Grant Mackintosh, project manager and water utilisation engineer at Emanti Water Management, a group of specialist water and environmental engineers and technicians that is a spin-off of the CSIR, believes it is relatively cheap and easy to improve the quality of water delivered to rural areas – service providers must simply comply with the regulation, which acts both as a guide and a controlling measure.

In terms of quality, South Africa is regarded as among the top 12 suppliers of drinking water in the world. While local authorities need to be praised for their endeavours to deliver water to rural communities, those monitoring water services feel that many local authorities providing water have neither the skills nor the capacity to deliver class one water to consumers. Some even feel that water of an inferior quality can do more harm than good. The fact is that many rural dwellers still don’t have access to clean water.

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Managing the quality of drinking water

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metropolitan areas in the world. The consensus is that water distributed by major water boards is generally of a very high quality. These drinking-water supply systems are usually well managed, while water quality is monitored and maintained in structured scientific programmes. However, Mackintosh says the situation in non-metropolitan areas is very different.

Other monitors agree that the rural areas are behind in terms of water quality. They do not, however, agree on the priority that should be given to delivering class one water – water which can be used indefinitely for any purpose – to these areas.

Before 1994, an estimated 30 to 40% of South Africa’s population was without adequate water-supply services and some 21 million people were without adequate sanitation. The impact on primary health remains significant. Since 1994, water service delivery has received considerable government attention, and progress has been made in backlog reduction and provision of access to a basic level of water, the first step on the ‘water ladder’. As of 2004, some ten million additional people have been supplied with access to drinking water, reducing the drinking water supply backlog to some four million.

“The progress is admirable, and closer attention now needs to be paid to ensuring the safety of the drinking water being provided for consumption,” says Mackintosh.

The Emanti Management group is involved in various local, provincial and national initiatives regarding the management of the quality of drinking water. It recently completed a Department of Water Affairs and Forestry (DWAF) and Masimambane-funded study, which probed the quality of treated water in the Western Cape. The company will be presenting practical considerations on compulsory standards for potable water for Water Service Authorities (WSAs) at the IMESA (Institute for Municipal Engineering, South Africa) Conference in Mossel Bay in October, where the team may present more of the results from the study. The results show levels of bacterial contamination higher than is allowed for class one water.

Findings showed that, at the time of sampling, a surprisingly high number of Western Cape communities received drinking water of a poor quality. Table 2 provides a summary interpretation of bacteriological drinking water results compared to SABS 241-2001 class one standards, which is the required quality for WSAs.

Inspection of the table shows:

- 42% failure in terms of total coliforms and 19% failure relating to faecal coliforms at the towns/communities sampled – the maximum allowable failure is 4%
- the percentage total and faecal coliforms failure, at villages/communities at 71% and 32% failure respectively, was significantly higher than the 7% and 0% failure recorded at the major towns
- a 41% and 20% faecal coliforms failure at smaller established towns. This is also significantly higher than the major towns.

A municipal engineer from the Cape, closely involved with water services and health, defends the quality of the water in the area. He says that natural water from pure river streams will also include certain levels of E. coli. “It is mostly harmless and only used as an indicator to show that there is a likely presence of excreta and bacteria.”

He says that natural water is ‘living,’ but for purposes of bulk water distribution one should consider ‘clean’ water as ‘dead’ or not having any live organisms. It is his opinion that people get used to the water quality they know. He later withdrew his comments, but perhaps it serves to confirm a different way of thinking between engineers and other monitors concerning the issue of water quality.

Dr Jo Barnes of the Department of Community Health, University of Stellenbosch, responds strongly to this type of talk: “While people can ‘adapt’ to a certain degree, it is also true that the vulnerable amongst them - children, the aged, pregnant women and chronically ill persons, especially HIV/AIDS sufferers, those who are Tuberculosis positive, the undernourished and the like - will get sick or die much sooner from environmentally acquired infections. One may thus get the impression that the population is unaffected, because the deaths are attributed to other causes.”

She says that just because the official statistics do not attribute illness and death to waterborne causes, it does not mean that any population is unaffected by poor quality drinking water. “For example, the South Africa mortality rate among rural babies whose bottle feeds are made up with contaminated water is unacceptably high, even by third world standards.”

Further, she says that disease-causing organisms in drinking water should be a reason for alarm within responsible health authorities.

“Many of the diarrhoeal diseases sweeping through communities
are viral. Poor sanitation – with even more faeces reaching the river – serves to perpetuate the outbreak.”

She explains: “Escherichia coli (E. coli), a gut organism in warm-blooded animals, does occur in nature. There are all kinds of animals around in most places, and it is true that many of the types of E. coli are not directly harmful to human health. It is, however, always a warning sign that the water may have been contaminated with untreated faeces and the E. coli count also serves as an indication that there are many other disease-causing organisms probably present in such water. E. coli needs quite a few organisms per 100 ml water ingested to infect humans, but for viruses, which are very efficiently carried by water, the infective dose can be as low as one or two per 100 ml water.”

She says E. coli is not a harmless organism only used as an indicator. “There are some extremely serious variants of E. coli, which cause internal bleeding especially in the kidneys, and which result in a high death rate (notably E. coli O157:H7). Most of the E. colis affecting humans cause diarrhoea, which can be dangerous depending on the patient’s state of health before he/she became ill. In fact, apart from the viruses, the E. coli organisms are a major cause of diarrhoea in poor communities. In 2000, 292 children out of every 1,000 were affected by diarrhoea in KwaZulu-Natal, and 174 per 1,000 countrywide.

“According to international conventions, if natural water contains more than 1,000 E. coli per 100 ml of water (not coliforms, but E. coli) then there is a health risk to humans who come into contact with this water, for example through irrigation and swimming, which increases as the E. coli count goes up. In South Africa, we use 2,000 E. coli organisms per 100 ml water as an informal benchmark. Thus, our quality control has dropped to half the international standard. According to our regulations, drinking water should contain no E. coli organisms.”

Municipalities are now faced with the challenge of improving the quality of the water they are delivering to rural communities. While the municipality of Lepaledi (see page 45) is still basking in the glory of effective water provision, it is also focussing on the next challenge: ensuring a high water quality. Gerhard van Wyk, manager of technical services, Lepaledi Municipality, says it is fortunate that most of the water it is distributing to these areas is groundwater, with little possibility of contamination. However, he admits that the municipality still has some work to do to get the water for rural areas to class one standard, which can be used indefinitely by the consumers.

Dr. Barnes underlines the urgency of establishing treatment facilities in rural areas. “If you just provide more water, of whatever quality, and make no serious effort to create space for a treatment facility alongside, you will soon have an environment that is even more polluted. Water is just as efficient a carrier of disease as it is a cleaning agent,” she says.

Local government

At local government level, the WSA, which is the municipality, is the local regulator of water services. It is responsible for providing safe drinking water, a non-transferable governance requirement that includes legislative compliance. As such, the WSA determines local policies and standards, which must conform to national minimum norms and standards. It promulgates by-laws, plans the provision of water services through the Water Services Development Plan, determines how investments in water services are undertaken and sets tariffs. Where the WSA is also the Water Services Provider (WSP), there is self-regulation.

For this purpose, the Water Research Commission (WRC) has also made available a set of five manuals that would provide WSAs with knowledge and practical steps for assessment, sampling, analysis, treatment and management of water. These can be distributed to any municipality free of charge.

Adherence to these requirements is the responsibility of the municipal engineer, who is the technical director. According to Mackintosh, one of the most important regulatory requirements in providing drinking water is to ensure compliance with the ‘Compulsory National Standards for the Quality of Potable Water’.

This obliges WSAs to monitor drinking water quality at the point of use, and to communicate any threat to health to consumers and the appropriate authorities. “These national standards provide a minimum requirement for drinking water quality management (DWQM) by WSAs, and while non-compliance to the standard of water quality is a non-prosecutable offence, failing to warn the users and authorities will be an offence that is prosecuteable by law,” says Mackintosh.

The findings of a recent strategic survey by DWAF’s water services’ business intelligence unit on the provision of drinking water quality also found that a majority of WSAs do not satisfy water quality management requirements (table one).

The survey was based on self-assessment by local governments via a questionnaire and telephonic interaction.

Mackintosh points out that the survey shows that many WSAs are not familiar with drinking water service legislative requirements,
and that inadequate monitoring of drinking water quality results in services that regularly fail legislative requirements.

“Fortunately, where DWQM practices are introduced, there is a significant turnaround in drinking water quality results,” says Mackintosh.

He cites Stellenbosch Municipality as an example, where DWQM is used iteratively to inspect and optimise drinking water service delivery. The effectiveness of this approach was demonstrated when Fran- schoek was first included into the Stellenbosch Municipal area. Initial investigation found that the drinking water quality within the town was very poor.

A total of 95% of samples collected failed required SABS limits for total coliforms and 88% of samples collected failed required SABS limits for faecal coliforms. Subsequent, and generally inexpensive, DWQM interventions resulted in 100% compliance with required drinking water quality standards within four months.

Free State

Mackintosh says that provincial and national government are mandated to provide co-operative governance and co-operative government support to local government. At provincial government level, the provincial sphere has regulatory functions over local government in respect of municipal planning, storm water management systems in built-up areas and water and sanitation services. Provincial government also fulfils regulatory functions in respect of its broad mandate to oversee local government and the general principles of co-operative governance. He cites the Free State as an example. Here, the Department of Local Government and Housing (DLGH) provides a co-operative governance function to WSAs by operating a provincially funded consultative audit of drinking water and treated wastewater. “This initiative can be regarded as best practice in terms of fulfilling the mandated functions of provincial government.”

This audit is undertaken on a monthly basis at about 85 towns, with drinking water samples being collected at water treatment works and at point of use in the distribution network. Treated wastewater samples are collected at the wastewater treatment works. Through this audit, a progressive improvement in drinking water quality has been achieved. Between April 2003 and March 2004, of the 1 741 drink-

“The most important and effective monitoring strategy for the sector is strengthening the voice of consumers”

ing water samples collected from surface water-based systems in the province, 3.4% failed required SABS limits for total coliforms. A total of 1.9% of the samples failed required SABS limits for faecal coliforms, where the maximum failure allowed is 4%.

Despite the fact that the Free State is generally considered to have fewer resources than the Western Cape in terms of WSA staffing, finances and technology implemented, its excellent drinking water quality results highlight the positive impact of effective monitoring, management, third party auditing and transparent reporting.

He also mentions other benefits of the programme. DLGH in the Free State can use the DWQM programme to ensure that WSAs introduce their own DWQM procedures and become regulatory compliant. DLGH uses the project to direct and assess infrastructural and capacity building support to local government, including funds from the Municipal Infrastructure Grant (MIG) and the Capacity Building Grant (CBG).

Regulatory governance

Says Mackintosh: “Regulation of the water services sector is the responsibility of the national government, represented by DWAF. In the broadest sense, regulation aims to ensure that all role players comply with the regulatory goals, objectives and measures in respect of the economic, social, political, environmental and technical desirables as provided for in all relevant policy and legislation.” The Water Services Act (Act 108 of 1997) provides the Minister of Water Affairs and Forestry and DWAF with authority to regulate and intervene, but the approach is developmental rather than punitive. He says that it is clearly set out in the overarching strategic framework for water services that DWAF plays a co-operative and regulatory governance role in assisting local and provincial government via supportive interventions and in the development of the necessary guiding policies.

Currently, DWAF is developing a national drinking water regulatory strategy, regional information centres, effective communication procedures, reporting frameworks and monitoring/evaluation protocols. Implementation of such initiatives will enable sustainable delivery and management of water services. Ultimately, says Mackintosh, DWAF can also be expected to intervene in areas where service delivery has failed.

The future

Several monitors, including the WRC, indicated a lack of technical capacity and skills, which can be solved by one of many training courses available to bring operators’ skills up to standard.

Mackintosh says that where reasonable infrastructure, resources and capacity exist, fairly simple and cost-effective DWQM procedures can readily result in the dramatic improvement of the quality of drinking water. He also indicates that it is a legislative compliance requirement for all local government departments acting as Water Service Authorities to understand these procedures.

“He points out that, according to the Strategic Framework for Water Services, ‘the most important and effective monitoring strategy for the sector is strengthening the voice of consumers’. WSAs have a responsibility to make the results of the quality of drinking water available to the consumer, and communicate any health risks to consumers. Communities need to be proactive in exercising their rights in this regard, by interacting with WSAs and with provincial and national government where and when required.

Best practices regarding drinking water delivery are considered to be those instances where drinking water quality results are made available to the civil society, especially when supported via internet-based systems.”