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Chew Bowen and Marais SA (Pty)  
Ltd  
Reg. No. 98/03939/07  
76 Valley View Road  
P O Box 37389  
Overport 4067  
Durban 4001  
Tel : (031) 3122280  
Fax : (031) 3122299  
Email : cbmdbn@iafrica.com

chew•bowen•marais  
consulting engineers

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21 October 2007

The Executive Director  
eThekweni Metro Water and Waste  
2 Prior Road  
DURBAN  
4001

*Attention : Mr M Hebbleman*

Dear Sir

**PROPOSED NEW OFFICE AND INDUSTRIAL PARK : SEWAGE TREATMENT  
WORKS : FORMAL SUBMISSION FOR APPROVAL IN TERMS OF GUIDELINE  
DOCUMENT NO 8**

Duly instructed, we submit for your approval, the following report on the proposed  
wastewater treatment plant for this development.

**1.0 OVERVIEW OF THE PLANT**

It is proposed to construct a wastewater treatment plant to serve this development.

The situation and extent of the development is depicted on the attached drawing.

This document is submitted to obtain formal approval for the construction of the works.

**Directors:** G T Westgate *Pr(Tech)Eng, Dip E (Civ), FCIWEM, FWISA, AMSAACE (Managing)*  
B G O'Brien *PrEng, Bsc(Eng), MSAICE*

**Assisted by:** A R Gorman *PrEng* J R H Hoffmann *PrSciNatTnl* J K Levings *PrTechEng* G J Vardell *PrEng*

D U R B A N



P R E T O R I A

In Association with : **Chew Bowen Marais Africa** and **B N Kirk Inc**

## **2.0 DESCRIPTION OF PRODUCT AND SYSTEM**

### **2.1 System Description**

The treatment plant will consist of the following unit processes:

#### **Septic Tank**

A two compartment septic tank will be constructed.

#### **Aerobic Second Stage**

This will take the form of an activated sludge module with surface aerators.

#### **Secondary Sedimentation Tank**

A secondary sedimentation tank will be constructed to allow for phase separation of the mixed liquor.

#### **Return Activated Sludge Pumps**

Two submersible pumps will be located in the return activated sludge sump for this duty. They will be installed on a duty / standby basis.

#### **Effluent Recycle**

An effluent recycle will be provided to return effluent to the septic tank.

#### **Sterilisation**

Sterilisation will be carried out in a two stage process for security of effluent bacteriological standards.

The first stage sterilisation will be carried out by ultra violet irradiation.

The second stage sterilisation will be carried out by means of sodium hypochlorite, dosed in liquid form into the chlorine contact tank.

#### **Flow Measurement**

A final effluent flow measuring system will be installed, coupled to a logger device.

#### **Sludge Disposal**

The septic tank requires infrequent desludging, typically once in two years. This will be carried out by a road tanker that will convey the sludge to the Shongweni land fill site for safe disposal. We do not anticipate that this sludge will have a higher than normal pathogen count due to the use of disinfectants and as such we do not believe that the sludge needs to be discharged to a toxic waste site.

### **2.2 Level of Hygiene and Public Health Impact**

This plant has been designed to produce an effluent complying with the General Authorisation of the Water Act and as such will be amenable to sterilisation to prevent the spread of water borne diseases and pathogens.

The septic tank is roofed and fly and vector infestation will be inhibited by this.

The aerobic process does not generate odours.

The design of the inlet to the septic tank is such as to prevent undue turbulence and hence odour release.

No odours are likely to be formed in the following unit processes.

### **2.3 Intended Purpose of the Treatment Works**

This treatment works has been purpose designed for application to this development on the basis of typical effluent analyses.

We are of the opinion that the system is in compliance with the NBR.

This application is not intended to solicit a blanket approval for use on any other developments as each development has to be considered in terms of its individual peculiarities and requirements. A complete, professional design routine should be insisted upon for each application.

The full process design for this plant has been carried out by D J Nozaic Pr Eng. The full context of this design is attached to this application as Appendix A. All biological loadings, hydraulic loadings and sizings are reflected in this report.

## **3.0 Visual Inspection**

### **3.1 Location of Typical Installations in eThekweni**

There are a number of such plants in the eThekweni area, typically at the Balmoral development in Inanda Road, Hillcrest. This plant is readily available for inspection and we will be pleased to arrange a visit for interested parties.

### **3.2 Actual Installations**

The Balmoral installation in Hillcrest has been monitored for a period by Consulting Chemists and Metro Pollution Control.

The plant performs well, under actual operating conditions, in respect of chemical parameters and does comply with the General Authorisation in this regard. This is particularly note worthy as the General Authorisation limit for ammonia has been reduced from 10mg/l to 6mg/l since the design and construction of this plant.

Full monitoring analyses carried out by Dave Nozaic for the past year are attached to this submission as Appendix B

## **4.0 SCIENTIFIC DESCRIPTION OF OPERATION**

### **4.1 Functional Design Specification**

The treatment plant has been designed to operate in the following manner:

### **Description of Wastewater Treatment Process**

Sewage from the complex is collected by the sewer reticulation system and is conveyed to a two compartment septic tank and settleable solids are deposited in the first compartment. Solids bypassing the first compartment will enter the second compartment where there will be an additional opportunity for residual solids to settle. In addition, should the first compartment not be desludged timeously, the new sludge will collect in the later compartment if the preceding one is full. A significant portion of the biodegradable material in the incoming sewage will be broken down in the septic tank through anaerobic decomposition and the effluent from the septic tank will be of reduced strength (lower BOD or COD).

The partially purified effluent from the septic tank is then passed to the second stage of treatment which is an activated sludge process. This consists of a rectangular aeration tank equipped with two turbine surface aerators suspended from bridges. The septic tank effluent enters the first compartment of the aeration tank where it contacts with activated sludge returned from the secondary sedimentation tank. The retention time of the sewage in the aeration tank is approximately 23 hours. The mixture is aerated according to a preset programme controlling the aerators in the 2 compartments with the aeration times being programmed by timers on the aerator control panel.

The aerated purified mixed liquor then enters a square conically bottomed secondary sedimentation tank where the activated sludge is settled and discharged to a sump adjacent to the clarifier. The settled sludge is then pumped from the sump back to the aeration tank. Effluent from the secondary sedimentation tank flows out to a chlorine contact tank for disinfection with hypochlorite. From there the effluent is discharged. A portion of the effluent is recycled to the septic tank for denitrification.

The sludge collected in the settlement section of the secondary sedimentation tank is returned to the aeration tank by the return activated sludge pumps. A portion of this return sludge is wasted to the septic tank for further degradation.

### **4.2 Loading Rates**

The design loading rates for the various components of the works are reflected in the process design attached to this application.

The system is designed to cater for all waste water generated on the site, as detailed in the process design.

## **5.0 SERVICING REQUIREMENTS**

### **5.1 Maintenance Services Required by the User**

Daily -            Visual inspection of all components  
                      Replenishment of sterilisation chemicals  
                      Check lamps of ultraviolet system  
                      Check residual chlorine levels and record.

Scrub secondary sedimentation tank launder  
Remove floating scum from surface of tanks and dispose  
Check pressures on sand filter and backwash if necessary  
Garden maintenance  
Check security fence  
Check safety

- Weekly - Check all gearbox oil levels  
Check all automatic systems.  
Record running hour readings  
Waste activated sludge
- Monthly - Sample and analyse effluent for compliance
- Six Monthly - Check all pump seals for water ingress  
Check septic tank sludge level  
Blow out switchgear panels
- Annually - Change all lubricants as required.
- Infrequently - Desludge septic tank as required.

## **5.2 Additives Required**

The following additives will be required throughout the life cycle of the plant:

Water for cleaning

Chlorine for sterilisation of effluent

Electricity for driven machines

Lubricants for machinery

## **5.3 Special Tools**

No special tools, other than those normally available to a handy man are required.

## **6.0 PRACTICALITY OF USE**

We are of the opinion that such a system is a practical solution for the treatment of waste water at such a development as is evidenced by the current installation at Balmoral.

## **7.0 ROBUSTNESS OF MATERIALS**

All materials required for the construction of this plant are normal building, civil engineering, mechanical engineering and electrical engineering products. These are all in accordance with the relevant SABS specifications where appropriate.

## **8.0 CONSTRUCTION, SPECIFICATION REQUIREMENTS**

This plant will be designed and documented by the responsible engineers who will ensure that the relevant specifications will be used for the construction phase and the manufacturing phase.

It must be appreciated that a number of reputable manufacturers are able to provide the specific components required eg pumps, switchgear, chlorinators and aerators.

The choice of actual equipment will be the subject of a competitive tender, regulated by a detailed contractual and technical documentation.

This documentation will be available for scrutiny by your department and if required, the actual tenders received can be inspected before award of contract.

## **9.0 Responsible Professional Engineers**

The design, construction monitoring and commissioning procedures will be carried out by WSP Consulting Engineers SA (Pty) Ltd on behalf of the developers. The responsible Directors are G T Westgate Pr Tech Eng and B G O' Brien Pr Eng.

## **10.0 Performance Monitoring Consultant**

The process management and performance monitoring consultant will be Mr D J Nozaic  
Pr Eng.

Please do not hesitate to contact us should you require further information.

Yours faithfully

***G T Westgate***  
**WSP CONSULTING ENGINEERS SA (PTY) LTD**