



## INNOVATIVE STEPS TOWARDS ACHIEVING UNIVERSALLY ACCESSIBLE TRANSPORT

(Ms) Safiyah Aboo

The Go George project has its origins in the development of the George Municipality in the Western Cape's Sandkraal Mobility Strategy. Initiated in 2003, the project recognised the need to expand the original scope into a mobility strategy that encompassed the entire George area. The project evolved into a transformative process that would turn the taxi industry into a formalized public transport system.

The result was the Go George system, a network of trunk and community routes that were negotiated with the taxi industry and subject to a full public participation process. The project had the full support of the Western Cape, partnering George Municipality with this initiative. With the successful application for public transport related funding from the Department of Transport, all three spheres of government became committed to the roll-out of a conventional bus system to replace the existing informal taxi operations.

The paper will discuss the technical detail associated with the modification including front door access, universally accessible side door arrangements, remote door control, wheelchair bay and restraint configuration, priority seating provision, internal variable message board, and general seating arrangements to enhance passenger travelling comfort.

## MISMANAGING STORMWATER MANAGEMENT

(Mr) Peter Allen

Stormwater management is an essential municipal function, not given enough attention in many municipalities. It becomes particularly important when people desperate for housing invade apparently available land. The paper will trace the constitutional and legislative stormwater mandate, give a brief overview of the hydrological factors involved (without being a lecture on stormwater hydrology) and highlight some misunderstanding of those factors.

A simple detention-storage equation will be presented, with discussion on misapplication of this equation. The focus of the paper will be that stormwater management must be implemented, but implementation must be rational, and stormwater management must be integrated into the wider developmental policies of the municipality.

## DEVELOPMENT OF A FLOOD EARLY WARNING SYSTEM - GETTING AHEAD OF DISASTERS

(Mr) Clint Chrystal

Changes in rainfall patterns, rising sea-levels, population growth, and economic activity are driving an increase in demand for flood risk forecasting and possible mitigation engineering. This paper will present the development, implementation and on-going fine-tuning of a flood early warning system (FEWS) for the eThekweni Municipality. Although initially considered as an early flood warning system, it now has now developed into far more, assisting with issues such as water quality, risk assessments, and real-time forecasting and data management.

This paper will highlight the innovative approaches used to implement and maintain the FEWS system. It is important to note that all software

used is open source (freely available) and can run on a single laptop, thus eliminating financial constraints. The FEWS tools allow engineers to step into the future, and provide decision-makers the opportunity to make sound and effective decisions. This will allow responders to carry out the required measures, to avoid major economic loss and, more importantly, loss of life. This innovative approach is part of the future for engineers, and this paper will provide some practical guides for those wishing to implement a similar system.

## THE FACE OF THE MUNICIPAL ENGINEER IN A COMMUNITY ORIENTATED PROJECT.

(Ms) Luchelle Damons

The role of the municipal engineer often changes in a community-based project. In a project such as Die Kraal, there is a rich history associated with the land and, thus, any developmental decisions made without the input of the local people will be met with resistance by the community. In my session, I hope to communicate some of the challenges faced on this project and similar community-orientated projects, and how the municipal engineer is often required to act as a mediator between the client and the community.

The project at Die Kraal has forced me to be a journalist, a historian, a confidant, and an engineer. This project demonstrates that there is more to the municipal engineer than just the design of services. Seeing that there is ongoing economic, social, environmental, and political change in South Africa, it is up to us, as engineers, to modify and adapt our practices accordingly. Because of the multi-faceted nature of this project, it is evident that the face of the municipal engineer is changing.

## BIOLOGICAL FILTRATION FOR SUSTAINABLE TREATMENT OF GROUNDWATER WITH HIGH IRON CONTENT – A CASE STUDY FROM OVERSTR AND MUNICIPALITY

(Mr) Geoff Du Toit

In order to secure its water supply through cyclical drought conditions, the Overstrand Municipality has decided to treat the iron and manganese rich groundwaters available in the area.

Conventionally, iron and manganese are oxidised chemically and then removed as precipitates. This process is, however, expensive and can pose operational challenges. An alternative process that offers distinct advantages is biological treatment, with lower capital investment requirements, combined with lower operating costs.

Following pilot plant testing on a borehole in Kleinmond, a full scale 10 Ml/d biofiltration plant was constructed adjacent to the existing Preekstoel Water Treatment Plant. The plant was commissioned in June 2013 and has provided a cost-effective and innovative means of securing the Greater Hermanus area's water supply requirements, insuring the municipality for future droughts.

### OBJECTIVE OF THIS PAPER

To inform the audience on the largely unknown process of biofiltration of potable water supplies, which is receiving increased attention from municipalities in the Western Cape and Eastern Cape. To provide lessons learnt from the design, commissioning, and operation of the Preekstoel Plant. To specifically present the operational results of the plant providing the actual costs incurred, and the results of the process.

## VALUE OF ASSESSING OUTFALL SEWER CONDITION

(Mr) Alaster Goyns

South Africa has made great strides in providing clean water for everyone. However, waste water disposal has lagged this. Exposure to dirty water can cause disease and death. Many outfall sewers installed 40 or more years ago are now under congested urban areas, have deteriorated, are semi-functional, have collapsed, or are about to collapse. The risk to public health and safety as well as environmental pollution is serious.

With South Africa's first outfall sewers, there was little idea of their service life or how to predict this. The technology to provide data for assessing their condition and the knowhow to predict their remaining life is now available. CCTV inspections plus laser and sonar profiling means that defects can be described in terms of their location, extent, and severity. With invert and ground levels added to this, sewers can be effectively managed and maintained and their residual strength and remaining life predicted.

The value of condition assessments is that the municipal engineer, or his representative, can make technically sound decisions on the repairing, rehabilitating, or replacing of sewers based on social, environmental, practical, and economic constraints. A strategy of rehabilitating existing sewers and simultaneously installing new sewers where existing capacity is inadequate or for new developments will accelerate the provision of sanitation for all in South Africa.

## DEVELOPMENT CHARGES IN SOUTH AFRICA: CURRENT THINKING AND AREAS OF CONTESTATION

(Mr) Nick Graham

Development Charges (DCs) have always been a contentious topic for municipal engineers, and are inconsistently applied. National Treasury introduced a Draft Policy Framework for Municipal Development Charges in 2011, but this has never been finalised. With the introduction of the Spatial Planning and Land Use Management Act in 2014, there is a need for standardisation in the calculation and application of DCs.

While National Treasury is in the process of drafting legislation to introduce some standardisation, there is still much debate and confusion around what DCs are for, what their legal basis is, how they should be calculated, and how they should be implemented.

This paper draws on experience in drafting DC policies at national, provincial, and municipal levels to provide the rationale and legal basis for DCs. The paper will identify and discuss the contentious issues surrounding DCs:-

- Who should cover which costs?
- How should they be calculated?
- Should socially beneficial land use changes pay the same as commercial land uses?
- Should there be different methods for different sized developments?
- When and why should exemptions be granted?

The paper concludes with a motivation for municipalities to adopt simple, clear, and coherent policies to ensure municipal financial sustainability.

## INNOVATIVE APPROACH TO URBAN AQUIFER MANAGEMENT OF THE CAPE FLATS AQUIFER

(Ms) Rowena Hay

The Cape Flats Aquifer (CFA) covers an area of 400 km<sup>2</sup> and consists of fluvial, marine, and aeolian tertiary and quaternary sedimentary deposits of the Sandveld Group, which unconformably overlie weathered Malmesbury Group and Cape Granite Suite basement rocks.

The CFA recharges extremely quickly and has a relatively low residence time. The nature of urban expansion on top of it poses an ongoing pollution threat. This large resource of groundwater has deteriorated over the past decades and is now non-potable in certain areas, with varying levels of contamination, due to pesticides and fertilisers from agricultural practices, wastewater treatment plants, informal settlements, unlined or leaking canals, and stormwater run-off.

The Department of Water and Sanitation requested Umvoto as part of the Support for the Continuation of the Water Reconciliation Strategy for the Western Cape Water Supply System to develop a strategy to: 1) remediate the current state of the CFA; 2) restore ecosystem functioning, 3) expand small-scale community supply; and 4) use for bulk supply through artificial recharge and or aquifer storage and recovery. This paper presents an approach to urban aquifer management that takes into account the realities of growing urbanisation, informal settlements, industrial development, and urban agriculture.

## CAPACITY BUILDING GUIDELINES IN URBAN AND REGIONAL PLANNING FOR MUNICIPAL ENGINEERS AND ENGINEERING STAFF WITHIN MUNICIPALITIES

(Ms) Ilana Jansen Van Rensburg

Urban and Regional Planning responsibilities have been assumed by newly established and existing local municipalities. Of these municipalities, many do not have the financial means to employ full-time Urban and Regional Planners to manage these responsibilities.

Recognising the need for capacity building in physical development planning at all levels, including all local, district, and national authorities, for equipping them with a user-friendly and comprehensive user guideline, the project will assist in carrying out their Urban and Regional Planning duties and associated responsibilities.

The project is proposed to serve in this need, although it is not aimed at training engineering staff to become Urban and Regional Planners but rather to enable them to engage with planning specialists. The purpose of this project is to provide an understanding of Urban and Regional Planning and associated practices, the policy and legislative framework that it accompanies and the implications it has for spatial development, transportation, the environment, land development and layout planning, the provision of engineering services and housing, sustainable development, statutory planning processes, etc..

A basic knowledge of this will build capacity within staff working in related disciplines. The project will also inform all parties involved of the changes SPLUMA will bring and attempt to guide them through the transition from the old legislation towards an integrated approach. Thus, the project will contribute to changing the face of the municipal engineer from an Urban and Regional Planning perspective.



## DEVELOPING ALTERNATIVE WATER SOURCES – WE “SEA” POSSIBILITIES

(Mr) Kevin Meier

Conventional water resource development options in South Africa are proving to be increasingly more difficult to implement. Feasible sites for new dams are becoming scarce. Variability in runoff, impacts of climate change, and the provision for environmental water requirements all impact on the sustainable yield from surface water schemes.

The National Department of Water and Sanitation, and Water Service Providers, are investigating alternative sources of supply, one of which is seawater desalination. Umgeni Water has recently undertaken a feasibility study of two potential 150 Mℓ/day Reverse Osmosis (RO) desalination plants near Durban. Of 11 sites identified initially, two were found to be the most suitable for feasibility study, namely one at Tongaat (30 km north of Durban) and another at the Lovu River Estuary (30 km south of Durban).

A 12-month seawater quality monitoring program was undertaken to determine the water quality factors that would influence the design of the pre-treatment system. Brine dispersion modelling was used to assess the dispersion characteristics of the resulting brine that would be discharged to sea. The integration of the desalinated water into the existing potable water supply system was also investigated, both from a phasing and from a water quality perspective. RO desalination of sea water appears feasible at both sites. The estimated capital cost is in the order of R3 billion per 150 Mℓ/day plant. A parallel Environmental Impact Assessment (EIA) is currently in progress.

## THE USE WASTEWATER INFLUENT CHARACTERISATION FOR THE COMPARATIVE COST EVALUATION OF SURFACE VERSUS FINE BUBBLE DIFFUSED AERATION

(Mr) Ian Pollard

Activated sludge has been the process of choice over the last 30 years for the treatment of municipal wastewater, due to its ability to produce superior effluent over rivaling technologies. Activated sludge treatment is dependent on cultivating and maintaining a microbial biomass that requires the impartation of oxygen, which is generally achieved by mechanical means with concomitant energy costs.

With the rising cost of electricity and advances in aeration technology, there is a growing interest in more efficient aeration systems, one of which is fine bubble diffused aeration. Although this technology is generally more expensive than conventional surface aerators in terms of CAPEX, operationally it is more efficient requiring less energy with an equivalent aeration input.

The main objective of this paper is to show that the designer of a wastewater treatment facility can only execute a proper modelled comparison between the two mentioned technologies with representative diurnal influent characteristics and it shows how such data was used to do such a comparison for a medium-sized municipal wastewater treatment works.

## THE MUNICIPAL ENGINEER AS DILIGENS PATERFAMILIAS: DUTY TO PREVENT DAMAGE AND INJURY

(Mr) Louis Roodt

Prior to 1994, the municipal engineer often acted as if sovereign immunity still existed. This is the outdated doctrine that the sovereign or state cannot commit a legal wrong and is immune from civil suit or criminal prosecution. The Bill of Rights, as stated in the Constitution, No 108 of 1996, set out to change the face of the municipal engineer from an absolute authority to a reasonable and responsible person. The conduct of the reasonable engineer is an element in determining negligence.

Legal duty arises from a number of grounds: the Constitution, statutory duty, and common law. Section 24 of the Constitution states that: “everyone has a right – (a) to an environment that is not harmful to their health and wellbeing”. The Occupational Health and Safety Act in Section 9 requires that the employer ensure that “persons other than those in his employment who may be directly affected by his activities are not thereby exposed to hazards to their health or safety”. The liability of the local authority with respect to road safety has been highlighted in a number of court cases; collectively known as municipal cases.

An ethical dimension also arises from the ECSA Rules of Conduct that require of registered persons to execute their work with integrity and in accordance with accepted norms of professional conduct.

## DESIGNING ECO EFFICIENT INFRASTRUCTURE PROJECTS WITH THE USE OF SUSTAINABLE CRITERIA AND GREENER ENGINEERING SOLUTIONS

(Mr) Shian Saroop

Globally, the construction industry is one of the main contributors to the depletion of natural resources and a major cause of unwanted side effects such as air and water pollution, solid waste, deforestation, health hazards, global warming, and other negative consequences (Harvey and Wayne, 20084).

In order to stay competitive and to meet upcoming stricter environmental regulations and customer requirements, designers have a key role in designing civil infrastructure so that it is environmentally sustainable. The changing roles of engineers will be highlighted, in order to react to changes in climate.

Mainstreaming environmental aspects and incorporating the eco-efficiency concept into various stages of infrastructure development have not been considered as much as they should have been. This paper looks at the effects of climate change on infrastructure and the changing role of engineers. It aims to demonstrate the use of sustainability criteria on infrastructure projects and proposes green engineering solutions that can be used on township infrastructure projects.

This paper focuses on the concept of eco-efficiency in infrastructure design that promotes the use of the greener engineering options, enabling him/her to choose the one likely to yield the best performance with the least environmental impact. The recommended green practices, proposed on infrastructure services design, would place fewer burdens on the environment, thus contributing to sustainable infrastructure service delivery.

## THE ROLE OF THE MUNICIPAL ENGINEER IN TERMS OF THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT (ACT 16 OF 2013) (SPLUMA)

(Mr) Carel Schoeman

IMESA, in 2013, appointed the NWU (Potchefstroom Campus) to develop Capacity Building Guidelines for Urban and Regional Planning in Municipal Engineering Departments. From the outcome, the impact and importance of SPLUMA on the changing face of the municipal engineer and his staff was identified as one of the major forces that will direct and redefine the role of the municipal engineer.

SPLUMA (Act 16 of 2013) and its newly promulgated Regulations (published on 23 March 2015) represent the final changes in the last bastion of the planning legislation that dates back to 1986 (previous political dispensation) but that still guided statutory planning within the municipal sphere of government after democratization in the period 1994 to 2015. The fact that the municipal engineer will have to assume a new role that implies involvement in all facets of spatial planning and statutory planning necessitates that the role of the municipal engineer should be re-looked, re-assessed and redefined.

The redefined role of the municipal engineer and its staff will now entail a trans-disciplinary involvement within which the municipal engineer will be co-responsible for sustainable spatial development involving more than setting of levels of infrastructure and services, bulk engineering infrastructure planning, internal infrastructure reticulation systems, system management and operational responsibilities and the calculation of development and engineering service contributions.

## INNOVATIVE WAYS TO DEAL WITH METAL THEFT

(Mr) Hilton Scholtz

Metal theft has become a major headache for municipalities. Anything that is not welded used to be the prime target. However, this is no longer the case. All metal items have become the target of thieves and vandals. Even the re-enforcement in concrete is no longer spared. Industry's answer was alternate materials, but this also now proves to be problematic.

The origin of this needs to be further investigated and most of the blame is placed at an increase in drug use and other anti – social behaviour.

Looking at the City of Cape Town's approaches may assist other cities to improve on what was used. The city employed a multi-pronged approach and had some successes. One way was to look at the legal aspect as well as the social and engineering aspects. Cities are increasingly under pressure to deal with metal theft as more people opt to litigate when they are injured due to open manholes.

The city also established a metal theft unit that deals with the enforcement of anti-theft operations. The City also revised the engineering standard for covers and frames to assist in the prosecution of those caught in possession of City property. Cities are evolving as urbanisation increases. We also need innovative approaches in dealing with this problem.

## TRENCHLESS SOLUTIONS FOR SEWER NETWORKS AND SEA OUTFALLS

(Mr) Frank Stevens

Services laid underground are indispensable for supplying the growing urban population. Water, sewage, oil, gas and electricity, functioning telephone and communications networks have to be connected to the households in an ever increasing speed without disrupting the existing infrastructure. A major challenge for many cities in South Africa is to build functioning sewage systems and, at the same time, preserve the environment as required by the Water Act. On the one hand this means extending the length and capacities of existing sewer networks, and on the other hand this means building treatment plants to appropriately discharge the sewage into a river or the ocean.

Trenchless technology offers various economic and ecological benefits when installing these systems underground: It can be used in all geological and hydrological ground conditions and particularly in deep installation depths. Wastewater is fed far out into the sea where the self-purifying power of nature dilutes the treated water. Trenchless outfall technology is used to take the wastewater into the sea.

This paper shows different trenchless installation methods and highlights how trenchless technology is used to build state-of-the-art sewers as well as sea intakes and outfalls. The latter are not only needed for the water-sewage-cycle but also for building e.g. desalination plants, which become ever more relevant for the water supply in South Africa.

## ALL TOWNS WATER RECONCILIATION STRATEGIES IN THE WESTERN AND EASTERN CAPE – ACHIEVEMENTS AND CHALLENGES

(Mrs) Isa Thompson

The Department of Water and Sanitation (DWS) began the development of water reconciliation strategies for towns, villages and clusters of villages in 2008 and concluded the first phase in 2011. Phase 2 started in 2012 and aims to monitor the progress with the implementation, and to support the maintenance, of these water reconciliation strategies for all towns and villages.

Recommended interventions to improve the water supply situation included putting in place water conservation and water demand management measures; upgrading infrastructure; groundwater and surface water development; water trading and re-use; desalination of sea or brackish water; and rainwater harvesting.

The available data and information for monitoring and evaluation of the implementation of the strategies differ significantly between the provinces, and between individual towns. This paper reports on lessons learnt from the development and implementation of these water reconciliation strategies in the Western Cape and Eastern Cape provinces.

The implication of the differences is that the monitoring and evaluation process for most reconciliation strategies in the Western Cape runs smoothly, while the difficulties of collating the relevant data persist in the Eastern Cape. Hence, the quality of the output and the detail of the evaluation of the progress of implementation differ significantly.