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An engineering response to the sea water quality issues in Durban

BEFORE DEALING WITH the engineering side of this issue, I believe it is important to first examine the science behind the decision taken by Blue Flag to withdraw status from certain of Durban's beaches. The quality of sea water is impacted primarily by storm events which have the effect of washing pollution from the land into the sea. For a short period after these storm events, the quality of sea water can be impacted negatively in areas immediately adjacent to river or storm water drain discharge points. The impact of this pollution is short-lived because of the ability of sea water to destroy pathogens within a few days.

Given that the viruses and other pathogens which cause infection cannot easily and cost effectively be detected in the sea water, indicators such as *E. coli*, *Enterococcus* and other bacteria are used. These indicator bacteria are themselves not harmful – in fact the World Health Organisation describes them as “harmless organisms”. Provided that the indicators which are used have a life similar to that of the pathogens and exist in numbers that are in proportion to the level of pathogens in any sample, they can be used to determine the level of pollution of a water body.

A number of papers exist which show that, in tropical waters, *Enterococci* are not suitable for use as indicators of the existence of pathogens in water because the *Enterococci* are able to multiply on

their own in the favourable environment which exists. Equally *E. coli* die off at a rate faster than the pathogens and may therefore under-report the degree to which a water body is polluted. The World Health Organisation, in one of its most recent publications, entitled “Monitoring Bathing Waters – a Practical Guide to the Design and Implementation of Monitoring Programmes”, states that “the lack of a strong relationship between faecal indicators and health outcomes in a number of epidemiological studies in warm tropical waters may, in part, relate to the inappropriate nature of *E. coli* or faecal streptococci as indices of water-borne pathogens in these recreational waters. In this context an alternative index group, sulphite-reducing clostridia or spores of *Clostridium perfringens*, have been proposed and are used in Hawaii.”

BLUE FLAG STANDARDS

Blue Flag in setting their standards require the *E. coli* count to be less than 100 colonies per 100 ml and the *Enterococcus* count to also be less than 100 colonies per 100 ml sample. From 2009, the *Enterococcus* level is to be reduced to 50 colonies per 100 ml sample.

Epidemiological studies have then been undertaken in the past to link the number of indicator colonies present in a specific volume of water, to the level of infection of bathers in contact with the water. At the time of most of these

epidemiological studies, bacteria colonies were grown on media which gave far lower counts of colonies than the modern day media which are more sensitive and which give higher colony counts. Recent studies indicate that the bacteria colony counts detected using the more sensitive techniques of today, can be 50% to 100% higher than those detected in the past.

The Blue Flag literature does not prescribe a single method of testing for these indicator bacteria and until now has not responded to the statement from the World Health Organisation that *Enterococci* are not suitable for use as an indicator in tropical waters.

A CITY'S TASK

Having said that, it is clear that the aim of any city should be to minimise the levels and frequencies of pollution of its beaches to the absolute minimum.

Pollution of Durban's beaches has a number of causes:

- river flows carrying sewage downstream from developments that are not yet connected to an acceptable sewage disposal system
- illegal interconnections of the sewer and storm water drains by residents on private property and abuse of the sewerage system
- the recent pumping of sand from the harbour itself onto our beaches
- pollution flowing down nine storm

water drains from the central city region and onto the central beaches ■ sewers that leak into rivers after damage by severe storm events, or vandalism

Some of these causes are the result of our rapid growth as a city and the high levels of poverty we face. These issues cannot be resolved overnight, as to do so would burden the ratepayers excessively with the cost of the additional capital needed. As an example, to ensure that every family without access to sanitation receives access to an acceptable basic sewage disposal system, will cost over R1,5 billion.

The upgrading of the city's sewerage system takes the form of extending the sewerage service to all communities and this work will not be completed until 2012 or 2013. In 1996, 250 000 families in the municipality did not have access to acceptable sanitation. Since that time over 20 000 families have been connected each year. This service delivery has been offset to some extent by the large inward migration of families into the municipality seeking access to basic services and employment. By photographing the municipal area every year and counting

the houses on the ground, it has been possible to measure this influx, which has reached 30 000 families in a single year on occasions.

To respond to illegal connections between sewer and storm water systems on private property, we have started to make use of smoke generators which pump smoke into sewers and this smoke will exit from any storm water drain that is connected to it, making detection somewhat easier. It is almost impossible to detect intermittent interconnections that are made during storm events when sewer manholes are opened to relieve local flooding.

Sand from the harbour itself has recently been pumped onto the beaches, instead of sourcing sand from the open sea south of the south pier, as used to be the case. It is necessary to continually pump sand onto the central beaches to prevent them from eroding away. Reports were received from the public that this sand smelt of sewage and it was found to be contributing to the contamination of the sand on the beaches. Since January, this pumping has been stopped and the sand quality will improve over time.

To reduce the impact of storm water drains discharging onto the beaches of the golden mile, we have begun to construct sumps in all nine of these drains and pump the contaminated low flows that arise from time to time into the nearest sewer. Two of these drains already have the sumps in place. It is a reality in a large city like ours, that poor people and vagrants do not always have ready access to toilets, or do not make use of these facilities when they are available. This drain intercept initiative will enable us to wash the city streets more often, knowing that the effluent that is generated will be collected and treated properly.

The frequency of testing of the water and sand microbiology has been increased to once a week and shortly we will display the results of these tests on notice boards on our beaches, as well as on the internet on a weekly basis, together with a litter index to indicate the cleanliness of all our beaches. These results continue to show compliance with DWAF (Department of Water Affairs and Forestry) water quality standards, except for a few days after significant storm events at beaches close to rivers or storm water drains. □

Source:

http://www.saice.org.za/downloads/monthly_publications/2008/CivilAug08/#/0