the contribution of infrastructure to poverty alleviation. It points out that (DBSA, 1998: p.7):

> "...infrastructure provision does not inevitably contribute to the eradication of poverty. Ill-designed infrastructure could have more costs than benefits for poor people because of inadequate targeting or adverse social, health, financial and environmental effects. Infrastructure provision can also widen the gap between poor and non-poor people where access to services is expensive, or where infrastructure services were not planned specifically around the needs of the poor. Delivery can also be disempowering if it turns the poor into passive recipients of services rather than central actors in their own development".

In commenting on the institutional dimension, the report has the following to say (DBSA, 1998: p.7):

> "Many a project team in agencies such as DBSA, the Department of Water Affairs and South Africa's electricity giant, Eskom, confirms that the quality and financial sustainability of projects are almost always directly related to whether initial funding decisions were informed by consumer demand and the economic rationality in very specific contexts. Ill-considered projects, designed in isolation from specific community dynamics and demand, have mostly proven costly. For example, where communities have not been fundamentally involved in the planning and implementation of electricity projects, the electricity uptake has almost always been lower than expected and communities have had little incentive to contribute to maintenance. Likewise, in several water projects many poor people continue to use rivers and unprotected springs as the

> services planned without their input are often unaffordable or do not meet their specific needs. While the relative priority of a service for a community determine how they respond to its availability, the mode and costs of delivery are obviously also major considerations."

The report concludes that:

> "...infrastructure holds significant development potential, both on a macroeconomic level and in changing the lives of individuals, households and firms. But, ... it must be carefully managed and financed."

Samuel Paul (1987) provides a useful conceptual framework for understanding community participation (CP). In providing this conceptual framework, Paul distinguishes between objectives, intensity and instruments. His five objectives are listed[2] below. While Paul makes the point that particular objectives may not be 'right' or 'wrong' - nor are they necessarily mutually exclusive - the objectives at the 'empowerment' end of the spectrum do tend to promote development in low-income communities more than those at the 'cost sharing' end. At the 'cost sharing' end, the focus is primarily on the project or facility, whereas at the empowerment end, the focus is primarily on the people that the project or facility is intended to benefit:

1. *Cost sharing*: 'Beneficiaries may be expected to contribute labor, money or undertake to maintain the project. Self help groups in low income housing illustrate this objective of CP. CP may thus be used to facilitate a collective understanding and agreement on cost sharing and its enforcement.'
2. Project *efficiency*: 'Project planning and implementation could become more efficient because of timely beneficiary inputs. CP could be used to promote agreement, co-operation and interaction among beneficiaries, and between them and the implementing agency of the project so that delays are reduced, a smoother flow of project services is achieved, and overall costs are minimised.'
3. Project *effectiveness*: 'Effectiveness refers to the degree to which a given objective is achieved. It is useful to distinguish effectiveness from efficiency which measures the relationship between a given output and its costs.'
4. *Capacity building* or building beneficiary capacity in relation to a project: 'Beneficiaries may share in the management tasks of the project by taking on operational responsibility for a segment of it themselves. For example, beneficiaries may play an active role in monitoring. Developing beneficiary capacity could also contribute to the sustainability of a project beyond the disbursement period due to the enhanced level of beneficiary interest and competence in project management.'
5. *Empowerment:* According to this view, development should lead to an equitable sharing of power and to a higher level of people's, in particular weaker groups', political awareness and strengths. Any project or development is then a means of empowering people so that they are able to initiate actions on their own and thus influence the processes and outcome of development.'

Quite apart from showing that community participation has a number of quite distinctive meanings, and therefore that following one particular course of action may imply *not* following

---

[2] Listed here in reverse order to that presented by Samuel Paul

another, it does also provide a useful *continuum of developmental objectives*. Two of Samuel Paul's objectives - namely capacity building and empowerment - are expanded upon in more detail below:

The *Development Impact Approach* developed by DBSA provides an approach for maximising the use of local skills and resources. It is essentially a more detailed and structured methodology for pursuing the *capacity building* objective of Samuel Paul, and provides a useful insight into the difference between a developmental approach and a conventional approach. The two approaches are depicted in the diagrams below. (The other complementary concept that is helpful - although not included here - is the development of small contractors).

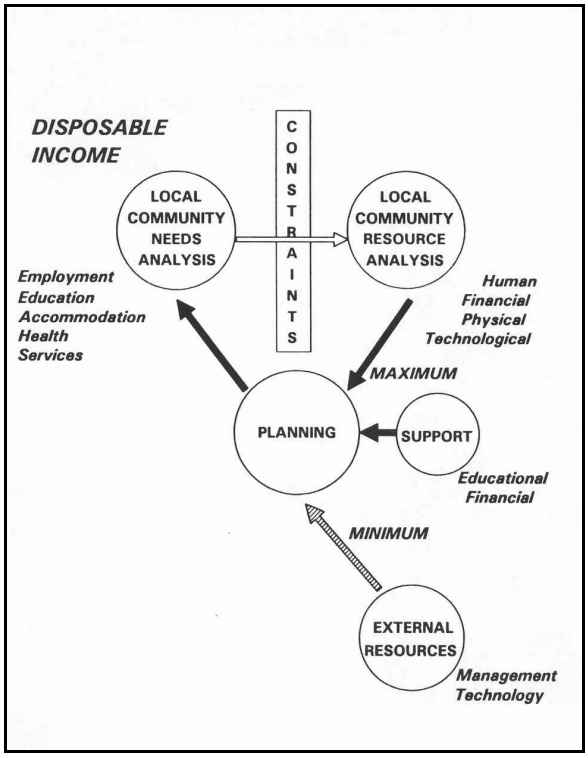


FIGURE 5.1:
DEVELOPMENT IMPACT APPROACH (DIA) (Marler, 1993; DBSA, 1993)

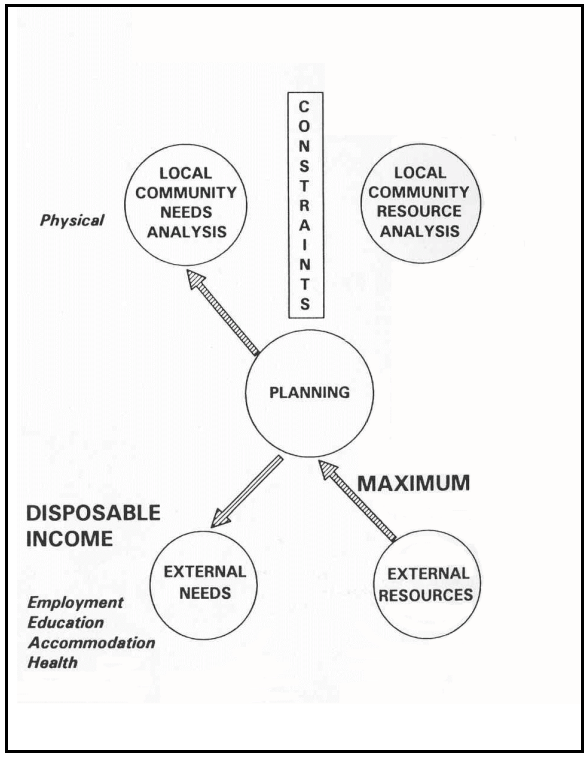


FIGURE 5.2:
CONVENTIONAL APPROACH (Marler, 1993; DBSA, 1993)

The importance of *empowerment* in development - as well as the problem of *bureaucracy* - is also stressed by Abrams (1992). In a characterisation of rural poverty, Abrams suggests the following components:

1. Capricious authorities and bureaucracy;
2. Poverty and lack of financial power;
3. Lack of access to expertise;
4. Isolation and marginalisation;
5. Environmental restraints.

Highlighting the first of these components, namely *capricious (i.e. fickle or unpredictable) authorities and bureaucracy*, Abrams comments as follows:

> Authorities in any country constitute a daunting edifice of officialdom to rural people. While there are certainly many exceptions, they are generally considered as unsympathetic and unaccountable. Local authorities are viewed differently depending on their accessibility and their identification with the needs of the people. In the face of bureaucracy, corruption and inefficiency, authorities are usually considered as part of the problem rather than an agent of empowerment.

Abrams points out that conventional 'development' is restricted mainly to *environmental restraints*, which includes (often inadequate) water supply, sanitation, energy etc.

He further points out that "...the effect of these characteristics is ... similar in most communities. They lead to an overwhelming sense of entrapment which results in a resignation and fatalism which forms an obstruction to development". He then goes on to suggest that:

> ...if the maldeveloped rural environment is characterised by entrapment through the interlinking of poverty cycles, then development is the process of breaking these cycles. As people gain the will to act they embark on a process which no one else can undertake on their behalf. This does not imply that they do not require advocacy work on their behalf nor that they do not require access to a whole range of skills and resources. The essential element which determines a genuine developmental process[3] is who ultimately makes the decisions. If the final initiative, motivation or decision lies with the state, the church, the development agency or anybody other than the community, then it is not empowerment.

This is highly significant for this particular study, for three reasons:

1. Poverty has *several facets*, of which the provision of services such as water supply and sanitation is but one.
2. *Bureaucracy* is a significant facet of poverty in general.
3. For development to occur, communities need to 'gain the will to act', *take the initiative and make the decisions themselves*. It is this principle of *empowerment* that is similar to that expressed as an objective of community participation by Samuel Paul, and one that is similarly stressed in the demand responsive approach, addressed in the following section.

---

[3] For this 'genuine developmental process', Abrams uses the term *empowerment*, which he understands to mean 'the process whereby people gain the will to act'.

These comments of Abrams were written in 1992, before the change of government in South Africa. Despite progress since then, however, most of the comments still hold to a greater or lesser degree.

What is further suggested in this study is that accompanying communities' 'gaining the will to act' must be a symmetrical gaining of the will to carry out their own responsibilities - on the part of government - of regulation, monitoring and support in the promotion of development. The retention of control without the will - and the capacity - to act creates a paralysed and virtually impenetrable bureaucracy. Furthermore, the retention of control where responsibility should be transferred to communities retards development.

5.3 Demand responsive approach

If a key to development is that communities should 'gain the will to act' and take responsibility for decision-making and action directed to their own development, then it is essential that a demand responsive rather than a supply driven approach be followed in the provision of infrastructure. Several of the topics that go to make up a developmental approach are incorporated - with others - in what is termed a *demand responsive approach*. World Bank (2002) defines the key characteristics of a demand responsive approach as follows:

1. Community members make informed choices about:
   (a) whether to participate in the project;
   (b) technology and service level options based on willingness to pay (based on the principle that more expensive systems cost more);
   (c) when and how their services are delivered;
   (d) how funds are managed and accounted for; and
   (e) how their services are operated and maintained.
2. Government plays a facilitative role, sets clear national policies and strategies, encourages broad stakeholder consultation and facilitates capacity building and learning;
3. An enabling environment is created for the participation of a wide range of providers of goods, services and technical assistance to communities, including the private sector, and non-government organizations; and
4. An adequate flow of information is provided to the community, and procedures are adopted for facilitating collective action decisions within the community (social intermediation).

The opposite of 'demand responsive' is 'supply driven'. They form a continuum rather than two discrete states. Notwithstanding that, the key difference relates to where control lies: If the major decisions about level of service etc are retained by the supplier or provider, then it is supply-driven. If the major decisions - and consequent responsibilities - are carried by the user, then it is demand responsive.

The language of economics does not fit easily with the language of the social disciplines. Nevertheless, although coming from slightly different perspectives both agree that for development to happen, choice and initiative must rest with the communities themselves, within some imposed framework of constraints or rules. Whether from an economic or a social perspective, there is agreement that development is weakly promoted where officials decide on behalf of communities what services they should have, based on how the officials think that resources should be allocated rather than the communities themselves. As expressed by Jackson and Davies (1995): "The principle of choice is essential, based on a true understanding of the costs involved. It is entirely feasible that, faced with difficult choices constrained by a shortage of capital, many urban households' priorities for investments in urban areas could be radically different from those assumed by city planners and others (e.g. large sites in preference to full services, telephones before roads, electricity before sewers etc)."

Demand for a good or service (as is understood in this study) constitutes demand only when the buyer actually pays the agreed price for the good or service. There must a clear expression of demand addressed to the provider by the community, based on community choice within the framework of clear project rules (which have been set by the provider, in conjunction with the Water Service Authority). This agreement or contract has clear obligations and responsibilities on both sides, which must be fully spelt out, fully understood, and freely entered into; and this expression of demand must translate into actual payment for services provided. Any provision of Free Basic Water Water (FBW) or possible Free Basic Sanitation (FBS) may form part of such an agreement. It simply means that no charge is made for the basic amount. For higher levels of service or for consumption beyond the basic level, however, payment is made (usually on a rising block tariff).

The demand responsive approach is not the idea of a single individual, but is rather a 'school of thought' that is presented with slightly different emphasis by different individuals and organisations, and that has been emphasising a particular set of ideas for say the past 10 years. These schools of thought are often reflected in global statements that are issued every few years. In the case of a demand responsive approach, the literature is largely based on the Dublin Statement on Water and Sustainable Development, 10 years ago (Dublin Statement, 1992). The statement is not binding on the governments concerned, but it does represent a milestone in this particular school of thought.

The participants '...saw the emerging global water resources picture as critical...and called for fundamental new approaches to the assessment, development and management of freshwater resources.' (Dublin Statement, 1992: p.129). Four guiding principles were laid down by the conference. All four are given for completeness, but it is the last one that is particularly key to the demand responsive approach:

- *Principle No.1:* Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.
- *Principle No.2:* Water development and management should be based on a participatory approach, involving users, planners and policy-makes at all levels
- *Principle No.3:* Women play a central part in the provision, management and safeguarding of water.
- *Principle No.4:* Water has an economic value in all its competing uses and should be recognized as an economic good.

To understand Principle No.4, one first needs to understand what an *economic good* is: It is a good or commodity that can be traded in a market. To understand the *significance* of Principle No.4, one needs to understand the change in thinking that it represented - which was from a

largely supply driven approach, based on the government providing (i.e. water as a social good). The shift is often expressed as 'Water is an economic good *as well as* a social good'.

From an *infrastructure provision* perspective, it can be helpful to identify particular overall approaches. Three major approaches are identifiable. It must be remembered that these are caricatures. At a time, they are appropriate and sound; held on to for too long, they are distorting and retrogressive. In fact, very often it is the erroneous interpretation of approaches that is damaging.

1. *'Standards' approach*, characterised by adherence to (high) standards on (ostensibly) technical grounds alone. In sanitation provision, this is often characterised by a policy of full water-borne sanitation for all, irrespective of cost. Formally, standardisation (as against the unco-ordinated and inefficient practices of the time) is best set out in the 'Blue Book' for the provision of municipal services (Department of Community Development, 1983). Although the logic is ostensibly based on technical considerations, it largely disregards health and environmental impact. The Blue Book was never intended for developing communities, but was applied rigidly in developing communities without regard for financial sustainability or the allocation of scarce resources.
2. *'Strategic' approach*, where the emphasis shifts to a consideration of coverage + backlogs + financial sustainability. While strategic planning is currently undertaken, decision-making within what is financially feasible tends to be retained by technical professionals. The shift from what were then rigid and often inappropriately applied standards to a strategic approach may be typified by the Water and Sanitation 2000 workshop (Water and Sanitation 2000, 1991) and the Strategic Sanitation Approach of Albert Wright (1992). What would appear to be needed at the present time is for elements of the strategic approach to be modified to promote a more demand responsive approach. At the time when a strategic approach was being promoted, the move from supply driven to demand responsive approaches was also strongly promoted, but appears not to have been widely implemented.
3. An approach that is being put forward at present is a *demand responsive approach*. Where it differs from the strategic approach is that there is a change in the role of government, particularly planning and technical professionals, who are required to provide an enabling environment or a framework of rules through which demand can be expressed by communities on the ground, demand being demand at a price. It does not necessarily rule out the use of subsidies, but it does suggest changed roles: an enabling role for government and a more active implementing role for communities. The key is the establishment of a framework of clear, non-negotiable, transparent rules, which clearly define what government is required to and can do (i.e. what it has the capacity to do) and what people are permitted to do to access sanitation. It is a method which plainly sets out the limitations of what government can do, and encourages communities to take responsibility for their own lives within that. It seeks to reduce dependency on government, and mobilise local resources. The shift from a supply driven strategic approach to a demand responsive approach may be typified by the Washington World Bank Conference (Garn, 1998; Sara, 1998).

5.4 Establishment of a framework through which demand can be expressed

How might demand responsive approaches be implemented in a local authority such as CoJ?
There are a number of *overall components* to such a framework, which may be summarised as follows:

1. *Regulation:* set by the local authority (although some rules may be imposed by provincial or national government): a framework of non-negotiable rules, through which the provision of services can take place;
2. *Support:* by the local authority to communities, mobilising those communities, supporting their decision-making and supporting the implementation of services.
3. *Implementation - and decisions around implementation* - carried by communities themselves or (which applies to implementation rather than decision-making) delegated by communities to agents appointed by them to carry this out on their behalf.

What are the decisions that constitute the framework of non-negotiable rules that is set by the local authority?
Further detail may be required in other areas, but the key rules relate to the following:

1. *Spatial planning requirements*, including which settlements may be located where; which existing settlements may remain and which cannot remain - together with clear, auditable reasons. Spatial aspects may be addressed within the context of the IDPs. The appropriate MEC at provincial level is also authorised to set an 'urban edge' to discourage urban sprawl.
2. *Layout planning within a settlement*, which may be carried out by a range of parties (e.g. developer or other agency such as the provincial housing department) within the township establishment procedures. This generally includes the choice of level of service. It is essential that communities are involved in this decision-making. If decisions are made *for* them, then it remains a supply driven approach. Extreme care should be exercised in the layout plan and choice of level of service, as these decisions have major and long term implications for the overall development of the settlement. A review of existing township establishment procedures is essential if a demand responsive approach is to be pursued.
3. The service provider (together with the appropriate service authority) needs to lay down careful rules about what *bulk infrastructure* can be provided, what the lead times are for provision and the cost implications thereof i.e. the constraints on the capital expenditure programme. This may include borrowing limitations, which are affected by the financial status of the service provider, together with statutory limitations placed on it by the Treasury.
4. *Opportunities for labour-intensive construction + development of small contractors* need to be identified and provision made for this. This may include details of tariff reductions where the community supplies labour for construction. To aid this, it would also be useful to classify different parts of the construction that can be carried out by the community.
5. If the Water Services Authority wishes to promote the development and use of local skills and resources, it may also wish to specify a *training grant*, to be transferred to the service provider (or another agent) for providing appropriate training.
6. In consultation with the Water Services Provider (with respect to the cost of the operation), the Water Services Authority must set a *tariff structure*, which includes on-site sanitation, is based on cost, and is practically and politically enforceable. Complementary to this must be a clear statement of *subsidies* to be transferred to the

provider from the authority for specific items (e.g. Equitable Share, CMIP, DWAF subsidy);

7. Rules surrounding *cut-offs* need to be established and publicised.

In *summary*, such a framework does the following:

1. It clarifies the roles and responsibilities of the various players (Water Services Authority, Water Services Provider and community in the first instance; but also assists in clarifying the role of other spheres of government in the second instance)
2. It clarifies the 'rules' under which the community can get sanitation.
3. It clarifies the decisions that the community must make.
4. It steers the community towards a contract between water service provider and community (see Figure 5.1). Essentially what the diagram depicts is that under a demand responsive approach, the service provider engages the community in the provision of services *only* under the conditions of quadrant B.

		Community interest	
		NO	YES
Resources available	NO	D Promotion-only Approach	A Community Approach
	YES	C Services Approach	B Partnership Approach *=demand-responsive*

FIGURE 5.3: LOCATION OF A DEMAND RESPONSIVE APPROACH WITHIN A MATRIX OF RESOURCES AVAILABLE AND COMMUNITY INTEREST (Source: after early stages of earlier Sanitation Protocol)

Further comments are made as follows:

There seems to be lack of clarity about the relative roles and responsibilities of the Water Services Provider and Water Services Authority. While Water Service Providers need to *provide*, it is at the same time necessary to use the provision of the infrastructure as a vehicle for development i.e. use a developmental approach. In similar vein, to suggest that 'Government will provide' is misleading. Rather, the understanding needs to be developed that 'people themselves provide; government regulates, facilitates and supports'. There are indications that the perception that 'government will provide' appears to be promoted if not in word, then certainly by the 'body language' of government - both officials and elected representatives, rather than the people themselves. What can cause further serious confusion is where supply-driven performance indicators are written into contractual obligations or used as management tools.

In implementing a demand responsive approach - or a framework of rules through which demand can be expressed - significant attention needs to be given to the establishment of these rules. The

establishment of these institutions is something that needs to be very carefully and thoroughly done. Once the rules are established, it becomes significantly easier to deliver infrastructure - and other objectives. It is the setting up of these systems that is slow.

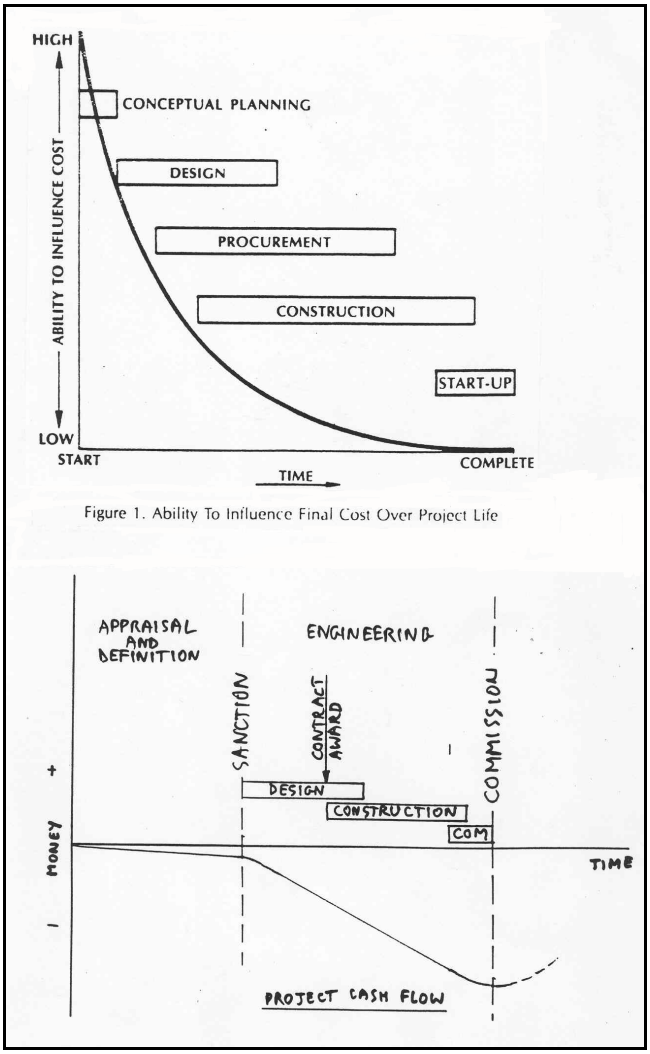


FIGURE 5.4:
ABILITY TO INFLUENCE PROJECT OUTCOME (CII, 1986) CONTRASTED WITH PROJECT CASH FLOW (after Thompson, 1981)

The establishment of a framework of rules through which demand can be expressed needs to be undertaken by means of a *pilot-and-programme approach*, combined with significant investigation or research. Johannesburg is in the process of following such a pilot-and-programme approach. The graphs in Figures 5.4 and 5.5 - taken from conventional project management approaches - highlight the important of thorough project appraisal in the early stages. The rate of spend in the early stages is low, but the impact of work at this stage - felt far into the life of the project - is out of all proportion to its cost. It is precisely at the early stages - when rate of spend is low - that the opportunity to influence the overall success of the project or programme - both financial and otherwise - is at its highest.

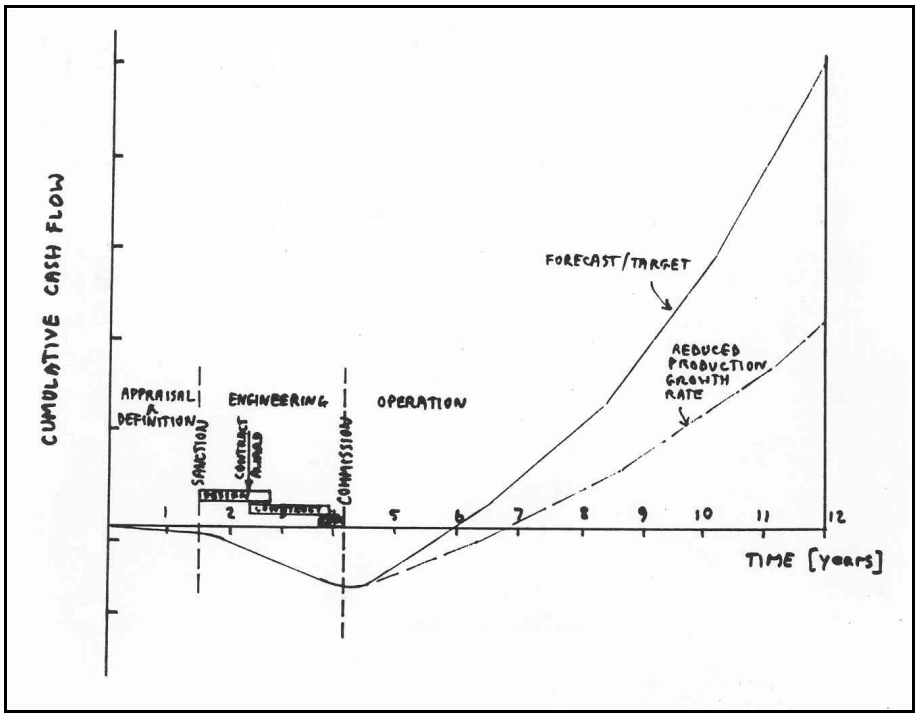


FIGURE 5.5:
PROJECT CASH FLOW OVER THE FULL LIFE OF THE PROJECT
(after Thompson, 1981)

The key to eliciting an expression of demand from communities is that the rules or criteria need to be communicated clearly to communities. The criteria are intended to be *motivational rather than exclusionary* in that they should motivate communities to respond in that manner, and mobilise resources from within the community to that end.

Another key element is that the terms under which communities may receive sanitation need to be *publicised as widely as possible*. The rules must be very public. A key characteristic is transparency. Certainly in rural water supply and sanitation, a key rule that is included is one which indicates the basis on which communities are served first.

In conjunction with the above rules, support needs to be provided which may include *information centres* as well as building supply centres to assist in order to facilitate the active involvement of communities.

5.5 Conclusions

1. Developmental approaches to the provision of infrastructure in general and sanitation in particular are significantly at variance with what might be termed conventional engineering approaches. The past record of projects in low-income or developing areas has been poor, and unless significant attention is given to developmental approaches, projects in these areas are likely to fail.

2. There are several different ways, however, in which failure[4] can occur. Four are suggested as follows:
   (a) *where a constructed facility falls down, blows up or fails physically in some catastrophic manner*. Failure is sudden, simple and obvious (although the exact causes of failure may not be); and it is usually a technical failure. Thankfully, such failures are rare.
   (b) *where the service is nominally provided, but the infrastructure assets have physically deteriorated, with consequent reduced utility*. The results may be little different from the first case, but the period of time over which deterioration takes place is much longer. Although the failure is physical, it is usually a direct consequence of financial, social and/or institutional failure rather than technical failure.
   (c) *where extension of basic services to all is delayed and significant backlogs persist*. In this case the consequences may not be the deterioration of any infrastructure assets, but rather (particularly in the case of water and sanitation services) poor environmental conditions and consequent health impact resulting in both illness and/or death. This situation is often associated with providing high levels of service to a few consumers, and little or no service to the rest.
   (d) *where the infrastructure is provided, and remains in satisfactory working order, but consumes resources and fails to perform or deliver the developmental benefits that it is intended to deliver*. Infrastructure provision does not necessarily enable growth - or poverty reduction - to happen. If inappropriately high levels of service are provided, they may divert scarce resources away from more beneficial areas and retard growth. Such a failure is difficult to identify as it is a loss of opportunity rather than a direct failure.
3. International experience over recent decades indicates that while development is possible, it is neither inevitable nor easy. Furthermore, it is multi-faceted process, requiring several components to be in place both individually and together for development to succeed.
4. Further local experience "...confirms that the quality and financial sustainability of projects are almost always directly related to whether initial funding decisions were informed by consumer demand and the economic rationality in very specific contexts. Ill-considered projects, designed in isolation from specific community dynamics and demand, have mostly proven costly." (DBSA, 1998).
5. Samuel Paul (1987) suggests five objectives of community participation as follows:
   (a) Cost sharing;
   (b) Project efficiency;
   (c) Project effectiveness;
   (d) Capacity building;
   (e) Empowerment.

   While Paul makes the point that particular objectives may not be 'right' or 'wrong' - nor are they necessarily mutually exclusive - the objectives at the 'empowerment' end of the spectrum do tend to promote development in low-income communities more than those the 'cost sharing' end.
6. Further detail on capacity building and empowerment are provided by DBSA (1993) and

---

[4] In engineering in general - and in this study in particular, the term 'failure' is used to mean any failure to meet required performance standards. This may even be fairly subtle such as excessive cracking or deflection of a structure. The term 'catastrophic failure' is reserved for when something actually falls down or blows up.

Abrams (1992) respectively: the Development Impact Approach of DBSA for promoting *maximum use of local skills and resources*, and the concept of 'empowerment' of Abrams (1992), who suggested that for development to occur, communities need to 'gain the will to act', *take the initiative and make the decisions themselves*.

7. If a key to development is that communities should 'gain the will to act' and take responsibility for decision-making and action directed to their own development, then it is essential that a demand responsive rather than supply driven approach be followed in the provision of infrastructure.

8. World Bank (2001) defines the key characteristics of a demand responsive approach as follows:

    1. Community members make informed choices about:
        (a) whether to participate in the project;
        (b) technology and service level options based on willingness to pay (based on the principle that more expensive systems cost more);
        (c) when and how their services are delivered;
        (d) how funds are managed and accounted for; and
        (e) how their services are operated and maintained.
    2. Government plays a facilitative role, sets clear national policies and strategies, encourages broad stakeholder consultation and facilitates capacity building and learning;
    3. An enabling environment is created for the participation of a wide range of providers of goods, services and technical assistance to communities, including the private sector, and non-government organizations; and
    4. An adequate flow of information is provided to the community, and procedures are adopted for facilitating collective action decisions within the community (social intermediation).

9. The opposite of 'demand responsive' is 'supply driven'. They form a continuum rather than two discrete states. Notwithstanding that, the key difference relates to where control lies: If the major decisions about level of service etc are retained by the supplier or provider, then it is supply driven. If the major decisions - and consequent responsibilities - are carried by the user, then it is demand responsive.

10. From an *infrastructure provision* perspective, three major approaches are identifiable. It must be remembered that these are caricatures. At a time, they are appropriate and sound; held on to for too long, they are distorting and retrogressive. In fact, very often it is the erroneous interpretation of approaches that is damaging.

    (a) *'Standards' approach*, characterised by adherence to (typically high) standards on (ostensibly) technical grounds alone.

    (b) *'Strategic' approach*, where the emphasis shifts to a consideration of coverage + backlogs + financial sustainability, rather than absolute standards alone. While strategic planning is currently undertaken, decision-making within what is financially feasible tends to be retained by technical professionals.

    (c) *Demand responsive approach*, which has many similar elements to the strategic approach, but where there is a change in the role of government, particularly planning and technical professionals, who are required to provide an enabling environment or a framework of rules through which demand can be expressed by communities on the ground, demand being demand at a price. It does not necessarily rule out the use of subsidies, but it does suggest changed roles: an enabling role for government and a more active implementing role for communities. The key is the establishment of a framework of clear, non-

negotiable, transparent rules.

5.6 Recommendations

1. There are a number of *overall components* to a framework through which demand might be addressed, which may be summarised as follows:
   (a) *Regulation*: set by the local authority: a framework of non-negotiable rules, through which the provision of services can take place;
   (b) *Support*: by the local authority to communities, mobilising those communities, supporting their decision-making and supporting the implementation of services.
   (c) *Implementation - and decisions around implementation* - carried by communities themselves or (which applies to implementation rather than decision-making) delegated by communities to agents appointed by them to carry this out on their behalf.
2. Within this framework, further detail is as follows:
   (a) *Settlement location* within macro spatial planning;
   (b) *Layout planning within a settlement* within the township establishment procedures. This generally includes the choice of level of service. It is essential that communities are involved in this decision-making. A review of existing township establishment procedures is essential if a demand responsive approach is to be pursued.
   (c) Rules about what *bulk infrastructure* can be provided, what the lead times are for provision and the cost implications thereof;
   (d) *Opportunities for labour-intensive construction + development of small contractors;*
   (e) *Training grant* to promote the development and use of local skills and resources;
   (f) *Tariff structure* and statement of *subsidies;*
   (g) Rules surrounding *cut-offs.*
3. Crucially, it is recommended that the service provider takes formal steps to assess customer demand for services, which may include the use of tools such as Contingent Valuation studies.
4. In *summary*, such a framework does the following:
   (a) It clarifies the roles and responsibilities of the various players (water service authority, water service provider and community in the first instance; but also assists in clarifying the role of other spheres of government in the second instance).
   (b) It clarifies the 'rules' under which the community can get sanitation.
   (c) It clarifies the decisions that the community must make.
   (d) It steers the community towards a contract between water service provider and community.
5. The establishment of a framework of rules through which demand can be expressed needs to be undertaken by means of pilot-and-programme approach, combined with significant investigation or research. Johannesburg is in the process of following such a pilot-and-programme approach.

6 CONCLUSIONS and RECOMMENDATIONS

6.1 Conclusions

Institutions as rules

1. In reviewing the Sanitation Policy and Protocol of CoJ, it is first necessary to place these documents within a broader framework, which is best described by the term 'institutions' or 'institutional' framework. The term is used on this project with a very specific meaning: that 'institutions' are viewed as 'rules' or 'ways of doing things' rather than 'organisations', with the following more detailed explanation (World Bank, 1999: p.22, 23):

   > The term *Institutions*, as it is used here, refers to sets of formal and informal rules governing the actions of individuals and organisations and the interactions of participants in the development process. Rules can be formal, taking the shape of constitutions, laws, regulations and contracts. Or they can be informal, like values and social norms.

   The Sanitation Policy and Protocol therefore form part of a range or suite of institutions for the provision of sanitation.
2. Policy, strategy and detailed procedure form a continuum in which the different elements are difficult to separate out:
   (a) *Policy* implies general principle, not easily departed from, and therefore stable and not easily subject to change;
   (a) *Strategy*, set within the framework of the policy, implies a plan of action necessitating a choice of timing, location, method and resources, in other words, 'what, when, where, how and with what resources'. It may be revised more regularly than policy; (say annually, but with a horison of 5 or 10 years or even longer);
   (b) *Detailed procedure*, implies detailed steps and techniques, which may be even more flexible than either policy or strategy.
3. The heart of policy generally lies in the policy principles. The policy principles set out both how sanitation *will* be provided, and by implication how sanitation will *not* be provided. The place where the tensions of policy are resolved is in strategy, where priorities are set and trade-offs made within specified time frames. The Water Services Development Plan (WSDP) (as required by the Water Services Act of 1997) is intended to be the primary strategic planning tool for the resolution of these priorities and trade-offs.
4. Recent policy, strategy and detailed procedure documents include:
   (a) *An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council* (GJMC, 2000a); and associated *Sanitation Protocol* document (Pegram et al., end of project: Feb 2000);
   (b) White Paper on Basic Household Sanitation (DWAF, Sept 2001);
   (c) Ethekwini Sanitation Protocol (2002?);
   (d) Sanitation Policy for the City of Johannesburg (CoJ, draft 2: Apr 2002b);
   (e) Procedures being piloted by Johannesburg Water under their low-income settlements programme (current).
5. With respect to sanitation policy for Johannesburg, current initiatives based on the White Paper on Basic Household Sanitation appear sound. With respect to more detailed

procedures, current pilot studies by Johannesburg Water have sought to gain an understanding of technical requirements and community dynamics as a first step. While sensibly following a pilot-and-programme approach and gaining essential experience in low-income settlements in Johannesburg, this initiative does need to be aware of three possible dangers:

(a) The lack of development at the pilot stage of a *clear framework through which demand can be expressed* carries the risk of not being able to mobilise community capacity, and of not being able to reverse the matter of non-payment;

(b) *Moving too quickly from pilot to full scale implementation programme* under pressure to deliver carries the risk of being unable to develop designs and procedures adequately, and runs the risk of rejection of particular levels of service by communities before JW has had the chance to get the systems right.

(c) A third possible danger is a longer term one rather than a short term one; and it may be argued to be outside the mandate of the water utility. Irrespective of whether it falls within the mandate of the utility or not, the consequences will impact profoundly on the utility: Unless *development takes place* in the low-income communities of Johannesburg, it is likely to prove extremely difficult to resolve the problems of non-payment and inability to pay currently being experienced - and prove difficult to turn consumers into customers. From the service provider side, this requires careful collaboration and planning together with other parties within the framework of the IDPs.

6. Key elements of policy are generally translated into legislation. However, it needs to be understood that while the legislation will generally seek to prevent what is clearly unacceptable, it will not necessarily enforce good practice. More specifically, it appears that while existing legislation and procedures do not *enforce* the principles of the White Paper on Basic Household Sanitation in a number of key respects, neither do they *prevent* the principles from being pursued. In other words, if such principles are *not* being followed in practice, there are reasons *other* than legislation that are driving this action. What legislation and regulations primarily do is to *allocate powers and functions*, but not necessarily to spell out in detail all actions that must be taken. The legislation allows the discretion of the incumbent in making decisions in the absence of an explicit ruling. The policy principles are nevertheless a statement of good practice, which would be unwise simply to disregard.

7. Various governance problems identified include the following:

(a) 'Silo' approach to government;

(b) Co-operative government can be made to work, but there appears to be currently no formal mechanism for ensuring that it works;

(c) Legislation is currently in a state of constant change;

(d) Underfunded mandate;

(e) No clear policy; interpretation of the legislation inconsistent;

(f) Clear legislation, but there is no mechanism for enforcement, so that it is ineffectual;

(g) Clear legislation, but the administrative procedures are so onerous that the vehicle is ineffective.

8. Progressing from the more general governance difficulties listed above to more specific issues, the following appear to be particularly critical issues in the provision of sanitation to low-income settlements:

(a) In contrast with rural areas, decisions about service provision in the urban context are primarily about access to land - and the opportunities that accompany them. It appears that decisions about the level of service of sanitation are made *within*

the context of township establishment. Servicing therefore accompanies the land registration - and housing procedure. It is not an independent procedure, over which the service provider has significant control. There appears to be a difference in approach between housing/planning and water services, with housing appearing to promote higher levels of service, but the service provider carrying the consequences of any non-payment.

(b) The second is between DWAF (water) and DEAT (environment) - as well as DTI (building regulations) - over *pollution from on-site sanitation systems*. It appears that while liquid waste - or waste with an impact on water - is controlled by DWAF, solid waste is controlled by DEAT.

9. While legislation and strategy are key drivers in the provision of services to low-income settlements, there are other tools that also serve as drivers. One such tool is that of performance indicators. The primary Key Performance Indicator (KPI) for CAPEX is generally 'timeous expenditure of capital budget'. For situations where the procedures are well-established, this is appropriate (although even here, the graph of expenditure over time follows the classic S-shape: starting more slowly and building up over time). For low-income areas, the same curve is not appropriate. CAPEX alone is simply too blunt an instrument to be used as a KPI in this situation.

10. May and Stark (1992) suggest that the establishment of operating procedures alone are unlikely to be sufficient to ensure good practice. They suggest that operating procedures need to be combined with various other mechanisms that regulate the *individual professional*. Regulatory mechanisms for design professions are set out in a paper by May and Stark (1992) in relation to earthquake policy. These give some insight into the 'family'of institutions that need to be set up to ensure good practice, which includes various forms of public and private regulation.

11. The value or attitude of learning is selected to explore the place of values and attitudes in the range of institutions for the provision of sanitation to low-income communities. Educational theory may provide useful insights into how learning might happen.

12. Substantial knowledge about both the principles and practice of service provision to the poor is available. Notwithstanding that, municipal engineers in general appear to battle to get to grips with particularly the non-technical aspects.

13. With respect to identifying the institutions or rules regarding the provision of services to low-income settlements, it is important to note the long period of time over which the development of policies, strategies and detailed procedures has taken place. It also pertinent to note that most of the *de facto* rules for the provision of sanitation to low-income areas that go to make up the 'institution' are informally held, which makes it both time-consuming and difficult to identify them.

14. Finally, regardless of the degree to which the local authority complies with the intent of national policies, there appear to be two specific 'rules' with which the local authority is *compelled* to comply:

(a) The local authority as a whole must remain *financially sustainable*;

(b) The local authority must comply with applicable *environmental* legislation.

These two topics are addressed in more detail in the following sections.

Financial sustainability

1. As indicated in the previous section, one of the 'rules' with which a local authority[1] appears compelled to comply is that of financial sustainability. What this implies for the local authority is that:
   (a) There must be a clear distinction between cost, price and subsidy; and
   (b) For the operation of the local authority as a whole in the long term, the expression C#P+S *must* hold true (where C=cost, P=price and S=subsidy).

   In other words, the price of the services provided by a local authority must be set at a value that will enable it to continue to provide these services on a financially sustainable basis. The price of the good or service may be reduced by the amount of internal cross-subsidy from richer to poorer consumers (normally by means of a rising block tariff) and/or by external subsidy (from a source outside the local authority). But whatever happens, total expenditure of the service provider must be covered by total income (from all sources, including external subsidy income). The matter is complicated by:
   (a) the service provider's need to borrow in order to fund major capital works;
   (b) C, P and S have further components (capital and operating; internal and bulk/connector; which can be expressed as one-off costs or can be translated into ongoing monthly or annual costs;
   (c) The price may be reduced by the amount of subsidy. For Free Basic Water (FBW) the cost is subsidised in full so that demand is not tested for the basic amount.
   (d) Nevertheless, breakeven is where C = P + S, and in the long run, the utility must be able to cover its costs, otherwise (to state the obvious) it will go bankrupt.
2. At the planning stage, there are a number of more specific levels of detail at which costs can be determined:
   (a) *Country-wide or regional estimates of average unit costs* e.g. Van Ryneveld (1995), or Palmer Development Group (1993 and 1994) - updated in Van Ryneveld (2000). These costs do not make provision for specific local conditions e.g. economies of scale of infrastructure (There are distinct differences between ERWAT and City of Johannesburg). They give a good 'first pass' overall understanding of the costs of different levels of service and what factors influence them, but generally have insufficient local detail for tariff-setting at local authority level;
   (b) *Average unit costs for the particular local authority or service provider, derived from historical costs* e.g. as derived from annual reports or summary studies e.g. iGoli 2002 (GJMC, 2000b?). These may be refined to produce more detailed equivalent costs to (a). They may also be translated into a model that can check sensitivity of various parameters (as suggested in the costing framework; see Van Ryneveld, 2000). Their limitation is that they remain essentially static models, and are not able to model changes in costs and level of service distributions over a period of time.
   (c) *Financial modelling of the service over a period of time* e.g. Palmer Development Group (1998a). This level of modelling would normally be undertaken for a large local authority for the construction of the WSDP. The approach is described in the Management Guidelines for Water Service Institutions (Palmer Development Group, 1998b).

---

[1] While this applies in the first instance to a local authority as a whole, the principle would apply equally to the operation of a service provider.

(d) *Detailed GIS-based physical modelling* of the actual network extensions, which can test the effect of different layouts, settlement densities, levels of service etc e.g. Boutek model; see Biermann and Landre (2002). Some current masterplanning may provide some of this data.

(e) *Combinations of different aspects* would provide a high level of modelling ability. e.g. integration of dynamic cost and tariff modelling together with physical modelling, supplemented by willingness-to-pay studies and economic development models.

A graded effort can also be a wise approach i.e. start with a fairly simple study (e.g. review of theoretical understanding, combined with more specific data from previous local investigations) to gain an understanding of the problem, and then follow it with more detailed studies. Many key understandings can be obtained from fairly rudimentary planning. This permits scarce resources to be targeted at specifically identified problem areas as the investigation progresses.

For decision-making in a large metropolitan local authority such as Johannesburg, static modelling of costs can provide a first estimate, but dynamic modelling of costs, prices, subsidies etc over a period of time is necessary for decision-making regarding tariffs and levels of service.

3. Updated costs (regional estimates of average unit costs; see (a) above) repeat earlier assertions that the life cycle cost of a full level of service of water supply and sanitation in Gauteng is (on average) 3 to 4 times the cost of a basic level of service; and the cost of an intermediate level of service is 1½ to 2 times that of a basic level of service.

4. A first indication of unit costs for Johannesburg may be derived from summary figures given by CoJ itself as part of the iGoli 2002 initiative (GJMC, 2000b?) (average unit costs for the particular local authority or service provider, derived from historical costs; see (b) above), which yield figures of about R18 000 per connection for average replacement capital cost for a full level of service of water and wastewater. This falls squarely within the range of estimates for the average of Gauteng. It is also very much of the same order of magnitude as the total housing subsidy amount of R20 300 (for income category of 0 to R1 500 per month; Department of Housing, Gauteng, 2002).

5. While the costs of the DDPLG Water and Sanitation Backlog Study (DDPLG, 2001) were not analysed in detail, it appears that while the estimates of operating cost as used in the study are not unreasonable, the estimates of capital cost are low as compared with figures for Gauteng presented in this study.

6. In the case of the Stretford x4 shallow sewer pilot project, JW deviated from the promulgated sewer tariffs in two respects:

   (a) in using a volumetric based tariff of R1 per kilolitre of water consumed, instead of the flat rate of R37/household.month (2002/2003 tariffs). (The volumetric tariff is understood to cover only the purification cost, and consumers are given a rebate on the balance of the operation and maintenance cost because they maintain their own sewer system).

   (b) in substantially reducing the impact fee for the bulk services contribution that is paid by consumers.

   By comparison with the costs of services, these tariffs appear to be low. The matter is further complicated by various reciprocal contributions between the community and the service provider in respect of:

   (c) the community contribution of labour for construction, operation and maintenance of the condominial sewers;

   (d) payment to the community for labour;

   (e) training provided to the community by JW in the execution of the tasks.

The monthly water and sewer tariffs for the intermediate level of service (shallow sewers) in the Stretford x4 pilot study were agreed with the community. Furthermore, there is merit in such tariff structures in that they are:

(a) simple;
(b) more affordable to low-income communities than the promulgated tariff,
(c) give consumers the benefit of the rising block tariff; and
(d) provide a rebate for in-kind community contributions to the construction, operation and maintenance of the sewer system.

What is not clear, however, is:

(a) whether consumers will in practice be able to restrict their consumption to below the free basic amount (i.e. 6kl/household.month), while using the intermediate level of service;
(b) whether the shallow sewer system will be able to operate satisfactorily on the return flow from the free basic amount of water used;
(c) whether - if consumption cannot be kept below the free basic amount (for whatever reason) - Johannesburg can afford to provide the intermediate level of service to residents for free, given that recovery of charges from existing low-income consumers is so low;
(d) whether - if extended to large numbers of households in Johannesburg - the provision of services at these tariffs is financially sustainable for the provider in the long run.

7. On the matter of non-payment, Professor Schlemmer (Water Services Forum News, Sept 2000) said: "The underlying causes of non-payment are not clearcut, simple or singular" and "...nothing less than such integrated and co-ordinated strategies are likely to reduce the problem to manageable proportions." Furthermore, figures (Hartley, 2002: p.1) indicating that the accumulated debt in the country's four metropolitan areas amounted to R9.4billion, and that the Johannesburg metropolitan councils had by far the largest debt - R4.56billion - give a clear indication that the problem of non-payment for municipal services remains a severe problem in the country as a whole and in Johannesburg in particular.

Environmental sustainability

1. There is a potential confusion between the procedures of
   (a) National Building Regulations (1985);
   (b) Groundwater Protocol (1997);
   (c) Water Use Authorisation Process (DWAF, 2000c) of the National Water Act (1998);
   (d) Environmental impact procedures National Environmental Management Act (1998).
2. DWAF Water Quality Management decision-making hierarchy lays down four principles to give direction to decision-making in this regard:
   (a) Prevention;
   (b) Minimisation at source;
   (c) Disposal according to the precautionary principle;
   (d) Disposal according to the differentiated approach.

   In similar manner to the general sanitation policy principles, these water quality management principles give limited assistance in deciding how decisions might be made in particular instances. They cannot easily be resolved in absolute terms; but rather have to be resolved through strategy. In order to give more specific direction to implementers

such as local authorities, it is necessary for these principles to be resolved in some form of *national and regional water resources strategies*.

3. There is a lack of clarity on how the critical judgement as to whether groundwater will be used in the long term for drinking purposes or stockwatering (as required in the Groundwater Protocol) should be made. The issue at stake here is *not* whether there will be any *contamination* (because even limited contamination is likely to occur, certainly in the long term) but rather whether the aquifer is of *major strategic importance*. It is suggested that the issue is dependent on the outcome of the Water Quality Management decision-making hierarchy - and therefore of some form of national and regional water resources strategies - as mentioned above.
4. There is lack of clarity as to whether the polluter pays principle will be invoked against local authorities who are issued with permits by DWAF to discharge effluent to any water resources, if any pollution (in the definition of the National Water Act) were to occur as a result of this.

Developmental approaches

1. Developmental approaches to the provision of infrastructure in general and sanitation in particular are significantly at variance with what might be termed conventional engineering approaches. The past record of projects in low-income or developing areas has been poor, and unless significant attention is given to developmental approaches, projects in these areas are likely to fail.
2. There are several different ways, however, in which failure[2] can occur. Four are suggested as follows:
   (a) *where a constructed facility falls down, blows up or fails physically in some catastrophic manner*. Failure is sudden, simple and obvious (although the exact causes of failure may not be); and it is usually a technical failure. Thankfully, such failures are rare.
   (b) *where the service is nominally provided, but the infrastructure assets have physically deteriorated, with consequent reduced utility*. The results may be little different from the first case, but the period of time over which deterioration takes place is much longer. Although the failure is physical, it is usually a direct consequence of financial, social and/or institutional failure rather than technical failure.
   (c) *where extension of basic services to all is delayed and significant backlogs persist*. In this case the consequences may not be the deterioration of any infrastructure assets, but rather (particularly in the case of water and sanitation services) poor environmental conditions and consequent health impact resulting in both illness and/or death. This situation is often associated with providing high levels of service to a few consumers, and little or no service to the rest.
   (d) *where the infrastructure is provided, and remains in satisfactory working order, but consumes resources and fails to perform or deliver the developmental benefits that it is intended to deliver*. Infrastructure provision does not necessarily enable growth - or poverty reduction - to happen. If inappropriately high levels of service are provided, they may divert scarce resources away from more beneficial areas

---

[2] In engineering in general - and in this study in particular, the term 'failure' is used to mean any failure to meet required performance standards. This may even be fairly subtle such as excessive cracking or deflection of a structure. The term 'catastrophic failure' is reserved for when something actually falls down or blows up.

and retard growth. Such a failure is difficult to identify as it is a loss of opportunity rather than a direct failure.

3. International experience over recent decades indicates that while development is possible, it is neither inevitable nor easy. Furthermore, it is multi-faceted process, requiring several components to be in place both individually and together for development to succeed.
4. Further local experience "...confirms that the quality and financial sustainability of projects are almost always directly related to whether initial funding decisions were informed by consumer demand and the economic rationality in very specific contexts. Ill-considered projects, designed in isolation from specific community dynamics and demand, have mostly proven costly." (DBSA, 1998)
5. Samuel Paul (1987) suggests five objectives of community participation as follows:
   (a) Cost sharing;
   (b) Project efficiency;
   (c) Project effectiveness;
   (d) Capacity building;
   (e) Empowerment.

   While Paul makes the point that particular objectives may not be 'right' or 'wrong' - nor are they necessarily mutually exclusive - the objectives at the 'empowerment' end of the spectrum do tend to promote development in low-income communities more than those at the 'cost sharing' end.
6. Further detail on capacity building and empowerment are provided by DBSA (1993) and Abrams (1992) respectively: the Development Impact Approach of DBSA for promoting *maximum use of local skills and resources*, and the concept of 'empowerment' of Abrams (1992), who suggested that for development to occur, communities need to 'gain the will to act', *take the initiative and make the decisions themselves*.
7. If a key to development is that communities should 'gain the will to act' and take responsibility for decision-making and action directed to their own development, then it is essential that a demand responsive rather than supply driven approach be followed in the provision of infrastructure.
8. World Bank (2002) defines the key characteristics of a demand responsive approach as follows:
   1. Community members make informed choices about:
      (a) whether to participate in the project;
      (b) technology and service level options based on willingness to pay (based on the principle that more expensive systems cost more);
      (c) when and how their services are delivered;
      (d) how funds are managed and accounted for; and
      (e) how their services are operated and maintained.
   2. Government plays a facilitative role, sets clear national policies and strategies, encourages broad stakeholder consultation and facilitates capacity building and learning;
   3. An enabling environment is created for the participation of a wide range of providers of goods, services and technical assistance to communities, including the private sector, and non-government organizations; and
   4. An adequate flow of information is provided to the community, and procedures are adopted for facilitating collective action decisions within the community (social intermediation).
9. The opposite of 'demand responsive' is 'supply driven'. They form a continuum rather than two discrete states. Notwithstanding that, the key difference relates to where control lies: If the major decisions about level of service etc are retained by the supplier or

provider, then it is supply driven. If the major decisions - and consequent responsibilities - are carried by the user, then it is demand responsive.

10. From an *infrastructure provision* perspective, three major approaches are identifiable. It must be remembered that these are caricatures. At a time, they are appropriate and sound; held on to for too long, they are distorting and retrogressive. In fact, very often it is the erroneous interpretation of approaches that is damaging.
    (a) *'Standards' approach*, characterised by adherence to (typically high) standards on (ostensibly) technical grounds alone.
    (b) *'Strategic' approach*, where the emphasis shifts to a consideration of coverage + backlogs + financial sustainability, rather than absolute standards alone. While strategic planning is currently undertaken, decision-making within what is financially feasible tends to be retained by technical professionals.
    (c) *Demand responsive approach*, which has many similar elements to the strategic approach, but where there is a change in the role of government, particularly planning and technical professionals, who are required to provide an enabling environment or a framework of rules through which demand can be expressed by communities on the ground, demand being demand at a price. It does not necessarily rule out the use of subsidies, but it does suggest changed roles: an enabling role for government and a more active implementing role for communities. The key is the establishment of a framework of clear, non-negotiable, transparent rules. Further suggested detail is given in the recommendations.

6.2 Recommendations

Institutions as rules

The following recommendations are made for resolution of the specific issues raised in the conclusions above:

1. With respect to the apparent difference in approach between housing/planning and water services, it is recommended that mechanisms be explicitly set up to develop a clear and detailed vision for how spatial development, infrastructure development and economic development are going to take place in CoJ - translated into clear step-by-step strategy. The *Joburg 2030* vision (CoJ, Feb 2002a) does provide such a long term vision, but there does not yet appear to be a sufficiently detailed strategy in the short and medium term for translating this into action. (For further details, see the CoJ IDP (CoJ, 2002d)).
2. In conjunction with the development of the more detailed strategy, it is also recommended that CoJ pursue with other spheres of government the implementation (e.g. offer the metro as a pilot site?) of a consolidated Municipal Infrastructure Grant (MIG), where such grant funding may be devolved to local authority level. While this would not in itself resolve any differences that there may be between parties at local authority level, it would at least focus the debate at that level, and reduce interference from other sphers of government.
3. Irrespective of the legislative procedure followed in the township establishment process, the decision to accept a particular level of service of infrastructure - with all its financial and other consequences - appears to rest with the local authority/service provider alone, with approval formally being given in the *services agreement* between local authority/service provider and the developer. The local authority/service provider is strongly advised to be fully aware of the responsibility that it carries in this regard, and

to ensure that it gives appropriate consideration to the long term consequences before entering into any such agreements. (Similar comments would apply in the case of informal settlements, where an agreement may be entered into directly with the community, in the absence of an agreement with a developer).

4. On the matters of overlapping responsibilities over pollution from sanitation systems, it is recommended that this be resolved through multilateral discussions between the three departments.

Further recommendation:

5. It is recommended that the various Key Performance Indicators (KPIs) being used for both organisations and individuals be reviewed to ensure that they promote co-ordinated development in general and conform to appropriate developmental outcomes for sanitation provision to low-income settlements in particular.

Financial sustainability

1. For the purposes of planning for financial sustainability, it is recommended that the following items be modelled dynamically over an extended period of time - together with demographics and economic development - in order to determine appropriate tariff levels and service provision strategies. This should at the same time form part of the preparation of Water Services Development Plans (WSDPs). What is recommended is a graded effort i.e. to start with a fairly simple study (e.g. review of theoretical understanding, combined with more specific data from previous local investigations) to gain an understanding of the problem, and then follow it with more detailed studies. Many key understandings can be obtained from fairly rudimentary planning. This permits scarce resources to be targeted at specifically identified problem areas as the investigation progresses.
   (a) Determine *external subsidies* that are available for low-income consumers and ensure that provision is made for these in the tariffs;
   (b) Determine the extent to which it is possible to provide an *internal cross-subsidy* of poorer consumers by increasing the tariffs to richer consumers over a period of time;
   (c) Because bulk and connector services form such a significant portion of the costs - particularly of the higher levels of service - it is necessary to determine the amount of *spare capacity* that exists in the network, which can be treated as a sunk cost that does not have to be recovered from new consumers. One has to be cautious here to recognise the effect that this may have on future infrastructure requirements - and make appropriate provision for future expansion;
   (d) Make provision for rehabilitation (or replacement) of ageing infrastructure;
   (e) Assess the impact of rehabilitation on physical losses in the system;
   (f) Assess the need for future improvements to the infrastructure or service where environmental standards may be raised (e.g. discharge requirements for wastewater treatment works);
   (g) Envisage and plan for upgrading of levels of service (e.g. from basic to intermediate), for how this might happen, and what the cost implications are likely to be.
2. Whatever method of costing is used, it is recommended that there be a clear and detailed statement of what assumptions have been made in the costing and what the costs represent. For this purpose, the establishment of a 'costing framework' is recommended for use by several local authorities e.g. across the province, which would provide a set of rules or standard method by which costs might be calculated. This would permit a consistent - and auditable - comparison to be made of the costs of any water supply and

sanitation option that might be proposed. What is more important, though, is that the local authority should over a period of time assemble a database of such costs for its own decision-making.

3. Assessment of demand is included under the 'Development approaches' section.

Environmental sustainability

The following approach is recommended for addressing environmental sustainability of sanitation systems:

1. In the very short term (say 2 or 3 years; say less than 10 years), adopt a *health* focus (ensure access to adequate sanitation for all in the short term):
   (a) ensure that basic (health-protecting) on-site sanitation is provided to all;
   (b) ensure that health and hygiene education is provided to all;
   (c) ensure that contaminants from both excreta and greywater do not surface (and so come into contact with people), but remain in the sub-surface;
   (d) ensure that a clean water supply is provided;
2. With respect to *short term environmental impact* (say 3 to 10 or 20 years):
   (a) minimise diffuse pollution by design for - and possible treatment of - greywater;
   (b) assess (only) the long term impact of on-site sanitation i.e. assess the water resources (groundwater and surface water), estimate impacts and likely long term scenarios, together with long term planning for service provision and for development, using a mass balance/mass flow approach;
   (c) establish baseline water quality status, and establish an ongoing monitoring system.
3. With respect to *long term environmental impact* (say longer than 20 years):
   (a) While the aquifers may not be strategic now or in the short term future (say 10 to 20 years?), they may become of strategic importance in the medium to long term future (say 50 to 100 years?). There is therefore a need to develop a sound understanding of longer term behaviour of contaminants and their possible management, which is a combination of physical and social factors.
   (b) Initiate longer term research and discussion into these matters. In particular, assess very carefully those short term interventions that may have long term impacts.
4. Where further work is required is as follows:
   (a) water resources assessment of groundwater aquifers and an assessment of when they are likely to be used (from an assessment of demand).
   (b) what remedial measures (or treatment measures) will need to be put in place to ensure that the water is safe for domestic and stock-watering purposes.
   (c) clarification of the ownership of the *characteristics* of the groundwater resource i.e. its quality.
   (d) clarification as to whether local authorities will be legally responsible for cleaning up the aquifer under the 'polluter pays principle' - even if it is given a permit to do so by DWAF (Similar clarification may be required for surface water resources as well).

Developmental approaches

1. There are a number of *overall components* to a framework through which demand might be addressed, which may be summarised as follows:
   (a) *Regulation*: set by the local authority: a framework of non-negotiable rules,

through which the provision of services can take place;

(b) *Support*: by the local authority to communities, mobilising those communities, supporting their decision-making and supporting the implementation of services.

(c) *Implementation - and decisions around implementation* - carried by communities themselves or (which applies to implementation rather than decision-making) delegated by communities to agents appointed by them to carry this out on their behalf.

2. Within this framework, further detail is as follows:

(a) *Settlement location* within macro spatial planning;

(b) *Layout planning within a settlement* within the township establishment procedures. This generally includes the choice of level of service. It is essential that communities are involved in this decision-making. A review of existing township establishment procedures is essential if a demand responsive approach is to be pursued.

(c) Rules about what *bulk infrastructure* can be provided, what the lead times are for provision and the cost implications thereof;

(d) *Opportunities for labour-intensive construction + development of small contractors;*

(e) *Training grant* to promote the development and use of local skills and resources;

(f) *Tariff structure* and statement of *subsidies;*

(g) Rules surrounding *cut-offs.*

3. Crucially, it is recommended that the service provider takes formal steps to assess customer demand for services, which may include the use of tools such as Contingent Valuation studies.

4. In *summary*, such a framework does the following:

(a) It clarifies the roles and responsibilities of the various players (water service authority, water service provider and community in the first instance; but also assists in clarifying the role of other spheres of government in the second instance)

(b) It clarifies the 'rules' under which the community can get sanitation.

(c) It clarifies the decisions that the community must make.

(d) It steers the community towards a contract between water service provider and community.

5. The establishment of a framework of rules through which demand can be expressed needs to be undertaken by means of pilot-and-programme approach, combined with significant investigation or research. Johannesburg is in the process of following such a pilot-and-programme approach.

7 REFERENCES AND BIBLIOGRAPHY

7.1 References

Abrams, L.J. (1990) *Community Organisation, Rural Empowerment & Engineering,* Rural Advice Centre, March.

Abrams, L J (1992) Redefining rural development and the emerging role of new development organisations, *SAICE Congress*?.

Ausubel, D P (1968) *Educational Psychology: A Cognitive View*, Holt Rinehart and Wilson.

Baum, W C (1982) *The Project Cycle,* The World Bank.

Baum W C and Tolbert S M (1985) *Investing in Development: Lessons of World Bank Experience,* Oxford University Press (published for The World Bank)

Biermann, S M and Landre, M (2002) (forthcoming): The utilisation of engineering services bulk infrastructure components in integrated development planning, *Development Southern Africa*, 19, 2.

CII (Construction Industry Institute) (1986) *Constructability: A Primer*, Publication 3-1, CII.

CoJ (City of Johannesburg) (2002a) *Joburg 2030*, Corporate Planning Unit, February.

CoJ (City of Johannesburg) (2002b) *Sanitation Policy for the City of Johannesburg*, prepared by J Burke, Environmental Quality Management, 2nd draft, April.

CoJ (City of Johannesburg) (2002c) *City Development Plan 2001/2002*, Section 10: Sectoral outcomes, outputs, and targets: Utilities, City of Johannesburg Budget 2001-2002, §http://www.johannesburgnews.co.za/budget_2001/develop_plan/sectoral_utilities.html,

CoJ (City of Johannesburg) (2002d) *Integrated Development Plan 2002/2003*, §http://www.goafrica.co.za/joburg/city_vision/idp.stm,

Department of Community Development (1983) *Guidelines for the Provision of Engineering Services in Residential Townships* (Blue Book).

Department of Housing, Gauteng (2002) Housing subsidy details, §http://www.gpghousing.org.za/Subsidies.htm,

Department of Provincial and Local Government (2002?) *Brochure on Key Performance Indicators*

DBSA (1993) *Socio-economic Enhancement of Development Projects*, Construction and Development Series, Number 1, February, DBSA.

DBSA (1998) *Infrastructure: A Foundation for Development*, DBSA.

DDPLG (Department of Development Planning and Local Government, Gauteng) (2001) *Business Plan for the Elimination of the Backlog in Water and Sanitation Services in the Gauteng Province, Final Business Plan: 30 November 2001*, prepared for Chief Directorate: Development Planning, Directorate: Planning Support Services, Subdirectorate: Engineering Services, November.

Dublin Statement (1992) The Dublin Statement on Water and Sustainable Development, International Conference on Water and the Environment-Development Issues for the 21st Century, 26-31 July, Dublin, Ireland, published in *J Water SRT-Aqua*, Vol.41, No.3, pp.129-135.

DWAF (1997) *A Protocol to Manage the Potential of Groundwater Contamination from On Site Sanitation,* National Sanitation Co-ordination Office and DWAF Directorate of Geohydrology, 1st Edition.

DWAF (1999) *Managing the Water Quality Effects of Settlements: The National Strategy,* Policy Document U1.1, DWAF Directorate: Water Quality Management, 1st Edition.

DWAF (2000a) *Water Use Authorisation process (individual applications),* Chief Directorate: Water Use and Conservation, Directorate: Water Quality Management, 1st Edition, Revision 3, December, §http://www.dwaf.gov.za/Dir_WQM/docsFrame.htm, see 'Policies, Procedures, Guidelines and Strategies' for document listing.
For actual licence application forms under the National Water Act of 1998, see §http://www.dwaf.gov.za/Projects/WARMS/Forms/Eng/L000218/lic.html,; for the specific form 'Licencing Part 2G' for on-site sanitation, see ...../L000218/DW779L2g(1).pdf,

DWAF (2000b) *Policy and Strategy for Groundwater Quality Management in South Africa*, 1st Edition.

DWAF (2001) *White Paper on Basic Household Sanitation*, prepared by the NSTT, September.

DWAF (2002a) *Hierarchy of Water Quality Management Decision-Taking*, Chief Directorate: Water use and Conservation, Directorate: Water Quality Management, +http://www.dwaf.gov.za/Dir_WQM/about.htm,

DWAF (2002b) Map indicating groundwater catchments in Gauteng Province, and borehole location, Chief Directorate: Scientific Services, Directorate: Geohydrology, see +http://www.dwaf.gov.za/Geohydrology/maps.htm,

Garn, Mike (1998) Managing water as an economic good: The transition from supply-oriented to demand-responsive services, *Community Water Supply and Sanitation Conference*, The World Bank, Washington DC, 5-8 May.
+http://www.wsp.org/english/focus/conference, see section labelled 'The demand responsive approach'

Gauteng Provincial Department of Development Planning and Local Government (2001) *Gauteng Spatial Development Framework: Phase 3*.

Gerrans, G C (1986) *Memorandum on Some Aspects of University Teaching and Learning (with special reference to the Faculty of Science [University of the Witwatersrand, Johannesburg])*, prepared while on sabbatical leave at the University of East Anglia, Norwich, April to June.

GJMC (Greater Johannesburg Metropolitan Council) (2000a?) *An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council*.

GJMC (Greater Johannesburg Metropolitan Council) (2000b?) *iGoli 2002 Report*, see +http://www.igoli.co.za/, for updated 2002 and 2010 versions.

Hartley, Wyndham (2002) *Article:* Local councils owed R22.2bn in service fees, *Business Day*, 7 May, p.1.

Jackson, B and Davies, G (1995) Remaking the urban sector: The importance of the economic aspects of sanitation and giving people clear choices, *Civil Engineering, Magazine of the South African Institution of Civil Engineers*, Vol.3, No.9, September, pp.31-35.

Marler, M W (1993) Personal communication, presentation on Development Impact Approach, DBSA.

May, P J and Stark, N (1992) Design professions and earthquake policy*, The Professional Journal of the Earthquake Engineering Research Institute*, Theme Issue: Public Policy, Vol.8, No.1, February, pp.115-132.

Palmer Development Group in association with University of Cape Town Water Research Group (1993), Cost comparison of sanitation systems, In: Palmer Development Group in association with University of Cape Town Water Research Group (eds.) *Technical, Socio-Economic and Environmental Evaluation of Sanitation for Developing Urban Areas in South Africa*, Working Paper B6 of Water Research Commission Report No. 385/1/93, May.

Palmer Development Group (1994) *Costing of water supply systems*, working paper prepared for the Water Research Commission as part of a project titled Evaluation of Water Supply

to Developing Urban Communities, May (draft).

Palmer Development Group (1998a) *Report on the Financial Modelling of Water Supply and Sanitation Services in the Southern Metropolitan Local Council*, June (quoted by Tomlinson)

Palmer Development Group (1998b) *Management Guidelines for Water Service Institutions (Urban)*, WRC Report No. TT98/98, January.

Paul, S (1987) *Community Participation in Development Projects: the World Bank Experience*, World Bank Discussion Papers No.6, The World Bank.

Pegram, G, Hartley, S, Coulsen, N, Wall, K and Otterman, A (2000) *A Protocol to Support Peri-Urban Sanitation Provision in the GJMC*, prepared for the Greater Johannesburg Metropolitan Council (GJMC), and funded by the Eastern Metro Local Council (EMLC) and the British Department for International Development Southern Africa (DfIDSA) through the National Sanitation Coordination Office (NaSCO), February.

Qasim, R S, Lim, S W, Motley, E M and Heung, K G (1992) Estimating costs for treatment plant construction, *Journal of American Water Works Association*, August, pp.56-62.

Ross, D, Maphai, V, Kantor, B, Collins, P, Lodge, T and Ngubane, H (2001) *The Under-provision and Under-capitalization of Road Maintenance, Rehabilitation and Upgrading in South Africa: Analysis and Measures toward Improvement*, a study carried out under the umbrella of the South African Roads Policy Project, commissioned by the Southern African Bitumen Association (SABITA), SABITA, Cape Town, May.

RSA (1985) Government Notice: Department of Trade and Industry No. R.441, 1 March 1985: National Building Regulations and Building Standards Act, 1977, Government Gazette: Regulation Gazette No.3805, Vol. 237, No.9613, 1 March 1985, pp.70-72, 98.

Sara, Jennifer (1998) Giving communities choice is not enough, *Community Water Supply and Sanitation Conference*, The World Bank, Washington DC, 5-8 May. +http://www.wsp.org/english/focus/conference, see section labelled 'The demand responsive approach'

Shulman, L S (1999) Taking Learning Seriously, *Change Magazine*, July/August, republished in DeZure, D (ed.) (2000) *Learning from 'Change': Landmarks in Teaching and Learning in Higher Education from 'Change' Magazine, 1969-1999*, p.39-41.

Thompson, P (1981) *Organization and Economics of Construction*, McGraw-Hill.

Van Ryneveld, M.B. (1995) Costs and affordability of water supply and sanitation provision in the urban areas of South Africa, *Water SA*, Vol.21, No.1, January, pp.1-14.

Van Ryneveld, M B and McCutcheon (1997) Teaching of Development Engineering at undergraduate level in the Civil Engineering degree at the University of the Witwatersrand, Johannesburg, *8th Annual Congress of the South African Institution of Civil Engineering, "Magnum Opus"*, Eskom Conference Centre, Midrand, 17-18 April, 10pp.

Van Ryneveld M B (2000) Life cycle costing of water supply and sanitation services in Gauteng: an update, *Water Services Forum*, Rand Water Head Office, Glenvista, Johannesburg, 19 July, 7 pp.

Van Ryneveld M B, Marjanovic, P D, Fourie, A B and Sakulski, D (2001) *Assignment of a Financial Cost to Pollution for Sanitation Systems, with particular reference to Gauteng*, Water Research Commission Report No. 631/1/01, 165 pp.

Water and Sanitation 2000 (1991) *Water and Sanitation 2000 Workshop: Strategies for Water Supply and Sanitation Provision,* Midrand, 1 August.

World Bank (1999) Introduction: New directions in development thinking, In: *World Development Report 1999/2000: Entering the 21st Century*, +http://www.worldbank.org/wdr/2000/pdfs/intro.pdf,, further details of the report available online at +http://www.worldbank.org/wdr/2000/fullreport.html,, alternative

source +http://www.worldbank.org/html/extpb/digitalibrary.htm,, pp.13-30.
World Bank Water Supply and Sanitation (2002) *Key characteristics of demand responsive approach (DRA)* +http://www.worldbank.org/watsan/rural_dra.html,
Water Services Forum News (2000) *Article:* No easy answer to addressing non-payment, Issue No.3, September.
Wright, A.M. (1992) Strategic sanitation approach, *Fourth African Regional ITN Meeting,* University of Science and Technology, Kumasi, Ghana, 1-4 December.
Xu, Y and Braune, E (1995) *A Guideline for Groundwater Protection for the Community Water Supply and Sanitation Programme,* DWAF Community Water Supply and Sanitation, 1st Edition.

7.2 Selected bibligraphy

General topics:

Bester, J W and Austin, L M (1999) *Building VIPs: Guidelines for the Design and Construction of Domestic Ventilated Improved Pit Toilets*, publication sponsored by the South African Quality Institute, and prepared in collaboration with the CSIR Division of Building Technology, the Department of Water Affairs and Forestry (National Sanitation Co-ordination Office), the Water Research Commission and the South African Bureau of Standards, January.
Bester, J W and Austin, L M (2000) *Design, Construction, Operation and Maintenance of Ventilated Improved Pit Toilets in South Africa*, Water Research Commission Report no. 709/1/00.
Goldblatt, M (1997) *The provision, pricing and procurement of water: A willingness to pay survey in two informal settlements in Greater Johannesburg*, MSc dissertation, Faculty of Science, University of the Witwatersrand, Johannesburg.
Goldblatt, M (1999) Assessing the effective demand for improved water supplies in informal settlements: a willingness to pay survey in Vlakfontein and Finetown, Johannesburg, *Geoforum*, Vol.30, pp.27-41.
Hendler, P (1992) Living in apartheid's shadow: Residential planning for Africans in the PWV region 1970-1990, *Urban Forum*, Vol.3, No.2, pp.39-80.
Jackson, B M and Hlahla, M (1999) South Africa's infrastructure service delivery needs: the role and challenge for public-private partnerships, *Development Southern Africa,* Vol.16, No. 4, Summer, pp.551-563.
Kraak, A (1994) Lifelong learning and reconstruction: Can it deliver? *SA Labour Bulletin*, Vol.18, No.4, pp.32-39, September.
Mas, J-P (2001) The role of the private sector in Johannesburg Water, *Water Institute of Southern Africa Division for Water Distribution, in conjunction with Rand Water's Water Services Forum*: Private-Public and Public-Public Partnerships: Johannesburg Water and Amanziwethu (Harrismith) Perspective, held at Rand Water, 19 June.
National Water Supply and Environmental Health Programme, Ministry of Health, Lao PDR (2001) *Promoting Options for Cleaner and Healthier Lives: Translating Sector Strategy into Better Hygiene Practices in Lao PDR,* +http://www.wsp.org/pdfs/eap_lao_translating.pdf,, November.
Rogerson, C M (1996) Willingness to pay for water: The international debates, *Water SA,* Vol.22, No.4, October, pp.373-380.
Shovlin, M G and Tanaka, S S (1990) Risk communication in Los Angeles, *Journal of American Water Works Association*, November, p.40-44.
South African Institute of Race Relations (1999) *South Africa Survey 1999/2000 Millenium*

Edition, South African Institute of Race Relations, Johannesburg, p.414.
Statistics South Africa (1999a) *Consumer Price Index*, Statistical Release P0141.1, 18 May.
Statistics South Africa (1999b) *Producer Price Index*, Statistical Release P0142.1, 26 May.
Still, A (2001) The need and challenges of Johannesburg Water Utility, *Water Institute of Southern Africa Division for Water Distribution, in conjunction with Rand Water's Water Services Forum*: Private-Public and Public-Public Partnerships: Johannesburg Water and Amanziwethu (Harrismith) Perspective, held at Rand Water, 19 June.
Streeten, P et al. (1981) Appendix: Basic Needs and Human Rights, In: *First Things First: Meeting Basic Human Needs in Developing Countries*, World Bank
Syn-Consult Africa (Pty) Ltd (2001) *Sustainable Low-cost Housing Policy for Johannesburg,* 1st Interim Report: Final Draft, Policy Problem Definition, submitted to the Johannesburg Metropolitan Council Housing Department, 19 March.
Tayler, K and Parkinson, J (2000) Strategic planning for urban sanitation, *Water 21*, February, pp.54-57.
Tomlinson, R (1999) Ten years in the making: The evolution of metropolitan government in Johannesburg, *Urban Forum*, Vol.10, No. 1, pp.1-39.
Wall, Kevin (2000) *A Resume of World Bank Water and Sanitation Experience of Value to South Africa,* Water Research Commission Report No. KV 126/00, WRC.
Whittington, D, Lauria, D T, Wright, A M, Choe, K, Hughes, J A and Swarna, V (1992) *Household Demand for Improved Sanitation Services: A Case Study of Kumasi, Ghana,* Water and Sanitation Report No.3, UNDP-World Bank Water and Sanitation Program.
Whittington, D, Lauria, D T, Kyeongae Choe, Hughes, J A, Venkateswarlu Swarna and Wright, A M (1993) Household sanitation in Kumasi, Ghana: A description of current practices, attitudes and perceptions, *World Development,* Vol.21, No.5, pp.733-748, Pergamon Press.
Wood, A, Uchronska, W and Valashiya, G (2001) *Greywater management in dense, informal settlements in South Africa*, Water Research Commission Report No.767/1/01, April.
Yepes, G and Dianderas, A (1996) *Water and Wastewater Utilities: Indicators 2nd Edition,* Water and Sanitation Division, World Bank, TWUWS, May.

Demand responsive approach:

Bos, J J (2001) *The Role of Engineers in the Demand Responsive Approach: A Case Study from South Africa*, Water, Engineering and Development Centre (WEDC), Loughborough University, UK.
+http://www.lboro.ac.uk/wedc/publications/roedrasa.htm,
Briscoe, J (1997) Economic growth, *Water Quality International,* September/October, pp.12-15
Garn, Mike (1998) Managing water as an economic good: The transition from supply-oriented to demand-responsive services, *Community Water Supply and Sanitation Conference*, The World Bank, Washington DC, 5-8 May.
+http://www.wsp.org/english/focus/conference, see section labelled 'The demand responsive approach'
Heilbroner, R L (1967) Chapter 1: Introduction and Chapter 2: The Economic Revolution, In: *The Worldly Philosophers: The Great Economic Thinkers,* Allen Lane The Penguin Press.
One World Think Tank (1999) *The demand responsive approach in rural water and sanitation: Report of an Electronic Discussion*, 17 May-1 July 1999
+http://www.oneworld.org/thinktank/water/drarep.htm,
Palmer, Ian (1998) Mvula Trust: An independent approach to rural water supply and sanitation in South Africa, *Community Water Supply and Sanitation Conference*, The World Bank, Washington DC, 5-8 May.
+http://www.wsp.org/english/focus/conference, see section labelled 'Lessons and

challenges': 'Main case studies'

Parkin, M (1996) *Economics,* 3rd Edition, Addison-Wesley.

Sara, Jennifer (1998) Giving communities choice is not enough, *Community Water Supply and Sanitation Conference*, The World Bank, Washington DC, 5-8 May. +http://www.wsp.org/english/focus/conference, see section labelled 'The demand responsive approach'

Sara, Jennifer and Katz, Travis (1998) *Making Rural Water Supply Sustainable: Report on the Impact of Project Rules*, World Bank +http://www.wsp.org/pdfs/global_ruralreport.pdf,

Whittington, D, Davis, J and McLelland, E (1998) Implementing a demand-driven approach to community water supply planning: A case study of Lugazi, Uganda, forthcoming in *Water International*.

World Bank Water Supply and Sanitation (2002) Key characteristics of demand responsive approach (DRA) +http://www.worldbank.org/watsan/rural_dra.html,

World Bank: Water Supply and Sanitation (2001) Water Supply and Sanitation at the World Bank: Economics of Water and Sanitation +http://www.worldbank.org/html/fpd/water/topics/economics.html,

APPENDICES:

Pegram, G, Hartley, S, Coulsen, N, Wall, K and Otterman, A (2000) *A Protocol to Support Peri-Urban Sanitation Provision in the GJMC*, prepared for the Greater Johannesburg Metropolitan Council (GJMC), and funded by the Eastern Metro Local Council (EMLC) and the British Department for International Development Southern Africa (DfIDSA) through the National Sanitation Coordination Office (NaSCO), February.

City of Johannesburg (CoJ) (2002) *Sanitation Policy for the City of Johannesburg*, drafted by Jacky Burke, Environmental Planning and Management: CoJ, and approved by the Mayoral Committee on 28 November 2002.

A PROTOCOL
TO SUPPORT PERI-URBAN SANITATION PROVISION
IN THE GJMC

ACKNOWLEDGEMENTS

This project was initiated by the Greater Johannesburg Metropolitan Council (GJMC) and was jointly funded by the Eastern Metro Local Council (EMLC) and the British Department for International Development Southern Africa (DFIDSA), through the National Sanitation Coordination Office (NaSCO). The vision and contribution of these organisations are gratefully acknowledged. In particular, the following members of the project steering committee are thanked for their guidance:

J Burke	GJMC Scientific Services
A Lotz	SMLC
R Nay	EMLC
I Blackett	DFIDSA
K Eales	NaSCO
J Crowder	NaSCO
Amina Ismail	SMLC Environmental Health
H Mvulane	GJMC Health
U Madida	GJMC Housing
D Gadd	Rand Water
J Bhagwan	WRC

The project was coordinated and produced by Guy Pegram, with input from Simon Hartley, Nancy Coulsen, Kevin Wall and Arno Ottermann and review by Seetella Makheta.

A PROTOCOL TO SUPPORT PERI-URBAN SANITATION PROVISION IN THE GJMC

Table of Contents

PREFACE

The Peri-urban Sanitation Challenge in GJMC

Providing adequate sanitation facilities for the urban poor remains one of the major challenges in all developing countries. In South Africa, about 11 million people in urban and peri-urban areas have inadequate sanitation, which limits protection for public health, the environment and water supplies. Typically, environmental degradation has the greatest impact on the health and resources of the poorest and most marginalised members of society.

The challenge includes both poor and very poor communities, people living in formally laid-out settlements (possibly with formal houses) and those in spontaneous informal settlements. Some of these people may be in the queue for provision of better services, while others may not even be acknowledged by government agencies. Providing services to these urban dwellers may be complicated by the characteristics of the settlements in which they live:

- Settlements are located on the most marginal urban land, which is usually steep, rocky, prone to flooding and/or located away from sewered areas and treatment facilities.
- Population densities are high and open space is limited, often with irregular dwelling layout and unstable informal dwelling structures.
- Other service levels are low, particularly water supply and solid waste management, both of which have a negative impact on the effectiveness of sanitation solutions.
- Incomes are low, with widespread poverty and unemployment, resulting in limited affordability for improved services.
- Residents often have inadequate or illegal land tenure, which reduces the social stability of these settlements and may limit their recognition by government agencies, particularly where these agencies wish to discourage further settlement.
- The marginal status of people in these settlements may reduce their political influence and ability to compete for resources and services.
- Residents of these settlements are often socially and culturally diverse, having migrated from various urban and rural areas, which can reduce the sense of community.

Many of these characteristics limit the applicability of on-site sanitation options, either due to the risk to environmental health or because economies of scale make off-site solutions more cost-effective. Conversely, the capital costs and operation and maintenance requirements of conventional sewerage systems are unaffordable or unsustainable for transient settlements.

Within Greater Johannesburg this issue is complicated by VIPs representing the national minimum standard, while waterborne sewerage has historically been adopted as the minimum level of service, by the Greater Johannesburg Metropolitan Council (GJMC) and Gauteng Housing Board.

In spite of this formal policy on the minimum level of service, many peri-urban areas remain without adequate sanitation, due to financial and capacity constraints. Temporary services have been provided in the form of communal chemical toilets. The rate at which sanitation provision is occurring is too slow for the temporary provision of chemical toilets to be continued. In some cases, settlement expansion and financial constraints have resulted in one chemical toilet being used by more than 10 households. This situation is obviously unacceptable from an environmental health perspective and is financially unsustainable.

Recognising these shortcomings, GJMC has recently adopted a policy of replacing chemical toilets with communal VIPs. However, this only provides a temporary solution, in that the long-term goal for the GJMC is a household sanitation facility on every stand. The priority is to maintain existing infrastructure and to promote access to basic levels of service to the presently unserved. Above-basic levels of service should only be provided where these can be afforded by the household, and/or the environmental health consequences are unacceptable.

In attempting to achieve the long-term goal of household sanitation facilities, within the financial and capacity constraints, GJMC officials are faced with an ever-increasing array of generic and commercial sanitation systems. Making decisions about the appropriate sanitation system in a particular settlement, is further complicated by the varying possibilities and requirements of different systems in terms of social marketing, community participation, management arrangements, financing, water supply, operation and maintenance.

Objectives of the Protocol

Early in 1999, GJMC identified the need to develop guidelines to support sanitation promotion in peri-urban settlements, that currently have less than the basic service level and where full bore water borne sewerage is not necessarily viable in the short to medium term. The aim of the guidelines was for use in *determining the appropriate, optimum and sustainable sanitation approaches for a given settlement*, based on a clear and simple decision-making *protocol*.

The target users of the protocol were to be GJMC technical and/or environmental health officers, who are regularly faced with the task of sanitation promotion in peri-urban settlements. As such it is written from the GJMC perspective, outlining the steps that the officials have to perform, but engaging the need for community involvement in the process.

An Introduction to Sanitation

Before discussing the protocol it is necessary to briefly *discuss and define* the concepts of toilet, sanitation and sanitation technology.

A *toilet*, or a latrine as it is sometimes referred to, is both the site and the facility used when defecating and urinating. There are many varieties of toilets available, some using water and others not. However most of them have common components, such as a *privy or enclosure* which gives the user privacy and protection against wind and rain. This can be made from bricks, corrugated iron or wooden poles. Furthermore in South Africa most people prefer to sit rather than squat when going to the toilet which means that most local toilets have a *pedestal* onto which the *toilet seat* is located. A toilet that is dependent on water will usually have a *cistern* to store the water for flushing.

The term *sanitation* (as used in this document) refers to both the “hardware” such as the toilet and the “software” such as people’s hygiene practices and behaviour. For successful sanitation you need a well designed, functioning and maintained toilet, as well as appropriate health and hygiene practices and user behaviour.

A *sanitation technology* is a method by which human body wastes are collected, stored and treated. There are a variety of generic and proprietary sanitation technologies available, based

upon a limited number of approaches. For the purposes of this protocol, the following seven types of sanitation technology have been distinguished:

- VIP (Ventilated Improved Pit) systems work on the principle that the wastes drop into a pit where they are stored and slowly digest. The waste therefore also does not get transported away from the house and plot immediately. This also means that this technology falls into a group called on-site dry systems.
- Composting and desiccating systems are also on-site dry systems where the wastes drop into a lined pit/container and break-down or dry-out before being removed.
- Aqua privies use a small amount of water to flush or wash the wastes into a water tight tank where they digest into a liquid before flowing into a soakaway situated on the plot. This type of technology falls into the group called on-site wet system.
- Septic tanks are also on-site wet systems which may be used with full-flush toilets, and have a storage tank for the solids and an on-site soakaway for liquids.
- Small-bore solids free sewers have on-site storage of solids, similarly to the septic tank system, but with small sewers to remove the liquids from the plot.
- Full water borne systems use larger amounts of water, which flush the wastes away to a centralised treatment works. This treatment works receives sewerage (water and wastes) from many households to treat. Full water borne systems fall into the category called off-site wet systems.
- Shallow sewers are also off-site wet systems, but may be used with using less water for flushing of solids.

HOW TO USE THE PROTOCOL

The Protocol and Sanitation Promotion in Peri-urban Settlements

As outlined in the objectives above, the concept of *sanitation promotion* (rather than sanitation provision) and *community engagement* (rather than purely technical decision making), were taken as the point of departure for the protocol, to increase the chances of sustainable implementation of any intervention. There are a number of implications of a community oriented sanitation promotion approach.

The protocol is not designed to identify a single "best alternative" for a settlement, but rather to identify a suite of appropriate sanitation technologies, linked to considerations for their sustainable implementation. This suite provides the range from which one or more alternatives may be selected during the process of implementation planning and ensuring commitment from the GJMC and community.

The identification of this suite and associated considerations must integrate the community-social, financial-institutional and technical-physical requirements of the possible systems, with decisions being made according to all three groups of issues. This requires a balance to be kept between the needs of the technical GJMC decision making process (ensuring appropriateness and affordability) and the intensive consultation-participation requirements of the sanitation promotion process (for acceptability and sustainability).

The merging of the technical provision and social promotion approaches requires community representation, together with the involvement of both technical and environmental health officials, during the process of evaluating and identifying appropriate sanitation technologies. Thus the sanitation protocol is based on a small (less that 5 people) "team concept", with an official from the GJMC driving and/or facilitating the process.

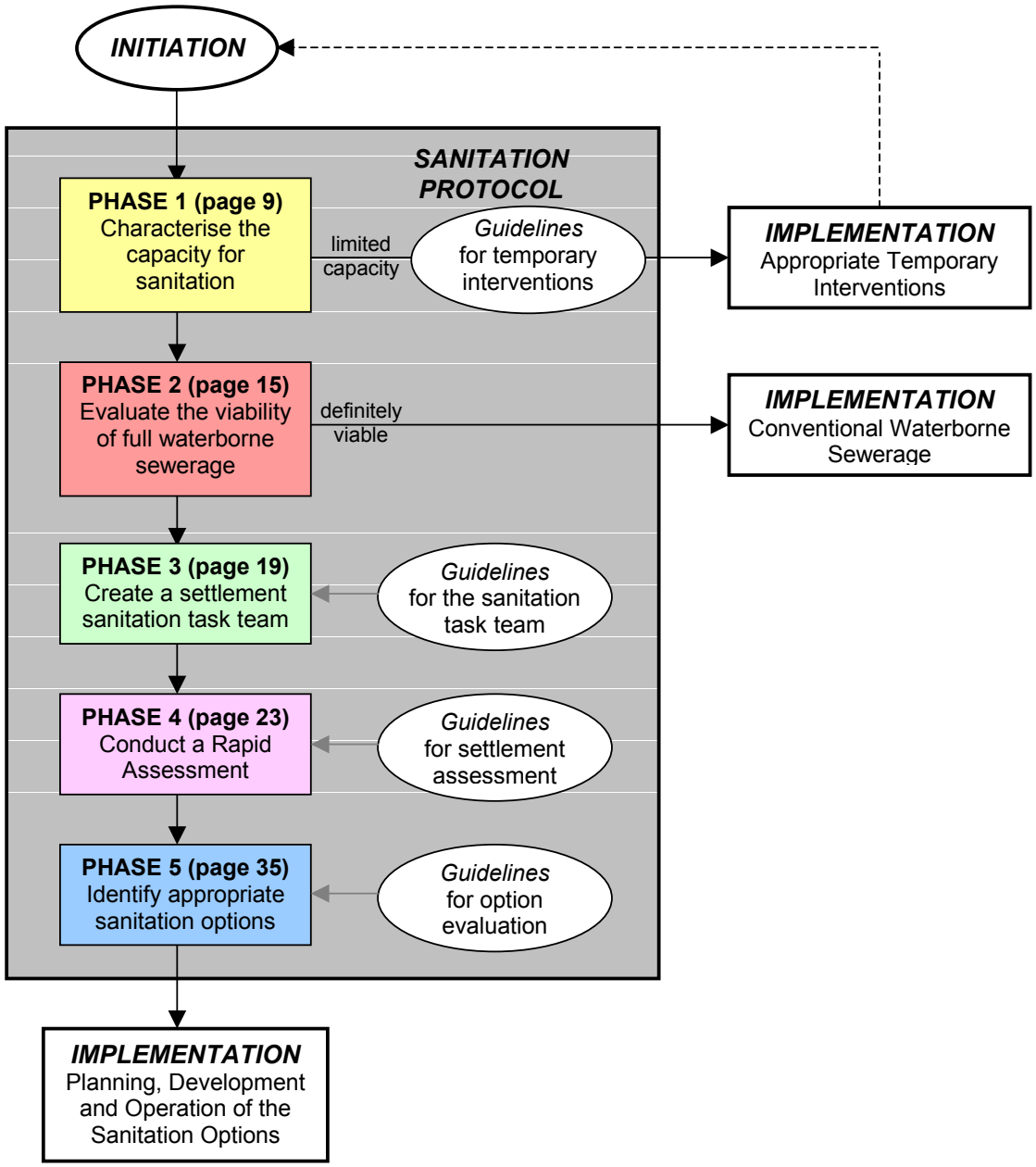
The above issues outline the fundamental approach to the protocol, which requires a paradigm shift from the general technical-discipline based approach that has historically been the basis for sanitation provision. This issue cannot be overstated, because there is a very real threat to the sustainability of any sanitation alternative that is not based on a tripartied alliance and process between representatives of the community, technical and environmental health.

Five generic stages of sanitation promotion may be identified:

- *Initiation* of the process, involves the identification and prioritisation of the settlement.
- *Evaluation* of the settlement and identification of a suite of appropriate sanitation options, based on the social-community, financial-institutional and physical characteristics of the settlement, together with the implications and requirements for their implementation.
- *Implementation planning*, which involves the selection of one or more sanitation options for the settlement and ensuring commitment from the GJMC and community on their respective responsibilities, based on an extensive consultation process.
- *Implementation* of the selected sanitation options, including the required user education, health and hygiene awareness, infrastructure development, etc.
- *Operation* of the system, based on the agreed responsibilities, and ongoing community development programmes.

As indicated in the following roadmap, the protocol supports the evaluation stage of sanitation promotion. There are two reasons for this. Firstly, the objective of the protocol was to assist in determining the appropriate, optimum and sustainable sanitation approaches for a given settlement, which is the aim of the evaluation stage. Secondly, and more importantly, the requirements and procedures for community involvement in the three stages of implementation (planning, development and operation) differ significantly from those required during the evaluation phase, and in effect require a separate protocol.

Roadmap to the Protocol



Using the Protocol

As indicated in the Roadmap above, there are five phases in the Protocol. These balance the need for appropriate community engagement with the GJMCs need for a decision making process.

There are a number of steps associated with each of these phases, which are described in detail in the relevant sections throughout this document. In using the protocol, the user should follow these phases and steps sequentially through the document, referring to the relevant guidelines where more information is required. A brief overview of the role of each phase is presented below.

Phase 1: Characterise the capacity of the community and the GCMC for the settlement

The protocol is designed for GJMC personnel. It enables them to promote improved sustainable sanitation by identifying appropriate sanitation technologies for a settlement. The capacity of the GJMC and the community to implement and support any sanitation intervention dictates whether the protocol can be successfully applied. It is not appropriate to apply the protocol to a specific settlement when the GJMC has no capacity, in terms of money and/or people, to implement any sanitation options coming out of the protocol. In this case, temporary sanitation interventions should be considered.

Phase 2: Evaluate the viability of full water borne sewerage

Politicians, GJMC personnel and the community perceive full waterborne sewerage to be the long-term sanitation alternative. Therefore, the technical and financial viability of this system is evaluated before proceeding with the protocol, as a check whether water borne sewerage should be implemented as a sustainable technical solution.

Phase 3: Create a sanitation task team

Identifying appropriate sanitation options requires technical and environmental health skills, as well as community knowledge and representation. The protocol is therefore designed to be applied by a small (4 to 6 person) sanitation task team representing the GJMC and community.

Phase 4: Conduct a rapid assessment of the settlement

A rapid assessment of key characteristics of the settlement and community, that will influence the evaluation of sanitation options, must be conducted by the sanitation task team. This is done through a combination of desktop evaluation and a site visit, and is based on a checklist of issues.

Phase 5: Identify appropriate sanitation options

The results of the rapid assessment are used to identify those sanitation options that are appropriate for the settlement, together with conditions or interventions that may be required to ensure its effective and sustainable operation.

This suite of options provides the basis to community consultation during the process of implementation planning for sanitation promotion in that settlement.

Getting Started (Guidelines for Initiation)

Settlements may be identified for sanitation promotion due to political, social, environmental health or technical reasons. This is a macro-level GJMC strategic planning process, that may be done through the Integrated Development Planning and Water Services Development Planning process. Engaging this planning level is not the aim of this protocol, but the outcomes of these processes dictate the context, priorities, targets and resources for sanitation promotion, as one component of municipal service provision.

These processes should also identify the settlements that have been prioritised for sanitation promotion, even though *ad hoc* sanitation intervention in a settlement may occasionally be required, due to a public health threat or political pressure.

Regardless of the process by which a settlement has been prioritised, the protocol is designed to be used for a discrete, relatively coherent (homogeneous) settlement. The following issues need to be considered in defining the "target area" for the protocol:

- Physical conditions, such as geology, slopes, rivers, highways, access to bulk & connector infrastructure.
- Community structure, particularly in terms of cohesiveness, stability (turnover and growth), organisational capacity and affiliations.
- Institutional arrangements, around municipal boundaries and applicability of available financial support.

If the preceding technical, social or institutional reasons indicate that there are two or more distinct parts of the settlement or community, the protocol may be applied to the different areas simultaneously. This will result in two or more suites of appropriate sanitation technologies, with associated implementation considerations. It is strongly advised that where the protocol is applied simultaneously, community perceptions are closely monitored and managed, to avoid a feeling of preferential treatment for one towards the other starts to emerge.

On the other hand, it may be appropriate to apply the protocol to the entire settlement, but reflecting the diversity within the community. This would result in the identification of a suite of sanitation options that can accommodate household specific requirements, within the limits of overall suitability and operational acceptability.

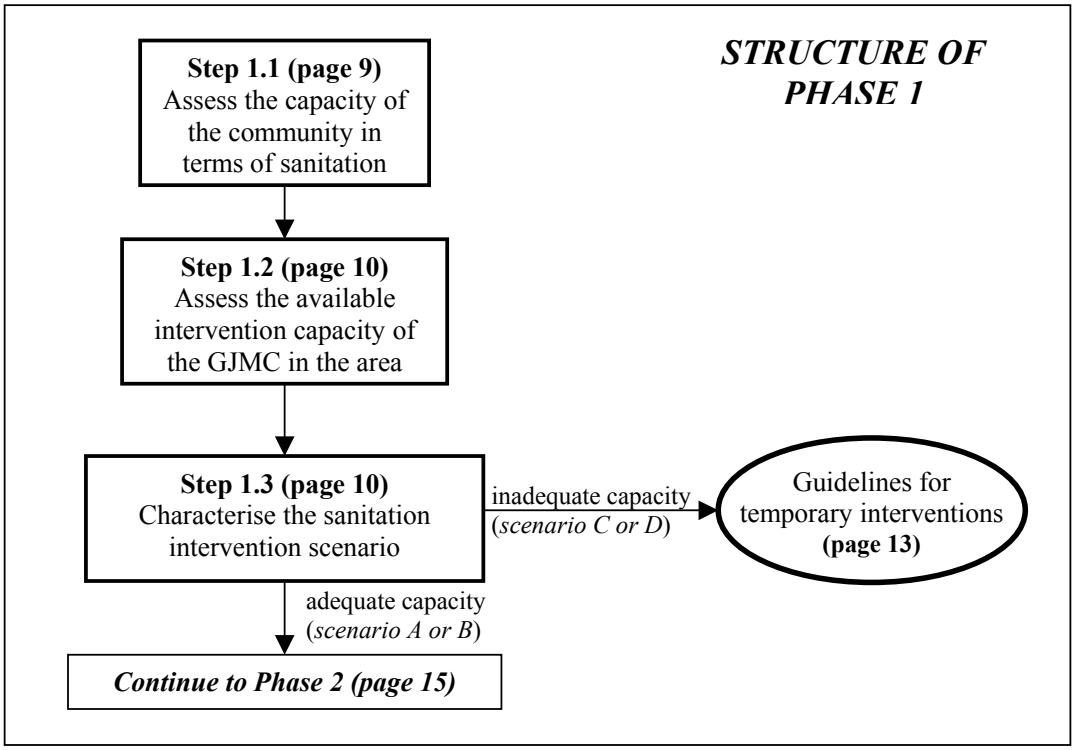
PHASE 1: CHARACTERISE THE CAPACITY

Why Characterise the Community and GJMC Capacity?

Sustainable sanitation is only possible where the process of sanitation promotion matches (1) the required *resources* for planning, implementation and operation of the sanitation option, with (2) the available *capacity* of the local authority *and* community. Sanitation system failure generally results where there is a *capacity gap*, i.e. required resources are less than the available capacity. This assumes a broad definition of capacity to include, among others, issues such as the organisational resources, technical skills, finances and sanitation awareness.

Phase 1 therefore requires a high-level screening assessment of the *capacity of the community* to support a sanitation intervention in the settlement and the *capacity of the GJMC* for sanitation intervention in that settlement (as indicated in the figure below).

This assessment of capacity indicates the appropriate sanitation intervention approach for that settlement (see Phase 3). As outlined below, this screening assessment of capacity also enables re-evaluation of the priority of the settlement in terms of interventions for sanitation promotion, within a resource-limited environment (such as the GJMC).



The Rapid Assessment in Phase 4 revisits these issues in more detail, with the emphasis on guiding the selection of sanitation options.

Step 1.1 Assess the capacity of the community

The most successful approaches to basic sanitation are demand driven. This means that people from a community request sanitation improvements. This is important because basic sanitation requires commitment from households if it is to be successful. Families must undertake to clean and maintain their toilets if their health is to be protected.

Two community capacity issues are critical in terms of the approach to sanitation intervention in a particular settlement, namely:

- a motivation or active desire for improved sanitation; and
- a stable and organised community.

Such a community is then able to participate in the completion of the protocol, selection of the sanitation option, getting commitment for the option and in the implementation and monitoring of the sanitation intervention. These two points are assessed by the questions presented in the following table.

Questions to Assess Community Capacity	**Yes**	**No**
Have the community made any complaints about sanitation to GJMC?		
What actions have the community taken to address their existing sanitation problems? • spoken with their local EHO • spoken with technical services • approached a local development NGO • built temporary toilets themselves • discussed sanitation problems in a local meeting		
• Are the existing household sanitation facilities generally kept clean? • Are the existing household sanitation facilities generally in working order?		
• Are there service organisations working in the community , for example, child welfare groups, feeding schemes, environmental groups, housing, job creation, adult education and other development initiatives • Is the community actively involved in any development project?		
In the last 12 months has this community lived without conflict or the threat of serious violence?		
• Are there recognised community leaders? • Are there recognised women community leaders?		
Which organisations are active in the community • ANC • Other political groups • Church groups • Women's groups • Civics and residents associations • Stokvels and burial societies		

If the above information is unknown then it may be gained by speaking with the local environmental health officer, development projects in the area or a GJMC community liaison officer. The more questions that are answered "yes" the greater the community capacity.

Step 1.2 Assess the available intervention capacity of the GJMC

The protocol assumes GJMC will be driving or facilitating the process of sanitation promotion in that settlement. This requires some human or financial resources (capacity) from the GJMC to support sanitation intervention in that settlement. It is not necessary for the GJMC to provide all resources, as the community should be expected to pay for services and support the sanitation intervention in other ways, but the GJMC should avoid becoming too involved unless they have some capacity. Where the GJMC does not have capacity in the short-term, temporary interventions may be implemented (see step 1.3 below).

The intervention capacity of the GJMC in a settlement, should be assessed in terms of the planning, implementation and operation of sanitation systems, and should be assessed by the person tasked with applying the protocol in that settlement. In particular, there are two components of capacity that must be assessed:

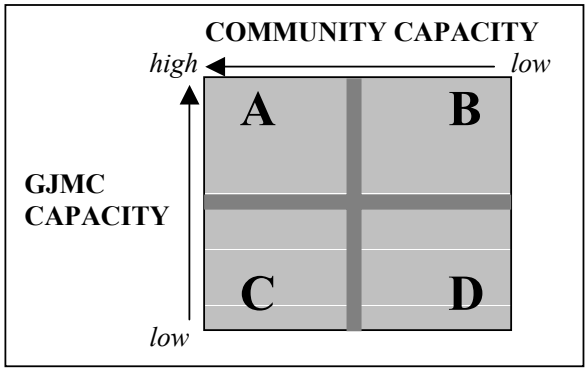
- Are there one or more GJMC personnel from technical services and/or environmental health available to drive or facilitate the process of sanitation promotion, which includes:
  - applying the protocol over the following month;
  - facilitating sanitation implementation planning and community engagement; and
  - driving the implementation process for any sanitation interventions

- Is there any financial support available ("ear-marked") for the implementation and/or operation of sanitation systems in that settlement?

In must be noted that the GJMC has capacity, but that this is inadequate for simultaneous sanitation promotion in all settlements. Therefore, the issue is really whether there is available capacity in that part (MLC) of the GJMC, which may be allocated for sanitation promotion in that particular settlement. This is inherently a prioritisation issue between settlements, and thus the assessment of capacity should be viewed as a screening check. Although financial support is not necessary for the protocol, GJMC people are required to facilitate the process.

Step 1.3 Characterise the sanitation intervention scenario

Based on the assessment of the GJMC and community capacity, the sanitation intervention scenario may be characterised in terms of the following matrix.



Matrix to Characterise Sanitation Intervention Capacity

For the protocol the most significant scenario is *scenario A*. Under *scenario A*, a **working partnership** can be established between the GJMC and the community, because both the community and GJMC have capacity for the sanitation intervention. A working partnership between communities and the council is the best approach to service delivery and therefore the protocol may be followed to best effect, if the settlement fall into this scenario.

Should the intervention fall into any other of the scenarios then it is important to consider how it can be shifted into *scenario A*. For example, in *scenario C* there is community capacity to support a sanitation intervention, but GJMC lacks funds or other resources. If funds or other resources are reallocated to this community, then the *scenario C* becomes *scenario A*. The following table shows the implications of each intervention scenario for the protocol.

Scenario	Description	Implication for the protocol
A	There is both high community and GJMC capacity for the sanitation intervention. A working partnership can be established.	Proceed with the protocol, but ensuring the development of a partnership between the GJMC and community, in order to avoid potential conflict.
B	There are funds and resources in GJMC for the sanitation intervention, but little or no capacity in the community. If there are no known community organisations, leaders and service groups working in the community then it will be difficult to find a method to talk with the community about the protocol and later the implementation plan. In this situation GJMC will need to find people who can help build community contacts.	Proceed with the protocol if this community is a high priority for sanitation intervention. However community capacity will have to be addressed during implementation planning. It may be most appropriate for the GJMC to work with a community liaison officer (working in urban development) or a local community development NGO (working on local development programmes).
C	There is high community capacity, but limited capacity in GJMC. Sanitation interventions are much more likely to succeed with active community involvement. Without funding any sanitation intervention will be a self-help initiative driven by the community. This is not a process GJMC is in a position to facilitate, but rather this should be NGO or CBO driven.	Can funds and resources from GJMC be reallocated to this community? A funded *scenario C* becomes *scenario A*, which is the best model for service delivery. Depending on relative environmental health priorities it may be better to fund and support a scenario C intervention rather than a scenario B. If this settlement can not be moved out of *scenario C*, then the protocol is not appropriate and temporary interventions (see below) should be considered until further GJMC capacity is available.
D	Neither the community nor the GJMC have capacity. Under this scenario it is not possible to plan and implement a major sanitation intervention.	It is not appropriate to proceed with the protocol unless this intervention is moved into a B scenario by the allocation of funds. The threat to environmental health should be considered, with the possibility of implementing temporary interventions.

Guidelines for Temporary Interventions

Why consider a temporary intervention?

There is inadequate capacity in the community and the GJMC to implement and sustain household sanitation facilities in the short-term. Therefore, planning of a more permanent sanitation solution through the protocol is not appropriate, until GJMC capacity is allocated or community capacity is increased. However, some type of temporary sanitation intervention is required, in order to address the public health and environmental consequences. Note that these are *Interventions* and not long-term sustainable *Solutions*!

What is considered a temporary intervention?

"Temporary" would typically mean a short time of approximately 1 to 3 years, beyond which the sanitation option is considered not sustainable without further intervention. The communal VIP programme being implemented by GJMC is the most viable temporary sanitation option.

However, communal sanitation facilities in the peri-urban context, especially at loadings of more than 5 to 8 houses per facility, are seldom appropriate or sustainable over a longer period. This, together with the GJMC vision of providing a household level sanitation facility, makes such communal sanitation facilities temporary solutions.

What type of temporary intervention may be considered?

Temporary interventions can be one or more a combination of:

- refurbishment of existing sanitation infrastructure;
- new communal sanitation infrastructure;
- sanitation-health awareness programs, focused on the specific health problems;
- education on suitable sanitation practices for the temporary sanitation option;
- school hygiene promotion projects, such as Gauteng Integrated Schools Sanitation Programme (GISSIP) has materials available for use in schools;
- provide a focus on hygiene promotion at the local child health clinic by putting up a display, giving a talk or organising a local drama;
- initiate a programme of home visits to help families improve their own sanitation situation;
- implement a programme of water point hygiene and water source protection where appropriate; and
- monitoring of sanitation health, sanitation interest and institutional capacity in order to implement emergency actions and identify suitable conditions when the protocol may be applied to identify permanent sanitation options.

How to identify and evaluate temporary interventions?

The following elements should be included in the process of identifying temporary sanitation interventions, and using evaluation guidelines presented in Phase 5.

Site Visit & Community Consultation
A site visit is essential to identify and assess site-specific considerations, consult the target community and meet with potential role players. The focus is primarily on identifying and assessing risk situations for health problems, with less emphasis on physical and technical detail.

Integrated Development Approach & Intervention Plan
Any temporary intervention needs to be rectified by a suitable permanent solution within the medium term. It is therefore important to assess the overall development potential and intention for the settlement (as outlined in the IDP), in order to formulate an integrated development approach for the community, including future levels of water supply and a funding strategy for sanitation promotion.

Environmental health priority
The environmental health priority of a settlement may be assessed according to the following criteria (see Phase 4 for approaches to assessing these):

- the proximity of any water sources to sanitation facilities in the settlement;
- average housing density greater than 30 dwellings per hectare;
- reported outbreaks of sanitation related disease (shigella, salmonella, typhoid and cholera) in the community in the last 12 months;
- local health workers in clinics or GPs report seeing a high incidence of worms in children;
- soil type-geology is such that ground water contamination can be expected to occur; and
- location of the settlement in the flood plain or above high water table.

Emergency Actions
The health risk and environmental impact from inadequate sanitation may vary from moderate to acute. In the event of epidemic outbreak of sanitation-related disease, emergency actions are required from health institutions. Similarly, inadequate sanitation facilities can aggravate inadequate waste management and lead to acute water quality problems and environmental impact.

Available Resources
All available resources need to be identified, including any contributions from within the community, the GJMC and any other aid organization.

Existing Sanitation Infrastructure
The appropriate combination of temporary interventions will depend upon, the type and condition of existing sanitation infrastructure and the level of sanitation awareness in the community. If a sanitation facility exists, even if it is below the minimum RDP level (i.e. bucket system), the general approach for temporary interventions would be to reinstate acceptable sanitation health for such infrastructure before considering new infrastructure. Interventions would then focus on sanitation awareness, health practices, operation and maintenance.

Identified Sanitation Options
If no sanitation facility exists, the selection is focused around the affordability and the level of access of alternative communal sanitation options. Affordability should consider possible subsidies and community contributions (money and in kind). The cheapest option with the best access (less households per facility) will in most instances be the preferred option.

Interventions will focus on a limited set of technical options (i.e. communal VIP or chemical toilets) and the appropriate sanitation practices for each option. Responsibility should as far as possible, be delegated to the community, and could include the operation and maintenance and health monitoring. Guidelines for evaluating temporary interventions are presented in Phase 5.

PHASE 2: EVALUATE FULL WATER BORNE SEWERAGE

Why evaluate full waterborne sewerage at this stage?

Full waterborne sewerage is the aspiration of most communities and institutions within the GJMC area. There may be many reasons for this including :

- community perceptions that full waterborne services are a status symbol
- social and political pressure for the correction of historical differences and discrimination
- historic failure of on-site and intermediate waterborne systems, due to various reasons
- operational simplicity for GJMC technical teams who work mainly with full waterborne sewerage
- potential cost savings where ring sewers and treatment capacity is available
- grey water problems and its resolution through waterborne sewerage systems
- the practical advantages of waterborne sewerage in densely populated areas
- improved manageability of potential environmental impact and groundwater pollution

For these and other reasons, full waterborne sewerage is the minimum level for any housing subsidy scheme funded by the Gauteng Housing Board. If adequate funds and resources are available, full waterborne sewerage is the "first-choice", in which case no need exists to evaluate any other sanitation options, even if they were to be cheaper.

However, such an upfront choice must guarantee to be affordable and sustainable.

Who should conduct this evaluation?

Officials in the GJMC, with a knowledge of the community, who are in a position to give a guarantee that adequate resources will be made available for sustained provision of full waterborne sewerage services, when they make this uncontested choice without engaging the sanitation protocol.

How should this evaluation be conducted?

The 7 steps on the following page have been selected as key success factors for an exclusive evaluation of Full Waterborne Sewerage.

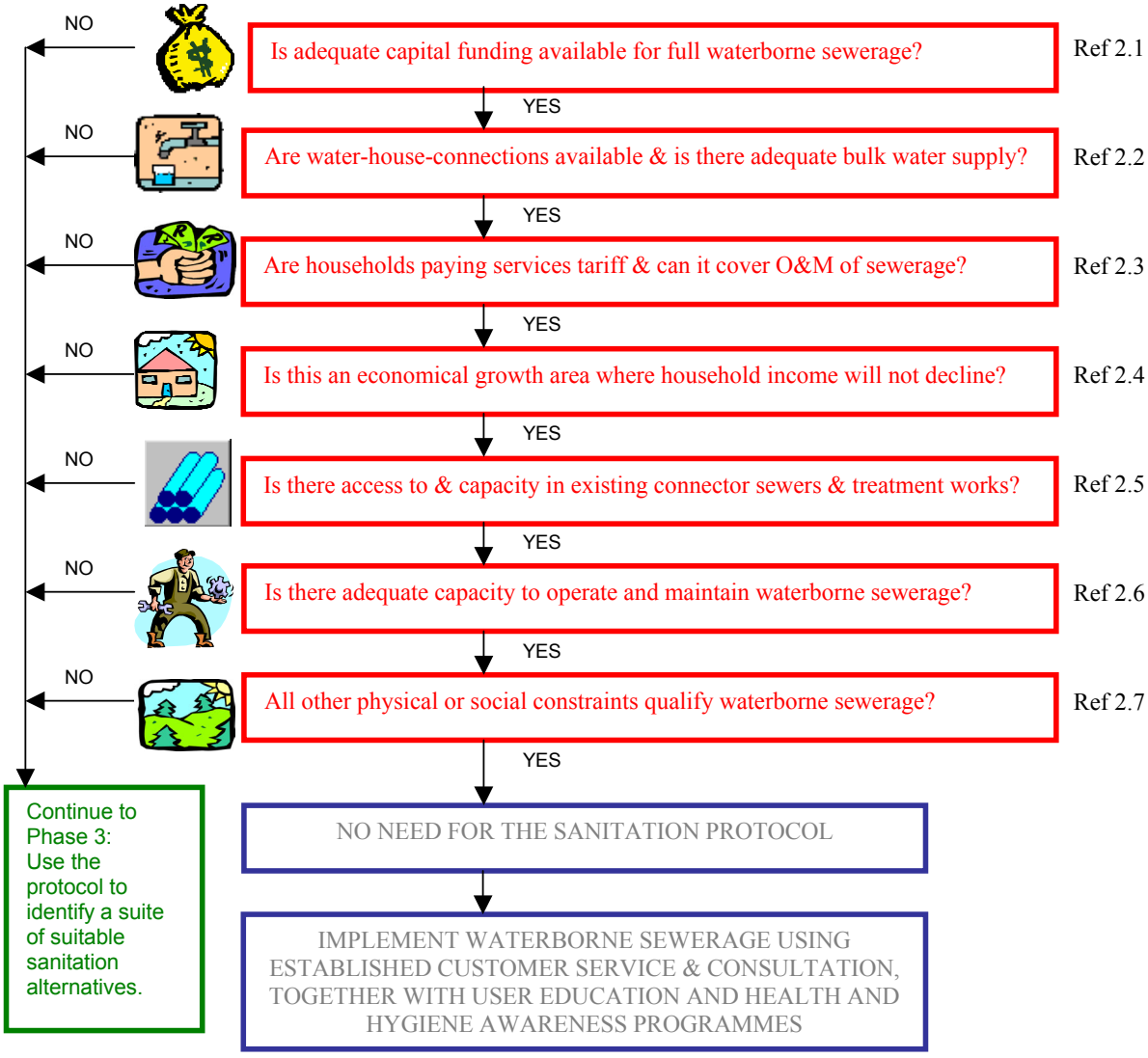
Only if all questions have a *definite Yes*, is there adequate confidence that full waterborne sewerage is definitely technically and financially viable (Note : it is not necessarily the cheapest or the most suited choice, but will be viable).

If any one of the questions is answered with a *No* or cannot be answered with a *definite Yes*, full water borne sewerage is eliminated as an obvious up-front choice and the protocol is engaged.

Full waterborne sewerage is still considered within the protocol, but not exclusively. It then becomes one of many sanitation options and forms part of a comprehensive evaluation and decision-making process, where it is may be compared with alternative sanitation options and interventions.

Procedural guidelines for viability of full waterborne sewerage

A positive answer (*definite Yes*) to **all** these questions implies that Full Waterborne Sewerage is a viable option. Any *one* negative answer (*No* or *Unsure*) eliminates the exclusive selection of Full Waterborne Sewerage and takes you into the full sanitation protocol, where waterborne sewerage will be evaluated against and contested by alternative technical options.



Evaluation guidelines for viability of full waterborne sewerage

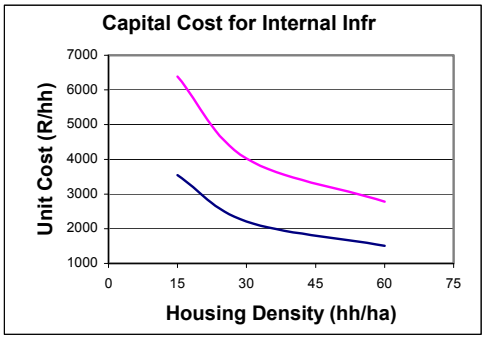
The following paragraphs and tables provide generic guidance to evaluate each of the key Questions on the previous page. (See Reference Number)

Note that these guidelines may not reflect all the site-specific conditions and therefore are not representative of all situations in the GJMC area. Users must still verify their selections with their own calculations where necessary.

Ref 2.1

COSTS vary mainly according to :
- housing density
- access to bulk & treatment infrastructure
- design standards & construction material
- geotechnical condition & physical barriers

Internal Cost = (Unit Cost) x (No. of Houses)

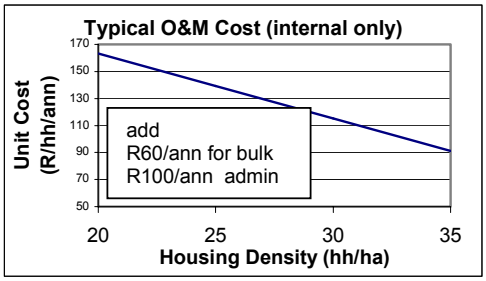


Ref 2.2

Typical water use for WB-Sewerage is
7 - 20 liters per person per day
(40 to 100 liters per household per day)

Ref 2.3

At least 80% of bills should be paid; unless subsidized, tariff should recover full cost (R20 to R40 per household per month) If combined with water use it should add ± R1/kl



Ref 2.4

This and other macro-economic indicators should be used to check affordability and hence sustainability of waterborne sewerage. This is particularly useful for greenfields projects.

Ref 2.5

If a bulk sewer is not within 0,5km of the development or has to cross a valley or river, or requires storage and pumping, additional bulk costs need to be provided, typically ranging :
- bulk connector sewers = R600 to R1000 per household per km
- regional treatment works = R1500 to R2000 per household
- bridges & special structures

Ref 2.6

Sustainability depends on cost-effective operation, maintenance & management. Even if the tariff is providing for management input, the availability & efficient use of skilled staff and suitable equipment may not be available and cause failure of waterborne sewerage

Ref 2.7

Finally, the preparation phase should confirm that there are no other constraints or hidden costs that may disqualify waterborne sewerage. These may include political instability, user preferences, inaccessibility of sites, geological limitation, physical barriers (i.e. motorway etc)

PHASE 3: CREATE A SANITATION TASK TEAM

Why is a settlement sanitation task team important for this protocol?

Phase 3 is a key step in the protocol. This is because two important things need to happen:

- GJMC officials responsible for sanitation are brought together in one team.
- Community representatives and people who work closely with the identified community make up the other half of the team with GJMC officials

Technical Services and Environmental Health Work Together

The two key departments in GJMC with responsibility for sanitation are technical services and environmental health. Technical services have responsibility for sanitation infrastructure and environmental health to ensure public health and environmental protection. Historically multidisciplinary teams for sanitation have not been established. The advantage of this approach is that resources and skills can be brought together to build capacity for sanitation in GJMC. It is essential that at least one technician and one environmental health officer (EHO) form part of the sanitation task team.

GJMC Officials Work with the Community

Community involvement in sanitation interventions is essential. This is because any sanitation option must be acceptable and affordable to those who are going to use it. Any sanitation technology requires some maintenance and cleaning by families. If families actively want a particular sanitation improvement then they are more likely to maintain, clean and pay for their services.

The advantage of getting the community involved with the protocol is that officials can learn more about the community at this early stage. If a decision is later taken to move into implementation planning, then these early community links can be built upon.

What is the role of the sanitation task team?

The sanitation task team is responsible for completing the protocol. The sanitation task team needs to complete a rapid assessment (Phase 4) and then identify a number of appropriate sanitation options for the target community (Phase 5).

It is not the role of the sanitation task team to develop an implementation plan or to manage or oversee the building of new sanitation facilities. This work will require a larger more representative sanitation task team. In fact the completion of the protocol for a specific community does not mean that GJMC has made a commitment to implement a sanitation intervention for the specific community. This decision will come later. It is important that the task team does not raise false expectations for sanitation improvements in a community.

The sanitation task team must be careful not to raise false expectations in the community.

Who is part of the sanitation task team?

The EHO and the technician should represent GJMC on the sanitation task team. It is suggested that where there is one EHO and one technician then two community representatives should join the team. If there are equal numbers of officials and community representatives then the community will feel like an equal partner in the team. If it is planned to include more officials on the sanitation task team then more community representatives will need to be found. If possible, the sanitation should not have more than six members.

A settlement sanitation task team should have an EHO, a technician and two community representatives.

How to find community members for the sanitation task team

It is not always easy to find community members to participate on the sanitation task team. This is because GJMC officials may only know a few community people. Any community representative who is joining the team will have to meet the following requirements:

- Be able to read the protocol.
- Be able to work in a common language for the team, for example, English, Afrikaans or Zulu.
- Be prepared to attend two meetings and a site or community visit to complete the protocol.
- Be prepared to participate without payment.

Depending on whether the intervention scenario is A or B, the selected representatives may be different. For either scenario, it is important to remember that in the home, sanitation is usually managed by women. Make sure that at least one community representative is a woman. Once community representatives have been selected then the sample letter shown below, can be sent to each member to explain what is expected of the sanitation task team.

Note: At least one community representative should be a woman.

Scenario A

If a community is well organised a local leader can be asked to identify appropriate community representatives given the requirements above. Alternatively a local NGO, church groups or other organisation may also have suggestions of appropriate community members who can be approached directly.

Scenario B

Where the community is poorly organised, with few community organisations or established leadership, it may not be possible to identify community members to participate in the sanitation task team. In this case individuals who work in the community as development or outreach workers are appropriate. These people are knowledgeable about the community although they are not community members. In some cases the local ward councillor could be asked to suggest representatives for a particular community.

What is expected of members of the sanitation task team?

The protocol should be completed over a period of no more than one month. This means that the lifetime of the sanitation task team should be no more than one month. There are four components to the work of the task team. These are:

1. An **introductory meeting** to introduce the team, the protocol and the different sanitation options (approx. 2 hours long).
2. A **site visit** to the community to collect information (2-3 hours long depending on the size of the community).
3. **Collection of additional data** for the rapid assessment (to be mainly completed by GJMC officials).
4. A final **evaluative meeting** to identify appropriate sanitation options for the target community (approx. 3 hours).

These meetings may have to be held over the weekend or in the early evening to accommodate community representatives who may be at work during the day.

What are the specific responsibilities of GJMC officials on the team?

There are two sets of responsibilities for the sanitation task team that need to be shared by participating EHO or technician on the sanitation task team. These are:

- acting as chair for the task team, and
- providing a secretariat for the sanitation task team.

Acting as Chair

The sanitation protocol is an initiative of GJMC. It is therefore appropriate that the sanitation task team be chaired by an official. The tasks of the chair are to:

- respect the contributions of all task team members;
- ensure that the community representatives feel able to participate;
- to organise for someone to give a talk about different sanitation options at the first introductory meeting;
- lead the site visit; and
- ensure that the work of the sanitation task team is completed timeously.

The secretariat

All task teams require some behind the scenes organising. The secretary of the sanitation task team is required to do the following tasks:

- Send out the sample letter to community representatives who have agreed to be part of the sanitation task team.
- Find a local venue for meetings make sure that it is convenient for the community members.
- Inform sanitation task team members about the when and where meetings will take place.
- Organise the site visit.
- Organise tea and coffee for the meetings.

Sample letter to community representatives of the team

GJMC address
Telephone number

Date

Dear ……,

Thank you very much for agreeing to participate in the settlement sanitation task team for _____(name of community).

The purpose of the task team is to complete the sanitation protocol developed by the GJMC. The protocol will identify which toilets are appropriate in this community. Although the protocol is a very important decision making tool, GJMC can not commit themselves to implementing a sanitation programme in _____(name of community) at this stage. This decision will come after the completion of the protocol. It is very important that members of the sanitation task team do not raise false expectations within the community.

The sanitation task team will need to meet three times. This is for:

- an introductory briefing meeting
- a community site visit
- an evaluation meeting to select possible toilet options

These meetings will be held over the next month. Unfortunately there is no payment for your time. A local venue will be chosen for meetings so that no transport costs are necessary.

The first introductory meeting will be held on _____ (day, date, time) at _____ (venue).

I look forward to our working together.

Yours sincerely

Name
Position

PHASE 4: CONDUCT A RAPID ASSESSMENT

Why conduct a rapid assessment of the settlement?

Evaluation of the appropriateness of different sanitation options for a particular settlement, must be based on knowledge about the planning, social, economic, institutional and physical conditions associated with that settlement. This requires some desktop investigation, a site visit to observe the conditions in the settlement, and input from the community representatives on the sanitation task team. As such it is appropriate to collect the information in advance and independently of the evaluation of the sanitation options.

The following three steps are required for the rapid assessment.

Step 4.1 Introductory sanitation task team meeting

The sanitation task team should meet initially, to bring everyone up to speed on the protocol, the range of sanitation options and the way forward. The community representatives may have a number of questions that should be addressed. Responsibilities should also be allocated for setting up the site visit.

It may be appropriate to attempt to answer some of the rapid assessment questions (see the Tables below), particularly those that are orientated to institutional-financial-planning context of the settlement. Otherwise, the GJMC technical and environmental health personnel should meet separately to address these questions.

Step 4.2 Site visit

It is very valuable for the sanitation task team to visit the community together. This is because it will tell the team first-hand what is happening in the community. Going with community representatives will inevitably provide an opportunity to meet informally with other people in the community. When setting up a site visit it is important to consider the following points:

1. *Have community leaders or others in the community been informed about the task team's visit?* Make sure that someone in the community is expecting the task team. Arrange to greet appropriate community leaders during the site visit. Discuss with community representatives in the sanitation task team who in the community can help the task team.

2. *What security precautions are necessary for the site visit?* It is very important to take someone with the sanitation task team who knows the area and is well known in the community. In some cases the community representatives on the sanitation task team can play this role. On the day of the site visit arrange for the sanitation task team to meet somewhere outside the community so that the team can travel in together with the guide. Check that the guide can stay with the sanitation task team for the duration of the site visit.

3. *Prepare a checklist of things to ask and see during the site visit.* This list will help focus the site visit and should contribute towards completing the Rapid Assessment Checklist. Discuss the checklist with the sanitation task team before arriving in the community.

4. *Take paper and pens.* It is often inappropriate for the members of the sanitation task team to write notes whilst walking around the community. However once the task team have left the community, task team members should write down any important information immediately.

The rapid assessment checklist should be completed as far as possible during and immediately after the site visit.

Step 4.3 Complete the Rapid Assessment Checklist

The GJMC technical and environmental health personnel should complete the rapid assessment checklist, conducting further investigation where required. Where definitive answers cannot be obtained, a "best-guess" should be made. The consistency of answers should also be evaluated, and contradictory results should be modified, where these occur.

Guidelines for answering the questions in this checklist are presented below.

Rapid Assessment Checklist		Response / Comments
1	*How many houses or people are there in the settlement?*	
2	*What is the average plot size or housing density?*	
3	*How many people are there in each household on average?*	
4	*What is the historical (and expected) population growth rate in the settlement?*	
5	*What is the development plan for this settlement in the next five years?*	
6	*Do a lot of non-residents pass through or stop in the settlement?*	
7	*Has the settlement been there for more than 3 years or is it a greenfields site?*	
8	*What are the community expectations for sanitation?*	
9	*Have any political commitments been made to this community about sanitation?*	
10	*What complaints have been made to GJMC about sanitation in this settlement?*	
11	*What has the community done to address their sanitation problems?*	
12	*What is the existing sanitation system in this settlement and how is grey water disposed?*	
13	*Who is responsible of managing and paying for the existing sanitation system?*	
14	*What is the condition of the existing sanitation system?*	
15	*In the past 12 months has the community lived without conflict or the threat of violence?*	
16	*Has sanitation or other infrastructure been vandalised in the community?*	
17	*Has there been a safety problem with the existing sanitation facilities?*	
18	*Are there recognised community leaders?* *Are there any women community leaders?*	
19	*Are there strong community organisations?*	
20	*Are there (or has there been) sanitation awareness programmes in the community?*	
21	*What method of anal cleansing is common in this community?*	

Rapid Assessment Checklist		Response / Comments
22	*What is the employment rate and the range in household income in the community?*	
23	*Has billing and revenue collection ever been conducted in this community in the past?*	
24	*What are the historical levels of payment for services in this area?*	
25	*What people likely to pay as a connection fee and ongoing monthly service charges?*	
26	*Is there history of co-operation between GJMC and this community?*	
27	*Is there a bulk sewer line passing within 1km of the settlement and is there spare operational capacity?*	
28	*Does the GJMC have capacity to remove sludge from on-site pits and tanks?*	
29	*What capital and operating budget does the GJMC have available for this community?*	
30	*What level of water supply is currently provided (or will be in the next 2 years)?*	
31	*Is household refuse and litter collected regularly and is it adequate?*	
32	*What sort of access is there to the settlement and to the household plots?*	
33	*Is the settlement on dolomites?*	
34	*Are the soils clay or sandy?*	
35	*How much rock is there in the settlement and at what depth?*	
36	*How deep is the water table?*	
37	*Are people likely to use boreholes located within the settlement?*	
38	*Is the settlement on steep or flat land?*	
39	*How close is the settlement to a river or is it in the flood plain?*	
40	*Are proprietary sanitation systems being marketed in this community?*	

Guidelines for completing the Rapid Assessment Checklist

Q.1 How many houses or people are there in the settlement?

The number of households of households (or people) in the settlement has an influence on the cost of sanitation per household, which generally decreases with settlement size. Where exact numbers are not available, this should distinguish between small (less that 100 households), medium, and large (greater than 1000 households) settlements.

Q.2 What is the average plot size (m^2) or housing density (dwelling/ha)?

Housing density has a significant impact on the viability and cost of alternative sanitation systems. This can be estimated in the settlement by the average plot size or as average densities from settlement planning surveys. It should distinguish between very dense (<150 m^2 or >60 dwellings/ha), dense (<250 m^2 or >35 dwellings/ha), medium (<400 m^2 or >20 dwellings/ha) and sparse (>800 m^2 or <10 dwellings/ha).

Q.3 How many people are there in each household on average?

The number of people in each household may influence the system design during the implementation planning phase, and should be collected at this stage. For peri-urban settlements, this may range from about 4 people/household, through an average of 5.5 people/household, up to about 9 people per household.

Q.4 What is the historical (and expected) population growth rate in the settlement?

The growth rate of the settlement indicates the population that should be accounted for, over the design life of the option (typically between 10 and 20 years). High growth rates (greater that 7% per year) are more difficult to plan for, while low growth rates (less than 2% per year) imply stability. This information may be obtained from municipal planning processes.

Q.5 What is the development plan (IDP-LDO) for this settlement in the next five years?

The municipal plan for the area may indicate the intended future infrastructure development for the settlement. This is particularly important in terms of relocation or upgrading of the settlement, and for sanitation, the intended water supply and solid waste disposal plans are critical. Where an initiative will be implemented, the sanitation protocol should become part of this and the objectives of the plan should be included. However, where nothing is intended within 5 years, the sanitation protocol should be applied for the current and expected conditions in the settlement.

Q.6 Do a lot of non-residents pass through the settlement?

Non-residents that pass through the settlement, possibly due to taxi ranks or street vendors, should be considered when promoting and planning sanitation in the settlement, because this implies the need for communal facilities at the places of high movement. Without this, residents' facilities may be abused, or lack of facilities may reduce the environmental health benefits of sanitation improvements in the settlement.

Q.7 Has the settlement been there for more than 3 years or is it a greenfields site?

The stability and existence of the settlement has an impact on the sanitation possibilities. Greenfields sites have their own challenges, because community involvement is more difficult, except where an existing community is to be relocated. On the other hand, upgrading existing settlements implies potential historical expectations and possibly experience with existing systems. New settlements pose problems in that the community may be transient and therefore less likely to make investments in sanitation.

Q.8 What are the community expectations for sanitation?

Because sanitation always requires a commitment at a household level, it is very important that the chosen options meet community expectations. Find out if a community meeting discussed sanitation and what recommendations were made. Find out if a local survey has been conducted to find out about community needs. During the site visit talk informally to community members and to people who work in the community to get an idea what the community expectations might be.

Q.9 Have any political commitments been made to this community about sanitation?

It is important to check what politicians have said about sanitation, because this may influence the expectations of the community. Speak to a local ward councillor. Read the relevant reports passed by council.

Q.10 What complaints have been made to GJMC about sanitation in this settlement?

If a community has made complaints to GJMC about their sanitation situation it shows a high level of motivation to get something done about sanitation. It also shows that the community, understand that the Council has responsibility for sanitation. The reasons behind unreliable sanitation services range from poor payment for services, lack of funds to maintain services, lack of enough skilled staff to maintain infrastructure, deliberate sabotage by the community or inadequate/inappropriate service provision in the first place. Read any record of complaints kept in either technical services or in environmental health.

Q.11 What has the community done to address their sanitation problems?

If a community has taken some steps to address their sanitation problems it shows that they are motivated to do something about sanitation. They may have taken some or all of the following steps: made a complaint to GJMC, built temporary toilets, held a community meeting to discuss sanitation, approached a local development NGO about sanitation. Find out if a community has made a complaint and refer to the question above. During the site visit look for temporary toilets built by the community. Talk with a community leader, church leader or other significant community figure for further information.

Q.12 What is the existing sanitation system in the settlement and how is grey water disposed?

Some sanitation options can be upgraded. This normally reduces the cost of installing a completely new system. The manner of disposal of household wastewater (in the yard, garden, street or sanitation system) may indicate whether dry on-site systems are appropriate. During the site visit check for both communal and household facilities.

Q.13 Who is responsible for managing and paying for the existing sanitation system?

The management of a sanitation option includes the installation, the maintenance and ensuring payment for the services. During the site visit look at plenty of existing toilets. Find out how the toilets are maintained, who repairs the infrastructure such as sewers or who suctions existing pits when they are full. Lastly check with the users of these services how their sanitation facilities are paid for. Find out from GJMC technical services what their present costs are for sanitation in this particular settlement.

Q.14 What is the condition of existing sanitation systems?

If existing facilities are in reasonable condition, then it will be easier to upgrade them. Well maintained facilities also suggests that new services will be adequately maintained. Where services are in poor condition it is important to find out the reasons for this. During the site visit look at plenty of existing toilets. Find out from technical services if there are problems with any sanitation infrastructure in the area. During the site visit talk informally with users to find out the problems they are having in keeping their toilets in good condition.

Q.15 In the last 12 months has this community lived without conflict or the threat of violence?

It is very difficult to sustain any community development initiative if there is serious conflict in a community. This can be political and/or criminal gang violence. The local police or community leader, ward councillor or church leader can provide information about the level of violence in a community.

Q.16 Has sanitation or other infrastructure been vandalised in the community?

It is impossible for GJMC to provide or maintain a sanitation system if it is likely to be vandalised. However some sanitation options require more infrastructure than others and therefore are more vulnerable to vandalism. During the site visit look for evidence of vandalism, for example, look at existing sanitation and water supply facilities. Are there a large number of illegal water and electrical connections in the community. What might be the implication of this? Talk with a community leader, ward councillor, church leader or other significant figure about this.

Q.17 Has there been a safety problem with existing sanitation facilities?

For women, the elderly and the disabled going to the toilet at night is frightening if there is no street lighting and toilets are sited too far from the home. This is because of the threat of violence and rape. Sometimes the design of toilets is so poor that children have been known to fall into the pits. Most toilets are not designed to meet the needs of the elderly and the disabled, who struggle to use the common toilet facility. During the site visit look for street lighting and look to see where existing toilets are sited. Check whether existing facilities can be used safely by children, the elderly and the disabled.

Q.18 Are there recognised community leaders? Are there any women community leaders?

It is much easier to work with a community if there are well known and recognised community leaders. Because sanitation is often considered to be women's work at a household level it is important to get their representation through women community leaders. A local ward councillor

or NGO working in the area should be able to provide the names of recognised local leaders including women.

Q.19 Are there strong community organisations?

It is much easier to work in a community that has stronger representation through organisations. It also suggests many people in the community are interested in their development, because many people are getting involved in local action groups. Such local groups include political parties, women's groups, stokvels, burial societies and church groups. Community leaders, church leaders and NGOs working in the area should be able to provide information about which groups are active in the community.

Q.20 Are there (or have there been) sanitation awareness programmes in the community?

If there has been a sanitation awareness programme in the area (such as through schools, NGOs or the GJMC) it suggests that there may be a better awareness of the link between health and sanitation. The importance of sanitation may also be better understood and so community motivation for improved sanitation may be higher. There will also be a channel for user education during the implementation stage. Speak to local NGOs in the area about the work they are undertaking. Speak to a local community leader to find out if they know about such a programme. Talk to the local school to find out if there is a sanitation awareness programme. Find out from GISSIP (Gauteng Integrated Schools Sanitation Improvement Programme) if a school in the area is part of their programme.

Q.21 What method of anal cleansing is common in this community?

Many sanitation options, especially water borne sanitation options become broken and blocked if toilet paper is not the usual way of anal cleansing. Other common anal cleansing materials are mealie cobs and newspaper. For these sanitation options user education about the use of toilet paper is essential. During the site visit look for evidence of anal cleansing materials in and around toilets. Check out what you see through informal discussions with community members during the site visit.

Q.22 What is the unemployment rate and the range in household income in the community?

The purpose of this question is to determine the affordability of sanitation options within the community. The lower the employment rate the lower the potential from within the community to finance capitol and operating and maintenance costs, in particular the communal type systems e.g. water borne sanitation. Employment rates of less than 50% and average income of R800 or less per month make communal type systems unsustainable unless heavily subsidised by the GJMC. The same applies to households that are dependant on the elderly that are receiving state pensions. This information can usually be obtained form The Census information, church leaders, social workers or local civic or community organisations.

Q.23 Has billing and revenue collection ever been conducted in this community in the past?

The purpose of this question is to asses whether a billing system is in place and the GJMC has the ability in the community to operate such a system. Where such as system is not in place and a communal type system is selected it may prove to be very difficult to collect sufficient funds to maintain the system. This information should be available from the GJMC.

Q.24 What are the historical levels of payment for services in this area?

The purpose of this question is to determine level of understanding for the reasons for service payments (rates/rent, water, electricity), give an indication of community stability and whether previous assessments for willingness to pay for services has translated to ability and actual payment. Where levels of payment are low (below 80%), the reasons for this need to be carefully understood and analysed so that what ever sanitation system(s) are selected for and by the community they do not fall prey to the same situation. The GJMC should have this information on hand.

Q.25 What are people likely to pay as a connection fee and ongoing monthly service charges?

Depending on how much the households value sanitation services, what they are prepared to pay towards attaining and maintaining these services will differ. This is also referred to as the *real demand* for sanitation. Where the demand is low and households are not interested in improved sanitation, this needs to be explored further to determine what the reasons are. They may range from a lack of knowledge about what the health benefits are for sanitation to an expectation that *government will provide*. During the rapid assessment site visit a few casual enquiries should be made to those that manage the household's budget.

Q.26 Is there a history of co-operation between the GJMC and this community?

Are there existing channels of communication between the community under consideration or do they need to be established? If there has been co-operation between the two parties in the past the success of that co-operation should be looked into so as to inform any future sanitation initiative that may be undertaken with this community.

Q.27 Is there a bulk sewer line passing within 1km of the settlement and is there spare operational capacity?

The spare operational capacity (physical sewer capacity, as well as human and equipment resources) will give an indication of what maximum level of water supply and sanitation can be considered. Should there not be a sewer within 1km this would mean that the bulk infrastructure would have to be created at considerable cost that may be prohibitive to the GJMC and or the community. Capacity for operation and maintenance is critical for the sustainable functioning of the system. GJMC Technical Services should be in a position give this information

Q.28 Does the GJMC have capacity to remove sludge from on-site pits and tanks?

Capacity to remove sludge includes human resources, vacuum tankers and access to sludge disposal facilities. On-site sanitation systems, be they VIP's, septic tanks, composting systems all need to be emptied out at some point. The councils ability to do this needs to determined upfront so that systems are not chosen that they will not be able to maintain in the longer term or a mechanism for overcoming this constraint is planned for in the implementation planning stage of the sanitation project for the community.

Q.29 What capital and operational budget does the GJMC have available for this community?

This question has two parts to it and both requiring information. The capital available from the council together with any other sources of funding give an indication of what the maximum investment is that can be made. However this needs to be considered very carefully in

conjunction with the second part that looks at the running cost of the systems. The higher the running cost the less significant the initial capitol cost may become. Systems with low running costs should be considered where O & M budgets are low and community affordability is low. The Technical Services division of the GJMC may be able to provide this information from their budget and financial planning.

Q.30 What level of water supply is currently provided (or will be in the next 2 years)?

The level of water supply (distance from the dwelling) in a settlement constrains the possible sanitation alternatives that should be considered. For example, water borne sewerage is not viable unless there is at least a yard connection, while the disposal of grey water should be considered in the selection of sanitation alternatives associated with in-house water supply. A distinction should be made between communal standpipes (or local water sources), yard taps and in-house supply. The level of existing water supply should be identified during the site visit, while the GJMC technical services department (and the WSDP) would indicate whether there are plans for upgrading water supply in the settlement within the next two years.

Q.31 Is household refuse and litter collected regularly and is it adequate?

The collection of household refuse is an important consideration in selecting sanitation technology options. Where regular refuse collection is not prevalent and or sufficient it is not uncommon to find the sanitation system being used to dispose of refuse. This has O & M as well as system life-span implications. The Sanitation and Waste Management division of the GJMC should be able to give an indication of the solid waste management for the settlement but a visual inspection during the Rapid Assessment site visit will also prove to be valuable.

Q.32 What sort of access is there to the settlement and household plots?

For the purposes of maintaining systems, access to stands or plots is essential. For example should a vacuum tanker not be able to access a particular stand to clean out the pit or septic tank this would have to be performed by other means or not at all with dire consequences. During the Rapid Assessment site visit note the width and condition of access roads or paths to the settlement, in the settlement and to the stands as well as what mode of transport is currently being used e.g. foot, bicycle or minibus taxi. Also cross check this with the Town Planning division to determine what the future plans are for accessibility.

Q.33 Is the settlement on dolomites?

Dolomite is a geology that can slowly dissolve in water and through the movement of groundwater remove solids to form underground cavities. These cavities are normally filled with water, but can also be hollow where groundwater is abstracted through boreholes or from mine shafts. Where these cavities are in the vicinity of the soil surface the thickness is thin and hence the strength of the cavity roof becomes weak and can collapse under the weight of houses or as a result of construction activity. It is essential that no housing and water services be constructed in areas of dangerous dolomitic cavities. The rapid assessment should therefore consult a geological map and specialists, if needed, to confirm the presence and extent of dolomites in the area under consideration. Leaking water pipes and sewers speed-up the weakening of the cavity roof and increase the risk of collapse. Should construction proceed in a dolomitic area, all sewered sanitation systems and water supply systems should be designed for a minimum risk of leakage and low maintenance requirement.

Q.34 Are the soils clay or sandy?

Clay soils are cohesive, have high water holding ability and low permeability. Sand soils on the other hand have little cohesion, low water holding capability and high permeability. Both extremes (i.e. clay of more than 35%; pure sand) have structural problems that can complicate construction activity for sanitation options. Sandy soils with low clay content are best suited for soakaways, are more easily excavated and are structurally stable for pits, septic tanks and pipe trenching. The clay content can be assessed on site, by taking a soil sample from a natural area (i.e. not from road pavings or near structures) and preferably from below the ground surface (i.e. at a gully or culvert). By wetting the soil and rolling it between the fingers and the palm of the hand, you can assess the clay content of the soil. If the moist soil moulds like plasticine and feels very sticky when wetter, it has high clay content and should be used with caution for soakaways and structural work. If the moist soil forms a ball that easily deforms or falls apart, it is a loam soil, with moderate infiltration capability. Soil that does not stick together when moist has a high sand content and high permeability, hence best suited for on-sight soakaways.

Q.35 How much rock is there in the settlement and at what depth?

Solid rock is difficult to excavate and may require expensive mechanical equipment (i.e. jack-hammers) to break it up. The quantity of rock has a direct influence on excavation costs and hence the cost of sanitation options. Sewer systems generally require more excavation than on-site sanitation options. The depth of rock, furthermore, impacts differently on conventional-sewer, shallow-sewer, and small-bore sewer systems. Shallow rock may also require that on-site sanitation be elevated to provide aboveground space for the pit or septic tank. During the site visit the size and extent of exposed rock should be assessed and recorded. Where possible, the site visit should also look for rock in gullies, road culverts, riverbeds and other natural or man-made depressions, to assess the presence, extent and depth of rock below the ground-level.

Q.36 How deep is the water table?

A shallow water table prohibits infiltration and the effective use of on-site soakaways. It also increases the risk of groundwater pollution and can affect the structural stability of the sanitation superstructure. On-site pits have to be lined and sealed and require regular desludging. Generally, most of these problems are not relevant when the water table is more than 1,5 meters below the ground level. During the site visit, it will be good to assess if the water table is below 1,5 meter of depth. You can either measure the depth to water at a borehole or a communal well, or you can dig a pit to 1,5 meter and observe any seepage of water into it. Alternatively you can ask community members whether they have observed any water seepage into existing pits (i.e. unimproved pit latrines) or construction sites (i.e. digging of house foundations).

Q.37 Are people likely to use boreholes located within the settlement?

If boreholes are located within the community and are being used for domestic purposes (i.e. drinking and washing), it is essential that the water quality is protected and maintained in compliance with the domestic user requirements. On-site sanitation (i.e. soakaways and unlined pits) can over time contaminate the groundwater and may therefore not be compatible with the borehole's water use. This risk is particularly high where sanitation facilities are within 30 to 50 meters from the borehole. Planning of suitable water supply and sanitation options are therefore inter-related and require regular monitoring of groundwater quality to ensure fitness-for-use. A site visit should record the presence of boreholes, the location in relation to sanitation facilities, and ask community members what the borehole water is being used for.

Q.38 Is the settlement on steep or flat land?

Slope of the area affects access for vehicles, depth of sewers and other excavations, and may result in surfacing of the water table (i.e. occurrence of springs). A site visit should assess the steepest and the most flat area within the settlement. The steepest area can be evaluated by the existence of vehicle access against the slope or the presence of springs in the area. The flat area can be described in terms of the full length of that slope and the estimated fall in height (i.e. number of house-heights) over that length.

Q.39 How close is the settlement to a river or is it in the flood plain?

Due to unavailability of land, many informal settlements are illegally locating within flood plains or on restricted land close to rivers and gullies. Mostly they are unaware of the dangers of flooding as these may only occur once in 10 to 50 years. Flood peaks are generally much higher in urban areas, where water runoff from paved areas (roads, roofs of houses, etc.) is much quicker and in greater volume than on natural vegetated areas. Most building regulations restrict any housing development within the 1-in-50-year flood-line, which can be a significant width from the actual riverbed, especially in urban areas. The GJMC is regularly updating the position of the 1-in-50-year flood-lines and records these on topographic maps and layouts of the area. A site visit should consult these to ensure that no household sanitation facilities are allowed within the flood plane and should alert the housing board and other role players of the need for resettling the illegal housing. Similar assessments may already have been conducted by the Land Development Objectives (LDO) and the Water Services Development Plans (WSDP) of the GJMC, and should be consulted during the Rapid Assessment.

Q.40 Are proprietary sanitation systems being marketed in this community?

It is important to know whether certain sanitation options have been or are being marketed to the target customers in the settlement and by whom (i.e. authorities; developers; manufacturers). The extent of the marketing may indicate what expectations, preferences or bias there exists towards certain sanitation options and can influence the consultation process required for the sanitation protocol. A site visit can assess the extent and influence of marketing exercises by talking to selected community members and recording the type and amount of sanitation facilities present in the settlement. It will be useful to also record problems and success of existing sanitation facilities at the same time.

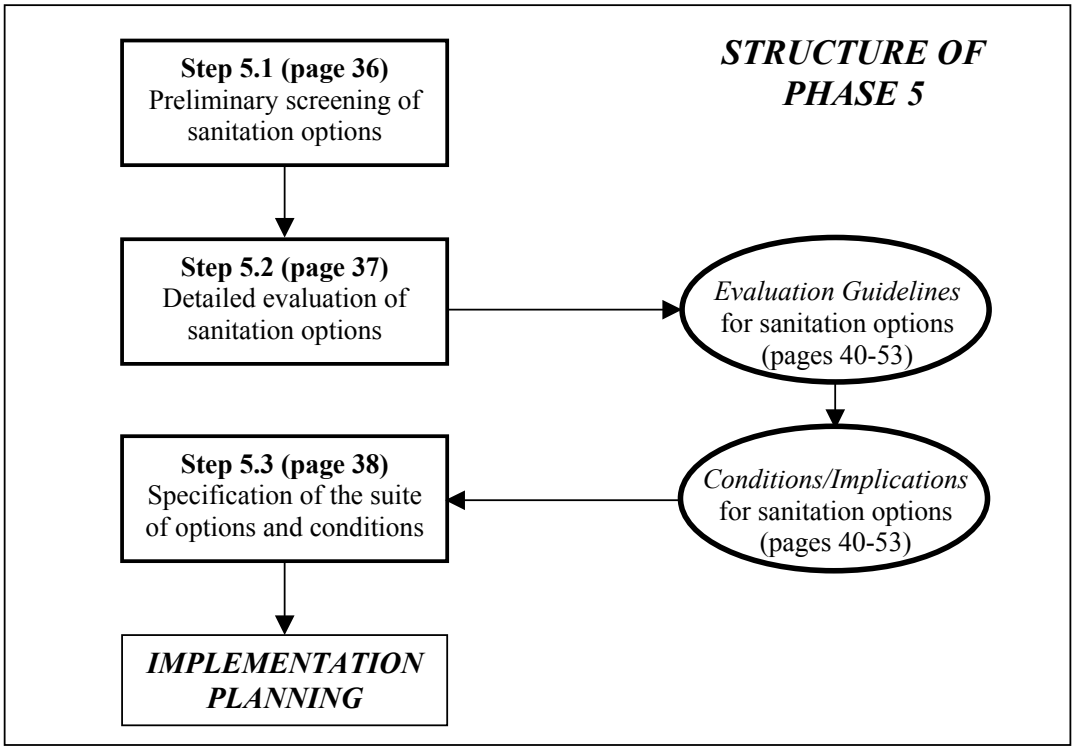
PHASE 5: IDENTIFY A SUITE OF SANITATION OPTIONS

How to identify a suite of appropriate sanitation options?

The main aim of the protocol is to identify those sanitation options that are feasible, given the characteristics of the particular settlement. As highlighted in the Preface of this document, the identification of a number of possible sanitation options (a suite of options) for a settlement is preferable to the selection of a single option. Actual option selection should occur during the implementation planning process, together with the broader community.

In certain settlements, the site-specific social or physical conditions require the implementation of additional interventions associated with a particular sanitation option, in order to provide the required environmental health benefits, improve its social acceptability, make it affordable or ensure effective operation. The suite of appropriate sanitation options therefore consists of a number of sanitation technologies, together with the conditions and interventions that are required to make them effective and sustainable.

Phase 5 involves three basic steps, as outlined in the following diagram and detailed in the following pages. The sanitation options are first screened against key settlement characteristics, in order to identify those that are not viable at all. The remaining options are evaluated, together with possible interventions that may make them feasible for that settlement. This results in a suite of appropriate options.



The *Rapid Site Assessment* (Phase 4) should have provided the information necessary to screen and evaluate each sanitation option. The following generic options have been included in this protocol (and are described in the *Addendum: Description of Sanitation Options*):

- Household Ventilated Improved Pit-latrine (VIP)
- Composting and Desiccating systems
- Aquaprivy/LOFLOS
- Septic tank and soakaway
- Small-bore solids-free sewers
- Shallow sewers
- Full-bore waterborne sewerage

Step 5.1 Preliminary screening of options

Under certain conditions of water supply, settlement density or geology, particular sanitation options are not feasible, without incurring excessive costs. These "knock-out conditions" make particular sanitation options non-viable or relatively non-competitive. They provide the basis for a screening exercise to eliminate sanitation options before the detailed evaluation, thereby saving unnecessary effort in Step 5.2. The following Tables present the implications of these "knockout conditions" for sanitation options.

Level of water supply	Exclusions
House connections	exclude the following dry systems - VIP - Composting/desiccating systems
Less than yard connections	exclude the following sewered systems - full waterborne sewer system - shallow sewer system - small-bore solids-free sewer system - exclude septic tank and soakaway
Distance to waterpoint > 100m	exclude the following wet systems - full waterborne sewer system - shallow sewer system - small-bore solids-free sewer system - septic tank and soakaway - Aquaprivy/LOFLOS
Budget identified for upgrade to house connection within three years (see WSDP)	exclude permanent on-site dry options, with possible temporary interventions until upgrade

Housing Density	Exclusions
Housing density > 90 du/ha (plot < 100m^2)	exclude permanent options, if resettlement or de-densification is likely
Housing density > 40 du/ha (plot < 200m^2)	exclude the following on-site systems - septic tank and soakaways - Aquaprivy/LOFLOS
Housing density < 20 du/ha (plot > 400m^2)	exclude the shallow sewers

Geological Conditions	Exclusions
Dangerous dolomitic area / cavities	exclude permanent options, if resettlement is likely to occur (see temporary interventions).
Water table < 1 meter below ground	exclude the following on-site soakaway systems - Septic tank and soakaways - Aquaprivy/LOFLOS
Clay soils (> 30% clay)	Exclude the following on-site soakaway systems - septic tank and soakaways - Aquaprivy/LOFLOS

Step 5.2 Detailed evaluation of sanitation options

The surviving sanitation options should be evaluated, in order to determine the conditions under which they can be considered for the settlement. Evaluation guidelines have been prepared for each of the generic sanitation options (see below). The tables list the key success factors for each technology as a set of questions, which may be answered using the information from the *Rapid Site Assessment* (Phase 4). The format of the Evaluation Guideline tables is as follows:

Evaluation Questions: VIP	Yes	Conditional
Groundwater is not being or likely to be used in the community for drinking purposes		VIP 1

A positive answer to the question implies there is no problem, while a negative response may indicate that this option is not appropriate, or that an intervention may be considered. For the negative response, a reference is provided to relevant c*onditions* or typical *interventions* that should be considered. These are listed in a separate table, as follows:

Reference	Conditions/Implications: VIP
VIP 1	The use of ground water from an area does not automatically mean that VIP's are not suitable. It does mean that careful consideration must be given to the siting of the toilets as well as the boreholes. The toilets may also require some design modifications such as sealing the pit, excavate larger shallower pits or raising the pits above the ground. Lining pits or raising them above the ground adds significantly to the cost by as much as R1000 to R2000.

Each of the sanitation options should be evaluated in this manner, checking those factors that require interventions.

Step 5.3 Specification of a suite of options and conditions

The options that survive the detailed evaluation should be listed, together with the associated conditions and possible interventions. It should be noted that the more conditions required, the less viable the system is in that particular settlement. Those systems that may be implemented with few conditions are likely to be the most sustainable.

Social considerations tend to be similar for a number of options, and need to be noted for the implementation planning stage of the sanitation promotion process. They often revolve around design criteria for particular options. Evaluation questions and associated considerations and

implications for social issues are presented below and should be added to the technically oriented considerations.

Linked to this should be a preliminary assessment of the costs of implementing each sanitation option with the require interventions. Interventions will normally increase the cost of the option. However, where the existing sanitation infrastructure may be used to upgrade to a new option, this will result in a cost saving.

All of this information should be compiled into a brief report, which would provide input to the Implementation Planning process.

However, before embarking on the Implementation Planning stage, the capacity of the GJMC and community to proceed with the process, given the identified suite of options and conditions, should be reassessed.

Social considerations for implementation planning

There are a number of very important social considerations that must be considered before a final suite of options is chosen. This is because sanitation is not just a technical decision it needs to consider what the community will find acceptable. After the evaluation of sanitation options the following social questions should be applied to the selected options.

Evaluation Questions: Social Considerations	**Yes**	**Conditional**
Can the sanitation option be sited close to the home?		SC 1
Can the sanitation option be sited in the home?		SC 2
Can the sanitation option be designed so that the toilet seat is safe for children to use from the ages of 3 years upwards?		SC 3
Can the sanitation be adapted easily so that it is appropriate for the elderly and the disabled?		SC 4
Can the sanitation option tolerate other anal cleansing materials other than toilet paper?		SC 5
Does this sanitation option address the needs of the community? Will it address their current complaints about sanitation?		SC 6
Has a political commitment been made to this sanitation option?		SC 7
Are there community organisations that could get involved with user education for this sanitation option?		SC 8
Is there a local school sanitation and hygiene awareness project that could support user education for this sanitation option?		SC 9
Does this sanitation option have no special maintenance needs at household level other than general cleaning		SC 10

Reference	Conditions/Implications: Social Considerations
SC 1	If toilets are sited away from the home then they are difficult to use at night because people may fear that they may be attacked. Also there is little privacy for people when they go to the toilet. If toilets are sited outside the immediate yard street lighting is important as is thorough consultation with the community about the appropriate siting of the toilets is essential.
SC 2	See SC 1
SC 3	It is important to encourage children to use toilets from a young age to promote improved health and hygiene. A programme to promote the use of a potty for young children will be needed to ensure that the families yard is kept free from faeces.
SC 4	Discuss with local development workers and community leaders the needs of the elderly and disabled in the community. Find out how many people need assistance. Contact a group working with disabled and elderly to find out what additional resources may be available.
SC 5	An extensive user education campaign is needed about the importance of toilet paper.
SC 6	An extensive marketing campaign will be needed in the community to persuade community members that this is the best sanitation option. It will be harder to create sanitation demand.
SC 7	How different is this sanitation option to other options that have political backing. Speak to local politicians to win their support for this sanitation option. It may be harder to sell this sanitation option to the community, if they have been promised something else.
SC 8	How important is user education for this sanitation option? Is the community generally familiar with the option? How easily will the system breakdown if it is not properly maintained? If user education is crucial it will be more difficult to sustain without community groups to work through.
SC 9	See SC 8. Again user education will be more difficult to sustain without a local school participating.
SC 10	It is important that households understand what the additional maintenance needs of this sanitation option are. In particular check with women in the community that they would be willing to carry out this work for their families. In most cases women take responsibility for sanitation in the home.

Evaluation Guidelines: Ventilated Improved Pit (VIP) Toilet System

Evaluation Questions: Household VIP	Yes	Conditional
Groundwater is not being or likely to be used in the community for drinking purposes		VIP 1
Will it be relatively easy to excavate a pit on most stands, i.e. no rock or sandy soils		VIP 2
Is the water table below 2m from the surface		VIP 3
Are individual stands accessible by vacuum tanker		VIP 4
Are stands large enough to accommodate more than one pit		VIP 4
Is the level of water supply for the site below that of a house connection		VIP 5
Is the area free of clay and a water supply level less than yard taps		VIP 6
Is the geology free of dolomitic cavities		VIP 7
Is there an effective solid waste management system in place		VIP 8
Is the settlement located above the 50 year flood line		VIP 9

Reference	Conditions/Implications: Household VIP
VIP 1	The use of ground water from an area does not automatically mean that VIP's are not suitable. It does mean that careful consideration must be given to the siting of the toilets as well as the boreholes. The toilets may also require some design modifications such as sealing the pit, excavate larger shallower pits or raising the pits above the ground. Lining pits or raising them above the ground adds significantly to the cost by as much as R1000 to R2000.
VIP 2	Where the area under consideration is very rocky larger shallower pit or raised pits can be considered. Raised pits need to be discussed with the community to asses their social acceptability. Sandy or uncohesive soils will require the pits to be lined. This will also add to the cost of construction.
VIP 3	The toilets will require some design modifications such as sealing the pit, excavate larger shallower pits or raising the pits above the ground. The pit will also need to be lined
VIP 4	Pit toilets eventually fill up. This can take between five to ten years, depending on the size of the pit and type of anal cleansing materials use. Pit life is reduced considerably if domestic refuse is discarded into it. In an urban / high density environment pit emptying needs careful consideration. Where manual pit emptying is not socially / culturally acceptable provision needs to be made for access by vacuum tanker. Alternatively, space and top structure permitting, a second pit can be dug or a double pit VIP erected from the outset. Where pits are to be emptied by vacuum tanker they will need to be lined which adds to the cost. See VIP 1 above
VIP 5	The VIP is designed to function dry or with small amounts of water for cleaning (1 – 1.5 l /day). Where in-house water is supplied, a separate means of disposing of grey water is required, as the VIP in a dense urban environment is not suitable for this purpose.
VIP 6	Where clay soils are prevalent, the VIP will operate as a wet (moist) pit system, which is conducive to good composting. How ever should excess amounts of sullage water be added, which is particularly likely if there household is serviced with a yard tap, then ponding in the base of the pit is likely and may lead to the breading of mosquitoes
VIP 7	VIP's that are situated on dolomitic cavities should be designed as dry systems and not accept sullage into the pit. Caution also needs to be taken where there is ground water that is abstracted from dolomitic formations such that the pollution potential from the pits are limited
VIP 8	Where there is not regular solid waste removal, the sanitation system can easily become the means to dispose of the solid waste. This will shorten the life of the pit
VIP 9	VIP's should not be constructed below the 50 year flood line due to the potential of the pit to flood and contents to be flushed out

Evaluation guidelines: Composting and Desiccating systems

Evaluation Questions: Composting and Desiccating systems	Yes	Conditional
Will it be relatively easy to excavate a hole to accommodate the digester, in other words there is little or no rock that will inhibit digging?		CD 1
Is the prospective site subjected to regular air movement, in other words there are very few windless or breezeless days?		CD 2
Are prospective stands receiving a water supply less than a yard tap		CD 3
Is there sufficient space or opportunity on-site or off-site to dispose of the digested contents		CD 4
Is there regular refuse collection in the settlement		CD 5

Reference	Conditions/Implications: Composting and Desiccating systems
CD 1	Where the area under consideration is very rocky a raised structure can be considered. Raised structures need to be discussed with the community to asses their social acceptability.
CD 2	Composting sytems use air (oxygen) to assist and speed up the composting process. Desiccating systems use air as a means of drying the waste. In areas with many windless days these systems are not suitable. The odours may not also be able to be transported away from the privy.
CD 3	If stands are receiving a water supply of a yard tap or house connection a separate system will be required to dispose of the grey water. This cannot be done by using these typse of toilets.
CD 4	At some point the digester will need to be emptied of most of its contents. The contents can be disposed of on-site as a soil conditioner, however if this practice is not acceptable to residents off-site disposal is required. This means that either the residents or local council must be able to collect, transport and dispose of the contents at a suitable site. Will this be possible for this settlement.
CD 5	This system does not tolerate domestic or household inorganic refuse being thrown into it. If refuse collection is not happening in the community, the user education of the system needs to take this into account.

Evaluation guidelines: Aqua Privies with On site Disposal (soakaway)

Evaluation Questions: Aqua Privy	Yes	Conditional
Is the level of water supply for the site below that of a house connection?		APO 1
Groundwater is not being or likely to be used in the community for drinking purposes?		APO 2
Are individual stands accessible by vacuum tanker?		APO 3
Is there sufficient space and housing densities less than 20 households per hectare?		APO 4
Is this a permanent settlement?		APO 5
Is the soil able to drain away the liquids at a rate of 25 mm per hour or more and is the water table more than 1m from the surface?		APO 6
Is there an effective solid waste management system in place		APO 7
Is the geology such that it can be easily excavated		APO 8
Is the geology such the it is free of dolomitic cavities		APO 9

Reference	Conditions/Implications: Aquaprivy
APO 1	The aqua privy is designed to function with small amounts of water for flushing (1 - 5 l /flush). Where in-house water is supplied a separate means of disposing of grey water is required as the soakaway in a dense urban environment is not suitable for this purpose.
APO 2	The use of ground water from an area does not automatically mean that aqua privies with on-site disposal are not suitable. It does mean that careful consideration must be given to the siting of the soakaways as well as the boreholes.
APO 3	The digester will eventually fill up and need to be emptied. The frequency depends on the size of the digester. It is therefore essential that there be access to the stands for a vacuum tanker. Should access not be possible due to density or topography then this form of sanitation system should be avoided.
APO 4	This system is only suited in moderate densities (i.e. <20 hh/ha) and requires space for a digester or septic tank (i.e. 2mx1mx1m deep) and a soakaway (typically 1,75m deep x 0,6m wide x 5 m long) and access for a vacuum tanker. The size of the soakaway is dependent on the percolation rate of the soil and the water table depth. Consider cost implications to provide access and space.
APO 5	If there is any doubt that the community may have to be resettled, due to any social, political, technical or physical reasons, consider the time frame and the lifespan of the system.
APO 6	Generally the soil is not suitable for percolation if the infiltration rate is less than 25mm per hour. With proper site management, the soakaway can be constructed as a flat bed, filled with sand and then planted with suitable local vegatation (even lawn) to form a evapotranspiration bed. This requires proper training and ongoing monitoring and maintenance by the household to ensure that effluent does not surface and be exposed to people contact (especially children). A high water table will reduce the infiltration of the soakaway. Soakaways thus have to decrease in depth and increase in surface area. It is advised that plants be used to assist with the uptake of effluent water.Where there both high water table and low infiltration rate it is advisable to avoid an onsite system like this.
APO 7	Without effective solid waste management, communities tend to use their sanitation facility to get rid of solid waste. Such solids will fill-up the septic tank and require frequent desludging. Disposal of disinfectants can kill the bacteria in the septic tank and further accelerate desludging.
APO 8	Consider the additional excavation cost for the septic tank and the soakaway. Rock reduces the infiltration and thus enlarges the soakaway proportionally. With increasing rock content, the size of the soakaway may exceed the available space and become an expensive construction. Plants can help increase the disposal of effluent and could effectively act as an evapotranspiration bed.
APO 9	Generally, no soakaways should be allowed on dolomitic areas as this weakens the roof of cavities and may cause them to collapse. Identify an alternative sanitation option.

Evaluation Guidelines: Septic tank and Soakaway

Evaluation Questions : Septic tank and soakaway	Yes	Conditional
Is this a permanent settlement ?		Ref ST 1
Is the community size suitable for this system ?		Ref ST 2
Is there a need to provide for significant population growth (migration)?		Ref ST 3
Is there adequate space (housing density < 20 hh/ha) for construction ?		Ref ST 4
Is the settlement located above the 50-year flood line?		Ref ST 5
Is there water supply within 50 meters of each household ?		Ref ST 6
Are vacuum tankers and disposal at treatment works available ?		Ref ST 7
Is the infiltration rate of the soils > 25mm per hour ?		Ref ST 8
Are the levels of payment for water and/or rates greater than 80%?		Ref ST 9
Can community afford >R600? connection fee & monthly rate >R20 ?		Ref ST 9
Is toilet paper commonly used for anal cleansing?		Ref ST 10
Is there effective solid waste management in the settlement?		Ref ST 11
Is the geology such that it can be easily excavated (i.e. little rock) ?		Ref ST 12
Is the geology free of dolomitic cavities ?		Ref ST 13
Is the water table >1meter from the ground level ?		Ref ST 14
Are there well-established community structures & a customer service?		Ref ST 15
Does GJMC have sufficient human resources & skills to O&M system ?		Ref ST 16
Is there any existing infrastructure for upgrading?		Ref ST 17

Reference	Conditions/Implications: Septic tank and soakaway
ST 1	If there is any doubt that the community may have to be resettled, due to any social, political, technical or physical reasons, consider the time frame and the lifespan of the system.
ST 2	Small to medium sized communities are well suited for this system.(up to 6000 households ?) Most of the O&M can be delegated top the household. Desludging services will mostly be provided by the GJMC.
ST 3	As this system is a on-site system, it is modular in nature and requires little provision for future population growth, other than anticipating growing need for vacuum tankers and increased disposal at treatment works. However, with densification a 2nd households may link to an existing septic tank and result in overloading and failure of the soakaway.
ST 4	This system is only suited in moderate densities (i.e. <20 hh/ha) and requires space for a septic tank (i.e. 2mx1mx1m deep) and a soakaway (typically 1,75m deep x 0,6m wide x 5 m long) and access for a vacuum tanker. The size of the soakaway is dependent on the percolation rate of the soil and the water table depth. Consider cost implications to provide access and space.
ST 5	If not, houses have to be resettled to safe ground. No services should be provided to houses within the 50 year floodline.
ST 6	The toilet can be flushed by pour-flush, sullage flush or cistern-flush systems. Considering a minimum flush volume of 5 liters and at least 3 flushes per day, the system could even be operated at a streettap level. A yard tap would improve effective operation. Use of disinfectant-free sullage water could save water and water costs.
ST 7	Consider additional cost for desludging and disposal at treatment works. Typically, a vacuum tanker service will cost R60 to R80.
ST 8	Generally, the soil is not suitable for percolation if the infiltration rate is <25mm per hour. With proper site management, the soakaway can be constructed as a flat bed, filled with sand and then planted with suitable local vegatation (even lawn) to form a evapotranspiration bed. This requires proper training and ongoing monitoring and maintenance by the household to ensure that effluent does not surface and be exposed to people contact (especially children)
ST 9	Without proper cost recovery of at least 80% such services cannot be maintained. If payment for services is not taking place waterborne services are not viable. It is therefore important to assess and confirm the ability and willingness to pay beforehand. Excavation and construction of the septic tank and soakaway are best undertaken by the community, thereby gaining community contribution and reducing the required capital funding from GJMC.
ST 10	Promote the use of toilet paper through sanitation awareness programs. Use of other cleansing material will fill up the septic tank and require frequent desludging. Consider cost implications.
ST 11	Without effective solid waste management, communities tend to use their sanitation facility to get rid of solid waste. Such solids will fill-up the septic tank and require frequent desludging. Disposal of disinfectants can kill the bacteria in the septic tank and further accelerate desludging.
ST 12	Consider the additional excavation cost for the septic tank and the soakaway. Rock reduces the infiltration and thus enlarges the soakaway proportionally. With increasing rock content, the size of the soakaway may exceed the available space and become an expensive construction. Plants can help increase the disposal of effluent and could effectively act as an evapotranspiration bed.
ST 13	Generally, no soakaways should be allowed on dolomitic areas as this weakens the roof of cavities and may cause them to collapse. Identify an alternative sanitation option.
ST 14	A high water table will reduce the infiltration of the soakaway. Soakaways thus have to decrease in depth and increase in surface area. It is again advised that plants be used to assist with the uptake of effluent water.
ST 15	To manage cost recovery and ensure client satisfaction, an efficient customer service is essential for any waterborne service. This requires organized and capable community structures and asks for sophisticated administration systems at the GJMC
ST 16	The system is suited for delegated management where the household takes full responsibility for the on-site infrastructure and only calls on GJMC support services when a vacuum tanker is needed to desludge the septic tank (i.e. once in 2 to 3 years).
ST 17	If there is any existing infrastructure that can be incorporated into the septic tank and soakaway system, the cost will reduce and can make it a better option. In considering any upgrade you should first assess the type of infrastructure, its condition and its suitability for use in the upgrade. Typical upgradability from other sanitation systems includes : • the superstructure (building and toilet) • converting a lined pit into a septic tank

Evaluation Guidelines: Small-bore Solids-free Sewer System

Evaluation Questions : Small-bore solids-free-sewer system	Yes	Conditional
Is this a permanent settlement ?		Ref SFS 1
Is the community size and connection rate adequate for effective O&M ?		Ref SFS 2
Is there a need to provide for significant population growth (migration)?		Ref SFS 3
Is there adequate space (housing density < 50 hh/ha) for construction ?		Ref SFS 4
Is the settlement located above of the 50-year flood line?		Ref SFS 5
Is there water supply within 50 meters from each household ?		Ref SFS 6
Is a connector sewer with spare capacity within 500m of the settlement?		Ref SFS 7
Is there spare capacity in the regional treatment works ?		Ref SFS 8
Are special structures needed to connect to bulk sewers ?		Ref SFS 9
Are the levels of payment for water and/or rates greater than 80%?		Ref SFS 10
Can community afford >R600 connection fee & monthly rate >R20 ?		Ref SFS 10
Is toilet paper commonly used for anal cleansing?		Ref SFS 11
Is there effective solid waste management in the settlement?		Ref SFS 12
Is the geology such that it can be easily excavated (i.e. little rock)		Ref SFS 13
Is the geology free of dolomitic cavities		Ref SFS 14
Are there well-established community structures & a customer service?		Ref SFS 15
Does GJMC have sufficient human resources & skills to O&M system ?		Ref SFS 16
Is there any existing infrastructure for upgrading?		Ref SFS 17

Reference	Conditions/Implications: Small-bore solids-free-sewer system
SFS 1	If there is any doubt that the community may have to be resettled, due to any social, political, technical or physical reasons, a solids-free-sewer system should not be considered .
SFS 2	Solids free sewer systems can cost-effectively be used in medium sized communities of > 500 households if there is a high connection rate and treatment works are available. For schemes of <1500 ? houses the DWAF may approve the much cheaper pond system for local treatment
SFS 3	Solids-free systems require smaller pipes and are thus less cost-sensitive to population growth. Hydraulic and construction flexibility could accommodate a much shorter design horizon (i.e. 5 years) than conventional sewers (i.e. >10 years) The cost-implication on the small-bore and conventional connector sewers should be evaluated as part of this sanitation option. Connection rate is less critical for this system as it is a full-flow-fluid-only system.
SFS 4	This system is again less sensitive to housing density and construction space than conventional sewer systems, as the pipes can be laid at low depth and around steep bends due to the fluid-only full-flow characteristics. However, adequate space must be provided on each stand for a septic tank (interceptor)to hold at least 24hr effluent (i.e. 2mx1mx1m deep). There must be access for a vacuum tanker. Consider cost implications to provide access and space.
SFS 5	If not, houses have to be resettled to safe ground. No services should be provided to houses within the 50 year floodline.
SFS 6	The toilet can be flushed by pour-flush, sullage flush or cistern-flush systems. Considering a minimum flush volume of 5 liters and at least 3 flushes per day, the system could even be operated at a streettap level. A yard tap would improve effective operation. Use of solids free and disinfectant-free sullage water could save water and water costs.
SFS 7	Consider additional cost of bulk sewers (i.e. R600 – R1000 per household per km) – unit cost could reduce up to 20% due to lower water use and flow rates.
SFS 8	Consider additional cost for treatment works (i.e. R1500 – R2000 per household) – note that desludging must also be disposed-of at treatment works and will require a vacuum tanker service, costing ±R60 to R80 per desludging. Overall, the system requires ± 40% less conveyance and treatment capacity than conventional sewerage
SFS 9	Due to its hydraulic characteristics no pipe bridges are needed. However, consider costs for : • sewerage collection points /sumps • sewerage pump stations – solids-free pumps are cheaper
SFS 10	Without proper cost recovery of at least 80% such services cannot be maintained. If payment for services is not taking place waterborne services are not viable. It is therefore important to assess and confirm the ability and willingness to pay beforehand.
SFS 11	Promote the use of toilet paper through sanitation awareness programs. Use of other cleansing material will fill up the septic tank and require frequent desludging. Consider cost implications.
SFS 12	Without effective solid waste management, communities tend to use their sanitation facility to get rid of solid waste. Such solids will fill-up the septic tank and require frequent desludging. Disposal of disinfectants can kill the bacteria in the septic tank and further accelerate desludging.
SFS 13	SF-sewers are less sensitive to excavation problems as they can be laid shallow and at various slopes below the hydraulic grade. Consider the additional excavation cost (i.e. 1m deep)
SFS 14	Consider additional costs to ensure that sewers are water-tight & require low maintenance
SFS 15	To manage cost recovery and ensure client satisfaction, a efficient customer service is essential for any waterborne sanitation system. This requires organized and capable community structures and asks for sophisticated administration systems at the GJMC. Cost additional capacity building.
SFS 16	To operate and maintain and administer waterborne sanitation requires certain resources. If they are not available within the GJMC or the community (delegated management) consider the cost implication to provide the required resources including O&M staff, administrative staff, equipment (i.e. vacuum tanker) etc.
SFS 17	If there is any existing infrastructure that can be incorporated into the SF-sewer system, the cost will reduce and can make it a better option. In considering any upgrade you should first assess the type of infrastructure, its condition and its suitability for use in the upgrade. Typical upgradability from other sanitation systems includes : • the superstructure (building and toilet) • converting a lined pit into a inceptor tank • using a septic tank, without the soakaway, as interceptor tank • using the shallow-sewer pipes with an inceptor tank if blockages on shallow sewer system are a problem

Evaluation Guidelines: Shallow Sewer System

Evaluation questions: Shallow sewer system	Yes	Conditional
Is the housing density greater than 30 dwellings/hectare?		Ref SS 1
Is there a yard tap for each household?		Ref SS 2
Is the settlement located above of the 50-year flood line?		Ref SS 3
Is the ground water table more than 1 metre below ground level?		Ref SS 4
Is there a connector sewer within 500 meters of the settlement?		Ref SS 5
Do 80% of households earn more than R1000 per month?		Ref SS 6
Are the levels of payment for water and/or rates greater than 80%?		Ref SS 7
Are soft materials commonly used for anal cleansing?		Ref SS 8
Has the community been there for more than 3 years?		Ref SS 9
Are there well established community structures or CBOs?		Ref SS 10
Is household refuse and litter collected/disposed of in the settlement?		Ref SS 11
Is there any existing infrastructure for upgrading?		Ref SS 12

Reference	Conditions/Implications: Shallow sewer system
SS 1	At densities of less than 30 du/ha, the household costs of shallow sewerage increase dramatically and the relative quantity of water for flushing decreases. Implementing shallow sewerage under these conditions requires: i) Relatively higher levels of income (average > R3500/month) and an expressed requirement (economic demand) by the residents for a sewer system. ii) At least a 90% household connection rate from the date of implementation, indicated by up-front payment of a connection fee.
SS 2	Effective flushing of shallow sewer systems requires an average water use greater than 30 litres/capita/day. Where there is not yard-tap or standpipe close to the house, shallow sewerage should only be used where there is proven water use greater than this level and pour flush latrines are adopted.
SS 3	The provision of sewer systems within the flood plain should be avoided, because permanent infrastructure should not be provided where it is not safe for people to live.
SS 4	Where shallow sewers are likely to be laid in saturated soil, particular care should be taken to ensure good construction and sealing, in order to prevent groundwater intrusion.
SS 5	The costs of shallow sewerage to a settlement will increase dramatically, if connector sewers must be constructed. Alternatively, for small settlements, local waste stabilisation systems may be implemented, but this also has capital cost implications (about R1500 per household).
SS 6	If households earn less than R1000 per month, they are unlikely to be able to afford a connection fee (R500) or the R20 to R30 monthly operating cost (assuming 3% of income may be used for sanitation). Community involvement in construction and operation of the system may make it affordable in low-income communities.
SS 7	Shallow sewerage is an intermediate cost sanitation system that requires high connection rates. Sustainable operation is only likely where the majority of people will pay for the costs for the system. Implementation should be delayed until this situation is achieved.
SS 8	Shallow sewerage cannot work with solid anal cleansing materials. Where this is the case, and other methods are affordable, user education in required, together with a smaller (75mm) house connection pipe and gully trap, to keep the blockage at the household.
SS 9	Shallow sewerage is a major investment requiring community significant involvement and should only be implemented in communities with historically demonstrated.
SS 10	Where there is no strong social organisation, the possibility for community involvement and the likely success of shallow sewerage decreases. Intensive community development is required before implementation of the infrastructure.
SS 11	Uncollected household refuse and litter contributes for blockage and failure of shallow sewer systems. Therefore, it is imperative that a solid waste management system (possibly local) is functioning before implementing shallow sewerage.
SS 12	The super-structure of existing household sanitation facilities (and possibly the latrine from on-site flushing systems) may be used for shallow sewerage, thereby reducing the costs of implementation.

Evaluation Guidelines: Full Waterborne Sewerage

Evaluation Questions : Full waterborne sewerage	Yes	Conditional
Is this a permanent settlement?		Ref WB 1
Is the community size and connection rate adequate for effective O&M?		Ref WB 2
Is there a need to provide for significant population growth (migration)?		Ref WB 3
Is there adequate space (housing density < 40 hh/ha) for construction?		Ref WB 4
Is the settlement located above of the 50-year flood line?		Ref WB 5
Is there metered water supply within each household?		Ref WB 6
Is a connector sewer with spare capacity within 500m of the settlement?		Ref WB 7
Is there spare capacity in the regional treatment works?		Ref WB 8
Are special structures needed to connect to bulk sewers?		Ref WB 9
Are the levels of payment for water and/or rates greater than 80%?		Ref WB 10
Can community afford >R800 connection fee & monthly rate >R40 for sewerage?		Ref WB 10
Is toilet paper commonly used for anal cleansing?		Ref WB 11
Is there effective solid waste management in the settlement?		Ref WB 12
Is there a risk for vandalism or abuse (i.e. deliberate blocking of sewers)?		Ref WB 13
Is the geology such that it can be easily excavated (i.e. little rock)?		Ref WB 14
Is the geology free of dolomitic cavities?		Ref WB 15
Is the flushing volume > 6 liters per flush (i.e. 6 - 15 l/c/day)?		Ref WB 16
Are there well established community structures & a customer service?		Ref WB 17
Does GJMC have sufficient human resources & skills to O&M system?		Ref WB 18
Is there any existing infrastructure for upgrading?		Ref WB 19

Reference	Conditions/Implications: Full waterborne sewerage
WB 1	If there is any doubt that the community may have to be resettled, due to any social, political, technical or physical reasons, full waterborne sanitation should not be considered .
WB 2	Small communities (households < 2000) and non-majority connection rates (i.e. connection rate < 75%) are seldom economically viable for full waterborne sanitation as the cost sharing in bulk and connector services becomes unaffordable.
WB 3	In order to ensure cost-effective sizing of trunk and connector sewers, it is important to provide in advance for normal population growth (i.e. 2% to 4% per annum over 10 years design horizon) If this settlement is likely to have higher growth through temporary or permanent immigration to the area, provision needs to be made for their added demand for water supply and the resulting increase in return flows
WB 4	Consider - protection measures so that construction does not damage houses • move selected houses to make space for access (cost new houses) • change to shallow sewer system or small-bore solids free sewers to limit excavation & increase flexibility of layout to adopt the unstructured housing layout
WB 5	If not, houses have to be resettled to safe ground. No services should be provided to houses within the 50 year floodline.
WB 6	Full house connections are needed to provide the minimum level of 100 l/c/d to 120 l/c/day. To ensure equitable cost recovery such water use should be metered and billed according to volume used. Of the total water use 60% to 75% relates to return flows (grey & black water) and such costs should be allocated to the waterborne sanitation system. At R2-50 per kl the water cost for waterborne sanitation is typically R30 to R50 per month. With the O&M cost the typical running cost amounts to between R60 and R80 per household per month.
WB 7	Consider additional cost of bulk sewers (i.e. R600 – R1000 per household per km)
WB 8	Consider additional cost for treatment works (i.e. R1500 – R2000 per household)
WB 9	Consider additional costs for : - pipe bridges over gullies and rivers - sewerage collection points/sumps - sewerage pump stations
WB 10	Without proper cost recovery of at least 80% such services cannot be maintained. If payment for services is not taking place waterborne services are not viable. It is therefore important to assess and confirm the ability and willingness to pay beforehand.
WB 11	Promote the use of toilet paper through sanitation awareness programs. Alternatively, cost the provision of toilet paper as part of tariff or subsidized service.
WB 12	Without effective solid waste management, communities tend to use their sanitation facility to get rid of solid waste. Such solids block sewers and cause operational failure. Ensure that solid waste systems are present and functional before you select ant sewer system.
WB 13	Provide for additional capital and operational expenses to secure manholes and promote sanitation awareness / community policing
WB 14	Consider the additional excavation cost (i.e. hard rock at 1m depth increases cost of conventional waterborne sanitation by up to 90%). Generally it is not affordable to construct full waterborne sewers with > 40% rock in a 1,5 meter profile.
WB 15	Consider additional costs to ensure that sewers are water-tight & require low maintenance
WB 16	Effective flushing of full-bore free-flow sewers requires more water than other sewer systems. On average 6 to 15 liters is used per flush accounting for 40 to 80 l/c/day for sanitation only. The available water for total water use should thus be at least 120 l/c/day. Waterborne sanitation should only be used where such a level of water use can be provided and is affordable.
WB 17	To manage cost recovery and ensure client satisfaction, a efficient customer service is essential for any waterborne sanitation system. This requires organized and capable community structures and asks for sophisticated administration systems at the GJMC
WB 18	To operate and maintain and administer waterborne sanitation requires a minimum level of skills and capacity from the GJMC. While this is generally present, it may lack capacity if all communities are provided with sophisticated systems such as waterborne sanitation. A failure in institutional capacity will also lead to failure of the system on the ground.
WB 19	If there is any existing infrastructure that can be incorporated into the waterborne sanitation system, the cost will reduce and can make it a better option. In considering any upgrade you should first assess the type of infrastructure, its condition and its suitability for use in the upgrade. For waterborne sanitation only the superstructure (building and toilet) could be incorporated.

Evaluation Guidelines: Temporary Interventions

Although temporary interventions should not generally be adopted as the output of the protocol, they may be considered under certain situations of limited GJMC capacity (*sanitation intervention scenario C or D*), as identified in Phase 1.

Evaluation Questions: Temporary Interventions	**Yes**	**Consideration**
Have you confirmed that there is inadequate capacity in the community and GJMC (funds & resources) to provide sustainable sanitation at household level?		Return to PHASE 1
Have you visited the site and assessed the situation?		Ref TI 1
Is this a planned / legal settlement?		Ref TI 2
Is the location of this settlement safe from flooding or sinkholes?		Ref TI 3
There are no epidemic or chronic outbreaks of diarrhea or worms?		Ref TI 4
Have environmental aspects been considered and taken care of?		Ref TI 5
Housing density is not a concern (i.e. < 50 dwellings/hectare)?		Ref TI 6
Is the community satisfied with their sanitation?		Ref TI 7
Is there any community capacity or recognized community leader(s)?		Ref TI 8
The community cannot contribute any resources (money or in like)?		Ref TI 9
No authority (incl GJMC) was previously involved in this area?		Ref TI 10
GJMC can make no institutional and financial resources available?		Ref TI 11
Is there potable water supply within 200 meters of each dwelling?		Ref TI 12
There is no existing sanitation infrastructure?		Ref TI 13
Are site conditions suited for technical options?		Ref TI 14
Which suit of temporary interventions is best suited and affordable for the available resources?		

Reference	Considerations: Temporary interventions
TI 1	Visit the site and assess the situation by : - inspecting the site together with an active NGO or a recognized leader in the community - consulting clinics, police station, health officers and social workers - inquiring selected community members (representative of ages, sexes and cultures)
TI 2	Promote/assist with the compilation of an integrated development plan to resolve aspects such as: - will the settlement be legalized or resettled ? - what economic growth is expected over the medium term (3 to 5 years) ? - what population growth & migration is expected over the medium term ? - what level of service is planned over the medium term ?
TI 3	Identify and assess the implications and potential interventions of the hazards: - confirm that the community is not within 50 year flood line – prevent housing in plain - confirm that community is not on major dolomitic cavities – resettle & fence off - confirm that there are no old mine shafts or unsafe structures – restrict access or repair
TI 4	It is not possible to find the actual incidence of diarrhoea and worms at a local level without conducting a survey. Instead local health workers including GPs can help assess the situation. Environmental health should have a record of serious outbreaks of disease where emergency measures are then necessary. Health workers can institute a campaign of health awareness to tackle key hygiene behaviours, promote breastfeeding and oral rehydration therapy for children with diarrhoea.
TI 5	Assess the environmental status and identify suitable interventions: - is a unique ecological area under threat – inform Environmental Affairs for intervention - is solid waste handling adequate – include interventions in service development program - how is sullage disposed of – provide communal soakaways or promote soakaways per hh - assess water quality and stormwater threats – construct drainage & detention ponds
TI 6	If housing density is a concern identify reasons and suitable interventions : - no access to or construction space for latrines – resettle selected houses to open space - on-site sanitation will contaminate groundwater – restrict drinking from boreholes
TI 7	Identify and evaluate the community complaints to prioritize elements in the suit of interventions : - refer serious health issue (i.e. disease breakout) to health specialist & intervention - identify social or cultural sanitation practices & perceptions and correct /extend - identify community skills and promote delegated responsibility
TI 8	Promote /assist with a community capacity building program by : - identifying and cooperating with other organizations and initiatives (i.e. NGO's) - consolidating sanitation health issues with other social interventions
TI 9	Identify any available community resources that can be used for the temporary intervention : - free labor and local skills for technical, social, training and managerial tasks - financial contribution for funding interventions or contribution of construction material
TI 10	Identify previous interventions, successes and failures and learn from them to improve the intervention planned for the temporary actions.
TI 11	Identify any available resources that can be used for the temporary intervention, including : - human resources (enviro./health officers, social workers, maintenance staff, technicians) - financial resources (capital budget, operational budget, training budget) - equipment & materials (maintenance equipment, vehicles, construction materials)
TI 12	Ensure that the minimum access to water supply is established together with sanitation intervention and sanitation promotion (i.e. washing of hands and sanitary hygiene)
TI 13	Identify the existing sanitation infrastructure and assess : - structural condition and required repairs – assess suitability & cost of refurbishment - functional condition – identify and cost operation and maintenance intervention - upgradability of elements – identify & asses value of upgradable /reusable infrastructure
TI 14	Identify & evaluate affordability and suitability of new technical options as temporary measures : - for very short intervention (<10mths) in dense areas with limited space – chemical toilets with service contracts may be a temporary option (NB: time frame may not be exceeded) - for dense areas with no excavation limitation, a deep groundwater table and good access for vacuum tankers – communal VIP with 2000 liter lined pit for every 8 to 10 houses - for moderate housing densities (< 30 hh/ha), some rock excavation, a low water table, or poor availability of vacuum tankers – communal VIP, 1500 liter pit per 5 to 8 houses - for lower housing density (<10hh/ha), significant rock, low water table, or poor access & availability of vacuum tankers – communal VIP, <1000 liter pit per 3 to 5 houses - composting systems should only be considered if there is an accepted use for it

SANITATION POLICY FOR THE CITY OF JOHANNESBURG

October 2002

Drafted by:
Jacky Burke
Environmental Planning and Management
City of Johannesburg

Approved by City of Johannesburg Mayoral Committee on 28 November 2002

CONTENTS **PAGE**

SANITATION POLICY FOR THE CITY OF JOHANNESBURG

1. PURPOSE

The purpose of this policy document is to provide a framework for addressing the sanitation backlog within the City of Johannesburg (CoJ) by 2010 as a medium term goal but without compromising the long term Igoli 2030 vision of full water borne sanitation for every household. The policy framework thus addresses low income and under serviced areas in the short to intermediate term.

2. POLICY OBJECTIVES

- To provide a policy which articulates the approach to sustainable sanitation provision within Johannesburg;
- To provide for at least an acceptable minimum level of service while striving towards improved levels of service in the short to medium term, accepted as 2010, but without compromising the long term 2030 goal of full water borne sanitation for all residents of Johannesburg.
- To assist the process of addressing sanitation backlogs within the City.

3. BACKGROUND

The rapid expansion of informal settlements in Johannesburg in the early 1990s led to the servicing of these low income areas (LIAs) with communal chemical toilets (at a ratio of one toilet to seven households) as an interim, emergency measure. Waterborne sanitation has always been the minimum level of sanitation service (LOS) for Johannesburg and has traditionally been the minimum standard for Gauteng Provincial Housing Department. The National minimum standard is an acceptable toilet facility, generally accepted as the ventilated improved pit latrine (VIP). In spite of these standards many of the LIAs in Johannesburg are still serviced with chemical toilets at ratios as high as one in twenty in some areas due to the financial and capacity constraints of the former Greater Johannesburg Metropolitan Council (GJMC) and current CoJ. Clearly this is not an acceptable situation as chemical toilets are expensive and not favoured by the community.

The **National Sanitation White Paper** (Department of Water Affairs and Forestry, September 2001) considers both chemical toilets and communal facilities as unacceptable. This policy document incorporates knowledge gained in actual sanitation implementation since 1996 and states that “by March 2010 all South Africans must have access to a basic minimum level of sanitation”.

In an attempt to address the sanitation backlog in Gauteng the **Gauteng Department of Provincial and Local Government (DPLG)** has produced a **“Business plan for the elimination of the backlog in water and sanitation services in the Gauteng Province”.** Concerns regarding the recommended intermediate level of service and financial implications of the plan were raised by Johannesburg Water (JW) and CoJ Councillors. The plan has since been revised and has as its main objective implementation of an intermediate level of sanitation service, subject to the recommendation of the local authority. The plan addresses the total backlog over the next eight years beginning January 2002. The provincial position, supported by the Gauteng legislature, is that we must move away from the high end solution of “Full water borne” to that of “an Intermediate level service” which uses as little water as possible and which has lower capital and operating and maintenance costs. The minimum standard of VIP remains applicable in all instances. This policy approach does not appear to have been carried through into relevant funding bodies as yet, given that funding is still generally made contingent on water-borne

sanitation.

Concerns regarding the DPLG plan were also raised by the **Gauteng Sanitation Advisory Committee (GSAC),** formed in April 2001and made up of interested and affected parties from government, local authorities, water service providers and NGO's. GSAC's purpose is to influence Provincial and Local Government in all aspects of sanitation to ensure integrated planning and coordination of sanitation initiatives. Both CoJ and Johannesburg Water are represented at GSAC.

Johannesburg Water (JW) in its role as water service provider to CoJ has prepared a Low Income Service Level Report and Plan for addressing the sanitation backlog in LIAs. The majority of informal settlements, a total of 183 775 dwellings, are earmarked for development by CoJ Housing. Sanitation upgrading for these dwellings will be addressed through the Alexandra presidential project, through the COJ's Housing programme and through upgrading programmes implemented by JW. Currently 11 170 dwellings are excluded from development plans as they are on private land.

JW retains waterborne sanitation as the long term preferred sanitation option but recognises that the financial and capacity implications of providing water borne sanitation to all communities in Johannesburg makes this an unattainable goal in the short to intermediate term.

The proposed level of service (LOS) for CoJ Housing and the Alexandra Presidential Project is full water borne sanitation. The proposed LOS for Johannesburg Water (22 219 units based on the Revised Plan) is either the condominial system, VIPs or communal ablution facilities depending on the settlement status and density. JW retains the responsibility for operation and maintenance of all sanitation facilities within CoJ regardless of who installed the facility.

JW is also embarking on a number of pilot studies to assess the best option for servicing low income areas. The options, which are detailed in the Appendix, include:

- VIPs or an equivalent dry, on-site system on a single stand basis unless the dwelling density only allows for communal facilities.
- Shallow sewers in the more formalised areas, with the possibility of prepaid water meters.

A demand responsive approach will be followed which will ensure community participation from planning through to and post implementation. Communities will dig trenches/pits at their own cost and will be paid for installation of slabs/pipes. They will be capacitated to manufacture slabs/install systems and top structures. Contributions from communities will ensure ownership and a positive attitude towards self-help and maintenance by the community.

A new sanitation policy for the CoJ will provide the framework for integrating the above initiatives to ensure sustainable implementation of the incremental improvements in household sanitation required to achieve Igoli 2030.

4. THE SANITATION BACKLOG

Against the long term aim of water borne sanitation for all, the backlog within Johannesburg can be defined as the number of households without water borne sanitation. Currently, of the approximately 442 000 proclaimed residential erven within Johannesburg, approximately 192 000 are considered low income. In addition, approximately 171 000 dwellings are located in informal settlements, comprising impermanent and permanent settlements. More recent calculations done by Johannesburg Water (Johannesburg Water Revised Plan for Low income areas, June 2002) suggest that this figure may even be higher, closer to 189 000 dwellings, and not necessarily static, given growth of informal settlements. The low income units are already serviced to an acceptable level, with services consisting of metered or un-metered house connections together with water-borne sewerage. The 171 000 informal dwellings are, however, currently generally served by a

combination of chemical toilets and unimproved pit latrines. It is these households who are considered to consititute the "backlog" in terms of sanitation provision.

The extent of increase in the number of dwellings in these informal settlements is not known at this stage, but would impact on backlog figures.

Table I. Informal settlement status and services

Status		**Land Tenure**	
Type	Number	Owner	Number
Permanent	40	Council	42
Impermanent	34	Province	15
Transitional	1	Private	17
Unknown	8	Unknown	9
Total	**83**		**83**

The estimated population based on 5 members per household at 171 000 dwellings is 885 000. Current LOS indicate that

- 52% have pit latrines that have been installed by the household
- 45% are serviced by communal chemical toilets
- 3% are serviced with communal ablution facilities.
- 0% have no sanitation services

The total number of households who currently are not serviced with water borne sanitation, either intermediate or full, is approximately 1 million (189 000 households at 5 members per household = 945 000, say 1 million).

The time frame for addressing the total backlog has been agreed by Housing and JW as 2015 in accordance with the WSSD sanitation target. Moving the target date forward to 2010 will need to be negotiated.

5. POLICY

5.1 DEFINITION OF SANITATION

For the purposes of the City of Johannesburg's sanitation policy, the National Sanitation Policy definition will be used, as follows:

> Sanitation refers to the principals and practices relating to the collection, removal or disposal of human excreta, household waste water and refuse as they impact upon people and the environment. Good sanitation includes appropriate health and hygiene awareness and behaviour, and acceptable, affordable and sustainable sanitation services

The National Policy defines the minimum acceptable basic level of sanitation as:

> Basic sanitation is:
> a) Appropriate health and hygiene awareness and behaviour
> b) A system for disposing of human excreta, household waste water and refuse, which is acceptable and affordable to the users, safe, hygienic and easily accessible and which does not have an impact on the environment
> c) A toilet facility for each household

Sanitation includes refuse disposal to the extent that a refuse collection and disposal system must be in place to ensure that sanitation facilities are not used for refuse disposal, a function that most sanitation systems are not designed for. The implementation of refuse collection and disposal services is beyond the scope of this policy framework.

5.2 THE SANITATION PROBLEM

The policy recognises that inadequate sanitation facilities produce a multitude of negative impacts, most notably the impact on human health, as witnessed by the 1.5million cases of diarrhoea annually in South Africa in children under five years of age and the recent outbreaks of cholera.

Negative impacts of poor sanitation include:

- Public health problems
- Environmental pollution
- Economic factors
- Social and psychological problems

5.2.1 Public health problems

The most common problems associated with poor sanitation are:

- diarrhoea and dysentery
- cholera
- bilharzia
- typhoid
- malaria
- worms
- eye infections and skin disease

It is noted that protection of public health can be achieved through any of the accepted sanitation systems (see Appendix for details). It is thus critical that decisions regarding sanitation systems take cognisance of sustainability needs, and not just aspirations of users. Full water borne sanitation, although the perceived aspiration of all, is the most expensive system. Furthermore, failure of water-borne systems due to inadequate management, as a result of financial constraints, or social problems leading to abuse of sanitation facilities, has severe negative health and environmental impacts especially in the case of water borne systems due to the extensive area covered by the sanitation network and the high volumes of waste water carried by the network.

5.2.2 Environmental pollution

The pollution risks of inadequate or failed sanitation systems include:

- contamination of surface and ground water
- excessive growth of aquatic plants, most notably algae
- depletion of oxygen which reduces biodiversity and upsets natural ecosystems.

Within Johannesburg both the Jukskei and Klip river catchments are severely impacted by sewage from overcapacitated and leaking sewer networks as well as sewage from inadequately serviced communities. Both rivers discharge to river systems used for potable water sources and removal

of these pollution loads to render the water fit for consumption is costly and ultimately accrues to the City through high treatment costs factored into the overall cost of water. The impact of inadequate sanitation on groundwater is not currently known, as groundwater data within COJ is sparse and groundwater monitoring is currently not part of a routine monitoring programme.

5.2.3 Economic impact

The cost of inadequate or failing sanitation is not easily quantifiable but includes the burden of health care costs, loss of productivity, reduced water quality for irrigation, higher water treatment costs and a growing scarcity of good quality water. South Africa is a water scarce country and hence water must be valued as an economic good.

5.2.4 Social and psychological problems

Inadequate sanitation facilities result in loss of privacy and dignity and increased risks to personal safety. This results in an overall decrease in the quality of life.

5.3 POLICY PRINCIPLES

Certain policy principles need to be followed to ensure that the strategic interventions undertaken to address the sanitation problem are sustainable and acceptable.

The five policy principles for addressing the sanitation backlog are:

- Demand responsive approach
- Package of services approach
- Adherence to a basic minimum standard
- Integrated environmental management approach
- Sustainability through acceptance and affordability

5.3.1 Demand responsive approach

Past experience has shown that supplying sanitation where there is no demand is not sustainable. Demand must be created through intensive health and hygiene programmes together with social marketing of sanitation systems. **Communities are willing to invest in sanitation and are capable of making informed decisions once they understand the link between health, hygiene and a toilet facility.** A demand responsive approach as opposed to a supply driven approach ensures ownership, willingness to manage facilities and willingness to pay for facilities.

5.3.2 Package of services approach

The choice of sanitation system must reflect the different levels of service in different communities (see appendix for details). This approach must be facilitated by integrated planning and implementation through the Integrated Development Plans (IDPs) of which the Water Services Development Plan (WSDP) is a component. Agreement on LOS must be reached by all stakeholders, including the community, when available, prior to implementation of specific projects.

5.3.3 Adherence to a basic minimum standard

All households should be upgraded to at least the National basic minimum standard as a priority before incremental upgrading is initiated. This will ensure that the limited funds available will provide "Health for All" rather than "All for Some". The design-life, and hence cost of on-plot systems can be reduced to coincide with the expected development of a community. Where budget implications put constraints on delivery of at least the basic minimum standard within a reasonable time frame, households should be part of a health and hygiene education and awareness programme and be shown how to upgrade their unimproved pits to a VIP where feasible.

5.3.4 Integrated environmental management approach

The environment must be protected from the potentially negative impacts of implementing and operating sanitation systems. Soil conditions, geology and groundwater levels must be considered prior to implementation to ensure compliance with environmental protection regulations. **Where on-site sanitation is the preferred LOS but groundwater offers a constraint, contained on-site systems should be installed.** Reuse of grey water for flushing of water borne systems and/or gardening should be encouraged to minimise diffuse pollution. Where pollution does occur the Polluter Pays Principal will apply.

5.3.5 Sustainability through acceptance and affordability

Sanitation systems must be sustainable to ensure ongoing benefits for public health and protection of the environment. **Sustainability can only be assured if the system is accepted by the community and is affordable to both the CoJ and the community.** Acceptance is gained by following the demand responsive approach prior to implementation. Affordability must be in terms of both capital costs and ongoing operation and maintenance costs. Full water borne sanitation is not sustainable if it is not affordable to the community as any subsidy provided by the CoJ for operation and maintenance (including water, toilet paper and cleaning agents) cannot be guaranteed for a long term period. The benefits of providing the minimum standard as opposed to the consequences of failed water borne systems needs to be clearly understood.

5.4 LEVEL OF SERVICE GUIDELINES

The appendix sets out the sanitation options which may be considered for Johannesburg, and highlights advantages and disadvantages of these options. Taking cognisance of these, and of the the policy principles outlined above, the following approach for the application of levels of service is proposed as a general guideline:

Service Level 1 – VIPs or equivalent on site dry sanitation system
To be considered for settlements which are to be relocated, subject to detailed consideration of geotechnical conditions, densities, groundwater levels etc.

Service Level 2 – Low to Intermediate off-site, low flush systems
To be considered for settlements earmarked for in-situ upgrading, incremental housing developments and settlements with low affordability levels.

Service Level 3 – Full water borne systems
New or permanent settlements with appropriate levels of affordability and willingness to pay for higher level of service.

Choice of options should be closely linked to affordability levels of the households receiving the service. The choice should also be informed by ongoing pilot projects to arrive at the most appropriate options for implementation within COJ.

5.5 STRATEGIC INTERVENTIONS

Strategic interventions will require integration of the various role players responsible for sanitation delivery. Together with the policy principles, the strategic interventions need to be applied through specific programmes for clearing the backlog. The JW Business Plan and CoJ WSDP will provide the platform for developing such programmes.

The strategic interventions for addressing the sanitation backlog include:

- Facilitating community participation
- Promoting health and hygiene practices
- Installing facilities and improving existing infrastructure
- Adopting an integrated environmental management approach
- Integration of development programmes

5.5.1 Facilitating community participation

Develop and/or draw from experience of other local authorities to create a framework for assessing community demand. This framework should:

- Clarify the specific roles and responsibilities of the various role players, the community and other spheres of government.
- Clarify the 'rules' under which a community can get sanitation
- Clarify the decisions that communities must make, such as, choice of LOS based on willingness and ability to pay and the 'who' and 'how' of operation and maintenance.
- Steer the community towards a contract with Johannesburg Water.

Communities can be empowered to implement the Demand Responsive Approach Framework themselves. It is crucial that the demand responsive approach is followed up with proper billing and revenue collection measures.

5.5.2 Promoting health and hygiene practices

Develop and/or draw from experience of other local authorities to create frameworks for implementing health and hygiene education and awareness, and training on correct operation and maintenance of water and toilet facilities. Communities can be empowered to implement both frameworks.

5.5.3 Installing facilities and improving existing infrastructure

Irrespective of the legislative procedures followed in the township establishment process, the decision to accept a particular LOS ultimately rests with local government and its service provider. It is crucial that financial models based on income levels, willingness to pay, the extent of cross subsidisation possible based on JW revenue, external subsidies and various scenarios of payment from LIAs are developed prior to any decision taken on the LOS to be implemented.

5.5.4 Adopting an integrated environmental management approach

All implementations plans must include measures to ensure compliance with current environmental legislation. Measures should include assessment of surface and ground water quality, soil conditions and the potential for reuse/treatment of grey water.

5.5.5 Integration of development programmes

The sanitation approach as outlined in the policy should be Integrated into the IDP, LIDPs, the WSDP, the Sustainable Housing Policy, housing development programs, Johannesburg Water sanitation programs, Provincial and National development initiatives and co-ordination in respect of sanitation issues relating to development programmes should be promoted. This should include the linking of land-use planning with implementation of different LOS and the applicability of the different LOS to in-situ upgrades and new (greenfields) developments.

5.6 ROLES AND RESPONSIBILITIES

Sanitation is a basic human right: Communities are first and foremost responsible for their own sanitation but the local authority has a constitutional responsibility to provide access to sanitation services.

The CoJ must implement the sanitation policy to fulfil its constitutional responsibility of ensuring access to sanitation. The planning and implementation of sanitation has been delegated to JW but integration, monitoring and evaluation remains a function of the CoJ.

The roles and responsibilities of communities, CoJ departments and UACs are detailed below:

5.6.1 **Communities** must participate in sanitation programmes. Participation may include:

- Taking part in the decision making process
- Forming part of a health and hygiene education team
- Assisting in the building of facilities
- Assisting in the operation and maintenance of facilities
- Payment for services

5.6.2 **Environmental Health** should:

- Budget for and drive the health and hygiene awareness and education programmes.
- Build capacity within communities to continue with such programmes.
- Collect statistics on baseline data for sanitation related health problems and health benefits associated with sanitation projects

5.6.3 **Environmental Management** should

- Draft the sanitation policy
- Develop policy intervention mechanisms
- Collect statistics on the environmental benefit/impact of sanitation projects

5.6.4 **Development Planning and Technical Support** should

- Facilitate integration of the IDPs with sanitation programmes
- Facilitate alignment of budgets

5.6.5 **Housing** should:

- Integrate housing developments with proposed sanitation projects

- Evaluate current proposed LOS for housing developments
- Engage with Province to ensure developments and financing packages align with the CoJ Sanitation Policy

5.6.6 **Finance** should

- Ensure accurate billing and promote payment for services

5.6.7 **Contract Management Unit (CMU)** should:

- Implement the policy
- Monitor and evaluate implementation of the policy through development of Key Performance Indicators.

5.6.8 **Johannesburg Water** should

- Draft sanitation implementation plans and develop sanitation programmes that integrate with other services
- Facilitate community participation and a demand responsive approach
- Budget for and drive the LOS education and training programmes.
- Install bulk infrastructure and capacitate communities to install toilet facilities
- Source funding and align budgets with other service providers

5.6.9 **Pikitup, Johannesburg Roads Agency (JRA), City Power** should:

- Ensure integration of services with sanitation projects
- Ensure alignment of budgets

5.7 FUNDING OF SANITATION IMPROVEMENT PROGRAMMES

5.7.1 Costs

In recognition of the need for financial sustainability, affordability to users, and the negative health and environmental impacts associated with the failure of systems which are not optimally maintained due to cost constraints, decisions regarding LOS must be based on consideration of both capital costs and ongoing operation and maintenance, as well as the ability of the beneficiary community to pay for particular levels of service.

Costs for implementing sanitation include:

- Appropriate health and hygiene awareness and education
- Awareness and training on different LOS and proper operation and maintenance of facilities
- Infrastructure costs of the systems for disposing of human excreta and waste water
- Operational costs for the treatment of the waste water and sludge
- Maintenance costs for maintaining the infrastructure
- Toilet facility per household
- Running costs of the toilet facility, including toilet paper and cleaning agents, which are unaffordable for many households but necessary for the correct operation of the system

5.7.2 Health and hygiene awareness and education

Adequate provision should be made within Environmental Health budgets for health, hygiene awareness and education.

5.7.3 LOS awareness and training.

Adequate provision should be made within Johannesburg Water's budget for awareness and training in respect of sanitation systems and levels of service.

5.7.4 Infrastructure (Capex) and operation and maintenance (Opex)

Capex is the responsibility of the implementing agent (Provincial Housing, CoJ Housing and Johannesburg Water) and Opex is the responsibility of Johannesburg Water.

The responsibility for operation and maintenance costs is two fold depending on the system provided and level of service. There is a user responsibility as well as a Utility responsibility. Maintenance of individual toilet structures and the desludging of on-site systems is typically the responsibility of the users, whereas the maintenance of the utility sewers and treatment facilities is the responsibility of the Utility.

5.7.5 Funding Sources

Current sources of funding available include:

- The Equitable Share subsidy
- Infrastructure grants
- CoJ revenue

These will be sourced as appropriate by the relevant parties.

5.8 MONITORING AND EVALUATION

The progress of addressing the sanitation backlog through implementation of the policy must be monitored and evaluated. Key performance indicators need to be developed and data needs to be collected. These functions reside with CMU and Environmental Planning and Management.

6. CONCLUSION

Numerous studies have indicated that implementation of sanitation within the DWAF definition reaps equivalent benefits for both the environment and public health, regardless of the system installed. In order to reap these benefits it is crucial that a demand responsive approach is followed as acceptance and correct usage of sanitation systems and payment for sanitation services cannot otherwise be guaranteed.

The successful implementation of this policy can only be achieved through the acceptance and implementation of alternative sanitation as a short to intermediate term service. Acceptance of alternative sanitation will pave the way forward for addressing the sanitation backlog in Johannesburg.

SANITATION FOR DIGNITY
SANITATION FOR HEALTH

October 2002
Jacky Burke
Environmental Quality Management

REFERENCES

1. White Paper on basic household sanitation, September 2001, Department of Water Affairs and Forestry

2. An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council, August 2000, Guy Pegram

3. Pilot application of Johannesburg Sanitation protocol and development of a generic South African urban sanitation protocol. Report to the Water Research Commission, October 2002, Mark van Ryneveld

4. Johannesburg Water low income service level report and plan, 2002

5. Johannesburg Water revised plan for low income areas, June 2002

6. Johannesburg Water Business Plan, 2002

7. Business Plan for the Elimination of the Backlog in Water and Sanitation Services in Gauteng Province. High Level Business Plan 2001, Africon

APPENDIX

TABLE 1: DESCRIPTION OF SANITATION OPTIONS WHICH MAY BE CONSIDERED FOR JOHANNESBURG

Sanitation System	Description	Advantages/Disadvantages	Institutional requirement	Experience
VIP *dry on-plot*	Comprises a top-structure over a pit. The pit is ***vented*** via a vent-pipe, which is covered with a screen, to control and eliminate flies and odour. The pit may be lined or unlined. *Pits may be emptied manually or by vacuum tanker and appropriate treatment and disposal of sludge is required.*	Low capital cost, suited to labour intensive construction, provides minimum level of sanitation. Environmental pollution may result, but only in very specific circumstances. Access to pits required for emptying vehicle. Operation and maintenance costs are moderate. **TOILET CANNOT BE INSTALLED INSIDE THE HOUSE AND SYSTEM DOES NOT ACCEPT SULLAGE AND MAY NOT BE SUITABLE FOR DOLOMITIC AREAS.**	Requires tank de-sludging service	The VIP is used widely internationally and in rural and less dense peri-urban areas in South Africa. The few failures have been due to inadequate user education or poor design and construction.
Composting / Desiccating/ Urine diversion *dry on-plot*	Consists of a top-structure over a container that with access to remove decomposed waste. These (generally proprietary) systems are based on capture and biological breakdown (composting) and/or drying-out (desiccating) of human waste into material that is safe for handling and disposal. In some cases urine is diverted to assist the process. *The resulting material must be removed and may be used as compost.*	Provides a basic level of service, which is designed to be used without water. Sullage and hard cleansing materials must be disposed of separately. Access to the system is required for removal of material. Community handling of decomposed human waste may not be consistent with local cultural customs and further treatment is required before use of the material as fertiliser. **SYSTEM DOES NOT ACCEPT SULLAGE, BUT MAY BE INSTALLED INSIDE THE HOUSE. THE SYSTEMS ARE DEPENDENT UPON TO CORRECT OPERATION.**	Requires removal of decomposed material by the community or local authority	Various proprietary systems have been constructed throughout South Africa, but failures occur with inadequate user education.
LOFLOS *low water on-plot*	Comprises a top-structure over a watertight container (septic tank), which drains to a subsurface drain (soakaway). The toilet is flushed using as little as 3*l* of water, which is carried to the toilet by the user (ie: is not necessarily piped). Solids are settled out and retained in the tank; liquids soak into the surrounding soil. *Tanks must be emptied by vacuum tanker and appropriate treatment and disposal of sludge is required*.	Provides basic level of sanitation and accepts sullage. Additional water has to be carried by user. Environmental pollution may result. Access to tanks for vehicle required. Operation and maintenance costs are moderate. **CANNOT BE INSTALLED INSIDE THE HOUSE AND SHOULD NOT BE USED IN DOLOMITIC AREAS OR WHERE PERMEABILITY IS LOW.**	Requires tank de-sludging service	Widespread use in Gauteng. Many failures, generally due to inappropriate application, inadequate user education, poor design and workmanship.
Conservancy or septic tank & soakaway *high water on-site*	Comprises an in-house toilet flushing to a septic or conservancy tank draining into a soakaway. Human waste is deposited in a sealed toilet from which it is flushed by 6-15 litres of water into a septic tank (or "digestor") into which domestic grey water is generally also discharged. After passing through the septic tank, the liquid effluent, soaks into the surrounding soil through the soakaway. *Tanks must be empties by vacuum tanker and appropriate treatment and disposal of sludge is required*	Provides a high level of service and user convenience and accepts sullage and can be used without bulk sewer system. Toilet can be installed inside the house. Cannot be used for high settlement densities or with soils with lower permeability. Requires large volumes and a reliable and uninterrupted supply of water. Capital costs are high. Operation and maintenance costs are high, especially in respect of the cost of the water used to flush. **FAILURE OF WATER SUPPLY, OR INAPPROPRIATE OPERATION CAUSES THE SYSTEM TO FAIL AND SHOULD NOT BE USED IN DOLOMITIC AREA OR WHERE PERMEABILITY IS LOW.**	Requires tank de-sludging service	Septic tanks are widely used by formal rural households on the outskirts of the city, which get water supply from boreholes or formal reticulation.

TABLE 1 (cont)

Sanitation System	Description	Advantages/Disadvantages	Institutional requirement	Experience
Small-bore solids-free sewers *medium water on/off-site*	Consists of a toilet flushing to a septic tank, with liquid effluent draining to small diameter (50-75mm) sewers. The effluent is collected in a central sump where it can be pumped or transported by tanker to the existing conventional sewer or treatment works. Alternatively, the small-bore sewer discharges effluent directly into an existing sewer system; this is referred to as a STED (Septic Tank Effluent Drainage) system. *Tanks must be emptied by vacuum tanker and treatment is required for both the sludge and liquid effluent from the sewers.*	Provides a convenient system, which can accept sullage associated with in-house water supply. The toilet can be constructed inside the dwelling. Capital costs are particularly high, while operational costs are also high, due to the requirement for de-sludging and effluent treatment. **OPERATION AND MAINTENANCE REQUIREMENTS FOR BOTH THE SEPTIC TANK AND SEWERS. SHOULD ONLY BE USED AS AN UPGRADE OF EXISTING SEPTIC TANK SYSTEMS.**	Both tank de-sludging and sewer maintenance are required.	This system has not been widely applied in South Africa, except in cases where existing septic tank system has been upgraded.
Shallow simplified sewerage *Medium water off-site*	Consists of a top structure (usually in-house) with lower flush toilets draining to smaller diameter (100mm) sewers laid at flatter gradients and shallower depths (than conventional sewerage) between dwellings on a block. High levels of connection are required to provide adequate flushing of the block sewers. These connect to street sewers and on to treatment facilities. **4 Treatment facilities are required, while maintenance of block sewers is often delegated to the residents.**	Provides a convenient sanitation option. Toilet can be constructed in the dwelling. Can be used with lower levels of water supply (30 litres//capita/day) and can accept sullage. Can be laid out in irregular informal settlements. Capital and operating costs are less than full water borne. Appropriate use is necessary, which required intensive consultation and user education. **REQUIRES HIGH CONNECTION RATES AND DENSER SETTLEMENTS, WITH LOCAL MAINTENANCE TO BE COST EFFECTIVE AND SUSTAINABLE.**	Low-technology block sewer maintenance delegated to residents, supported by skilled operation of the bulk system.	Has not been applied in South Africa, but has had wide application and success in settlements internationally, particularly where local residents take responsibility for the system.
Full-bore waterborne sewerage *high water off-site*	The waterborne sewerage system comprises a top-structure with a flush toilet. The toilet is connected to a sewer (pipe) network, which drains to a wastewater treatment facility. Pipes flow only partially full. *Pump stations may be required. Treatment facilities are required.*	Provides high level of sanitation and user convenience and accepts sullage. Toilet can be installed inside the house. Requires large volumes and a reliable and uninterrupted supply of water. Capital costs are high. Operation and maintenance costs are high, especially in respect of the cost of the water used to flush. Cannot be used in spatially irregular settlements. **FAILURE OF WATER SUPPLY, OPERATION AND MAINTENANCE OR LOCAL AUTHORITY FINANCIAL LIQUIDITY RESULT IN RAPID COLLAPSE OF THE SYSTEM AND SPREAD OF DISEASE.**	Skilled, organised and effective operation and maintenance capability required.	Widely used in South Africa. It is the goal of all South Africans, but is very costly.

Source: An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council August 2000

TABLE 2: PROPOSED WATER AND SANITATION SERVICE PACKAGES

Service Package	**Sanitation option**[1]	*Water Supply Level*[2]
Emergency or temporary services	**Communal VIP** (temporary <12 month measure) *Chemical toilets should be avoided, except in emergency situations*	**Communal tank or standpipe** *Water tankers may be used under emergency situations*
Basic level	**Household VIP** (on-plot dry) *Composting-desiccating systems may be used where the advantages and community acceptance are proven*	**Communal standpipe** *Yard connections may be used at lower densities*
Low level	**LOFLOS** (on-site low flush)	**Low volume yard connection** (such as yard tanks)
Intermediate level	**Shallow sewerage** (off-site medium flush) *Small-bore sewerage may be used where septic tanks already exist in more than 80% of plots*	**Yard connection** **5 House connection may be used if this is affordable**
High level	**Full-bore sewerage** (off-site full flush) *Septic (or conservancy) tanks may be used in sparsely populated areas, such as semi-rural small-holdings* *Small-bore sewerage may be used where septic tanks or aquaprivies already exist in more than 80% of plots*	**Yard or House connections** *These may range from trickle feed to full pressure systems, depending upon affordability and water availability.*

Note 1: Apart from communal facilities for emergency or temporary services, a household sanitation facility is implied for these service levels. A number of households on a plot with a single toilet / latrine (such as for backyard shacks) cannot be interpreted as an adequate level of service.

Note 2: Although the preferred level of water supply is indicated in bold, this may be flexible in that a higher level of water supply may be considered, as indicated in italics

Source: An Evolving Sanitation Policy Framework for the Greater Johannesburg Metropolitan Council August 2000