PRE-FEASIBILITY REPORT FOR THE PROVISION OF CIVIL ENGINEERING SEWER SERVICES FOR THE PROPOSED DEVELOPMENT OF PROPERTIES IN CATO RIDGE FOR THE CATO RIDGE DEVELOPMENT COMPANY

OCTOBER 2022

K&T PROJECT REFERENCE: 20207/ S1

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TEL: 033 347 5453/5046
FAX: 088 033 347 5453
WEB: www.kanteys.co.za
E-MAIL: ktdbn@pmb.kanteys.co.za
P O BOX 290, HILTON, 3245

KANTEY & TEMPLER (PTY) LTD
CONSULTING ENGINEERS
REG. NO. 1966/09839/07

Engineering African Development

Details of this report

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For and on behalf of

Kantey & Templer (Pty) Ltd

Approved by: Kevin Hohls

Signed:

Position: Professional Engineer

Date: 28 October 2022

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1. EXECUTIVE SUMMARY

Kantey & Templer PTY LTD has been appointed by the Cato Ridge Development Company (CRDC) to compile a Pre-Feasibility Engineering Services Report in order to obtain preliminary approval from the service authorities for the proposed bulk service provision for the new Cato Ridge Development. This report documents the Proposed Bulk Sewer Infrastructure to Service the Development.

The greater Cato Ridge area has been considered for a number of years as a major metropolitan industrial growth node within eThekwini as well as fulfilling the role of “back of port” logistics along the N3 [SIP2] logistics corridor between Gauteng and Durban

The proposed development has been programmed to be implemented in 3 Priority Phases which is indicated on the attached drawing in Annexure B

Due to the future road upgrades required and planned upgrade of the bulk trunk water and sewer lines by the eThekweni Municipality in 2031/2032 this proposed development will be unlocked in an incremental approach as follows:-

PRIORITY PHASE 1

Priority Phase 1 is programmed to be unlocked within the next 18 months and will be phased in over the next 10 year period as and when the demand arises which will be carried out as follows:-

a) The lower section of Phase 1 along the R103 and up to the Assmang turnoff along Eddie Hagan to be phased in over the next 5 years.
b) The upper section of Phase 1 from the Assmang Turn-off upto Macro Turn-off to be phased in over the next 5 to 10 years.

PRIORITY PHASE 2

Priority Phase 2 will only be unlocked after the road, sewer, water & electrical infrastructure has been completed in the area.

The eThekweni Municipality is currently programming to upgrade the bulk sewer & water reticulation in 2031/ 2032. It will not be economically viable to develop Phase 2 prior to this bulk water and sewer being carried out by Municipality.

Phase 2 will be implemented over the next 10 to 20 years

PRIORITY PHASE 3

There has been interests from the surrounding land owners to purchase land in close proximity to their existing properties and they will therefore be responsible to install their own services.

The remaining land for development is relatively minor and has been considered within this report.

2. INTRODUCTION

Kantey & Templer PTY LTD was appointed by the Cato Ridge Development Company (CRDC) to compile a Pre-Feasibility Engineering Services Report in order to obtain preliminary approval from the service authorities for the proposed bulk service provision for the new Cato Ridge Development in KwaZulu-Natal in support of the Environmental Impact Assessment Application update as per the Executive Summary. This report documents the findings of this assessment

2.1 Location & Access

The proposed development on the 367.862 hectares is on a greenfields site.

The site locality plan is attached in Annexure A of this document.

The development will have three (3) Priority Phase. The co-ordinates (centre) of each Priority Phase are as follows:

Priority Phase	**Y- CORDINATES**	**X- CORDINATES**
Priority Phase 1	+37 068	+3 289 114
Priority Phase 2	+36 175	+3 286 829
Priority Phase 3	+37 224	+3 290 057

Access to the development is via the R103 and Eddie Hagen Road.

3. DEVELOPMENT PHASING

The Cato Ridge Development is divided into three (3) separate development priorities.

The timeframes above is dependent on a fluctuating economy, market trends and property demands which may change.

The proposed development has been programmed to be implemented in 3 different Priority Phases which is indicated on the attached Drawing No 20207-DSWE 01 Revision D in Annexure B.

Due to the future road upgrades required and planned upgrade of the bulk trunk water and sewer lines by the eThekweni Municipality in 2031/2032 this proposed development will be unlocked in an incremental approach as follows:-

3.1 Priority Phase 1

Priority Phase 1 is programmed to be unlocked within the next 18 months and will be phased in over the next 10 year period as and when the demand arises which will be carried out as follows:-

a) The lower section of Phase 1 along the R103 and up to the Assmang turnoff along Eddie Hagan to be phased in over the next 5 years.
b) The upper section of Phase 1 from the Assmang Turn-off upto Macro Turn-off to be phased in over the next 5 to 10 years.

3.2 Priority Phase 2

Priority Phase 2 will only be unlocked after the road, sewer, water & electrical infrastructure has been completed in the area.

The eThekweni Municipality is currently programming to upgrade the bulk sewer & water reticulation in 2031/ 2032. It will not be economically viable to develop Phase 2 prior to this bulk water and sewer being carried out by Municipality.

Phase 2 will be implemented over the next 10 to 20 years

3.3 Priority Phase 3

There has been interests from the surrounding land owners to purchase land in close proximity to their existing properties and they will therefore be responsible to install their own services.

The remaining land for development is relatively minor and has been considered within this report.

3.4 General

The proposed development is zoned as follows:-

1) Priority Phase 1 & 2 are presently zoned “General Industry 2”
2) Priority Phase 3 is presently zoned Agriculture

The Bulk & Internal services will be designed according to accepted engineering specifications and principles as well as acceptable environmental requirements and specifications, as provided in approved environmental scoping and impact assessment reports. The following engineering services for the development of the area are proposed and are based on the following assumptions.

a) The level of service will cater for light industry logistics and warehouses, on the proposed development site.
b) Where possible, the services will be designed to connect to the existing and proposed new Municipal, SANRAL & Department of Transport services infrastructure.
c) Due to an absence of bulk sewer in the area Phase 1 & Phase 3 of the development will be serviced by temporary owner funding. Phase 2 will serviced by the proposed Municipal bulk infrastructure once installed
d) A private sewer treatment works will be constructed in 250KL modules up to a maximum size of 2ML for Priority Phase 1 portion of the proposed development.

e) The provision of services to the proposed development will be designed to ministerial norms and standards and generally in accordance with the "Guidelines for the Provisions of Engineering Services and Amenities in Residential Townships" (Red Book).

4. LAND USE AND DEMAND PARAMETERS

Table 4-1 indicates the anticipated bulk land use for the Development.

Table 4-1 Anticipated Bulk Developments

Priority	Warehouse Bulk (HA)	Industrial Bulk (HA)
Priority 1	61.912	61.912
Priority 2	74.541	74.541
Priority 3	20.309	20.309
TOTAL	**156.762**	**156.762**

Table 4-2 indicates the water demand parameters used in the calculations for this report.

Table 4-2 Water Demand Design Parameters

Priority	Warehousing AADD (kl/ha/d)	Industrial AADD (kl/ha/d)	Usage combined AADD 11.5(kl/ha/d)	Allowance for losses	Total Average Daily Demand (ML/ha/d)	Total Storage for 48 hours (ML)
Priority 1	10	13	1.424	15%	1.638	3.276
Priority 1	10	13	1.715	15%	1.972	3.944
Priority 3	10	13	0.467	15%	0.537	1.074
TOTAL			3.606		4.147	8.294

Table 4-3 indicates the sewer demand parameters used in the calculations for this report

Table 4-3 Sewer Demand Design Parameters

Priority	Sewer Average Daily Demand (80% of water demand) (ML/ha/d)
Priority 1	1.31
Priority 2	1.58
Priority 3	0.430
TOTAL	3.32

Please refer to the attached Drawing in Annexure B for further details of the water and sewer demands.

5. BULK INFRASTRUCTURE

5.1 Existing Infrastructure

Existing Sewer

The current Cato Ridge Ponds are running at capacity and cannot accommodate any new sewer connections for the proposed development.

6. PROPOSED BUILDING DEVELOPMENT

6.1 Cato Ridge Phased Development

The table below indicates the three (3) Priority Phases for the proposed development**.**

Priority	**Warehouse Bulk (HA)**	**Industrial Bulk (HA)**
Priority 1	61.912	61.912
Priority 2	74.541	74.541
Priority 3	20.309	20.309
TOTAL	**156.762**	**156.762**

Please refer to Paragraph 3. Development Phasing of this report which will provide details of Priority Phase 1, Priority Phase 2 & Priority Phase 3 for the proposed development.

7. NEW INFRASTRUCTURE

7.1 Sewer

The development will be phased in order to cater for sewer effluent.

After holding discussions with the eThekwini Municipality it is noted they are currently planning to connect the Cato Ridge area to the Hammarsdale wastewater treatment works in 2031/ 2032. The exact timing is still to be confirmed and will only proceed if the Cato Ridge area is developed.

In order for this development to proceed a sustainable solution for the disposal of the wastewater generated is required.

No connection is possible to the existing Cato Ridge ponds as these are reportedly at capacity.

For the management of the sewer effluent the four options listed below have been investigated in order to unlock the development since there is no formalised Municipal bulk line to tie into for the development. The following options present themselves:

a) Conservancy tanks

Although not considered sustainable due to high clearance costs conservancy tanks will only be implemented in the event of isolated pockets of land being sold within Priority Phase 1 & 2 which will be developed prior to the construction of the private waste water treatment works and installation of the bulk sewer line. This will only be applicable until the threshold through flow is reached to be licenced by end users. The conservancy tanks will be sealed and require emptying. Once the sewer trunk main has been connected than any conservancy tanks constructed will be abandoned as it will be more cost effective to connect directly to the bulk trunk main line.

A conservancy tank is a structure is required for the collection of sewage material from human activities in areas where no existing municipal sewerage pipelines exist. The tank acts as a temporary holding area for the sewage. The sewage enters the conservancy tank from an inlet chamber. An interseptic trap allows one to monitor the liquid level of the main tank. The tank is connected to an outlet valve chamber via a uPVC outflow pipe. The valve chamber allows for the suction of the sewage off site for further treatment.

As such the conservancy tank must be sized to cater for onsite sewage outflows that allow for economical sewage collection for disposal off site. The design principle is to size a tank that will be economically feasible to construct whilst making sure that the tank is cleaned out on a regular schedule that is economically feasible to maintain in terms of cost of collection.

The local municipality requires that the conservancy tanks be sized to cater for a 4 day storage volume.

b) Connect to the existing Assmang Manganese Cato Ridge Sewer Treatment Works

The existing treatment works has a capacity of 240 kilolitres of which only 150 kilolitres is being utilised which provides a spare capacity of 90 kilolitres. Although this option was investigated it will no longer be considered due to the Environmental Issues involved with laying the sewer line to connect to this treatment works.

c) Utilise the existing private wastewater treatment works originally constructed for the abattoir

We understand that the eThekweni Municipality will not support this approach and accordingly have not considered this further.

d) Construct a private wastewater treatment works.

The eThekwini Municipality have produced a Guideline (Guideline 12) which is generally applied in cases where private wastewater plants are required. In general they do not accept such plants for anything other than wastewater emanating from residential areas. The treatment capacity of the works is also limited to a maximum of 2 Mld. The waste water treatment works would be constructed in 250 Kilolitre modules which would be upgraded on line as the demand increases

However, in this instance we understand that Metro will consider the construction and operation of a private wastewater treatment works since it will be operated on a temporary basis until the planned bulk infrastructure is provided to the area.

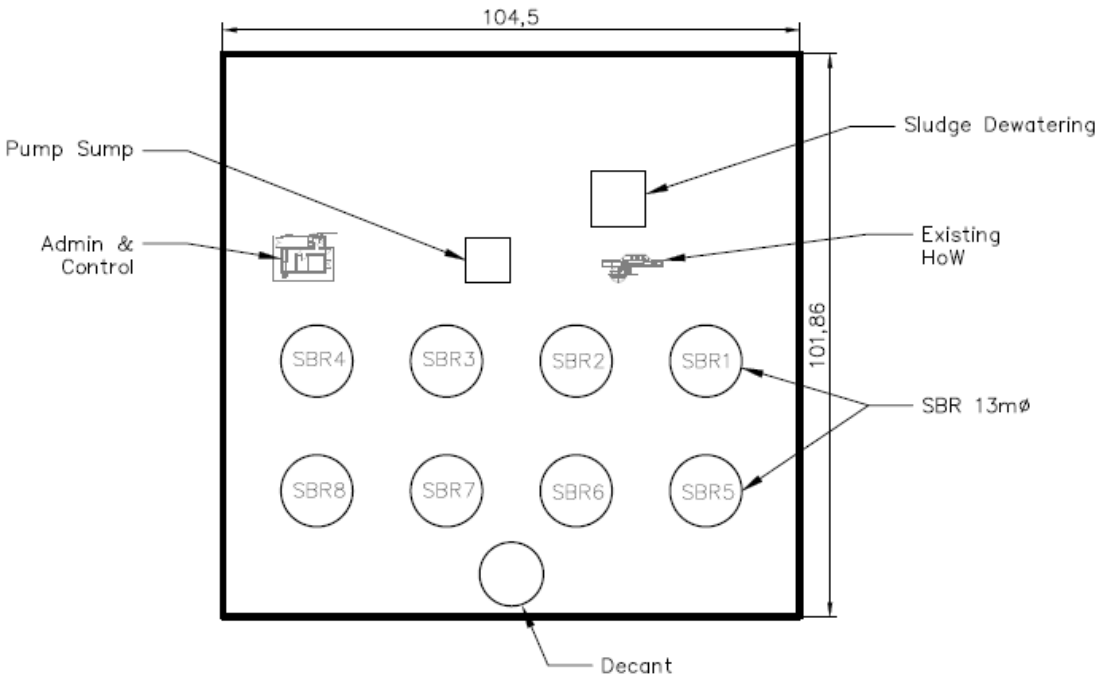
On the understanding that Metro will deviate from their guideline and allow the construction of a private wastewater treatment works with a capacity not exceeding 2 Mld, then this becomes an option worth serious consideration.

It is common cause that domestic wastewater is relatively easy to treat and that it facilitates the treatment of other wastes in admixture. The implication of this is that a large proportion of domestic sewage is required to treat wastewater containing less tractable substances. Because of this, it will be necessary to exclude (or limit) the quantity and quality of “trade effluents” entering the system and that very strict trade effluent discharge controls will have to be applied to protect the process in the works.

It is therefore proposed that Priority Phase 1 is phased as and when the properties are sold, and the demand arises to connect to the mini waste water treatment works which will be constructed in 250 KL modules as per the drawing indicated below. There will be a total of 8 modules which will not exceed 2ML as per the requirements by eThekweni Municipality. Details are listed below:-

Construction and Operation of a Private Wastewater Treatment Works

If it is accepted that the ultimate capacity of the temporary works will be limited to 2 Mld and also that the development of the project will be phased, then it would be logical to limit the capital expenditure works by building it in modules of 250 kilolitres as per the drawing below :-



250KIø MODULE
ULTIMATE SIZE 2MIø

PRELIMINARY DESIGN REPORT

MINI WASTEWATER TREATMENT WORKS

1. CONCEPT DESIGN

The concept covered in this report is for the design and construction of a “mini wastewater treatment works” as opposed to a “package plant”.
The differences between the two are:

- A mini works has each unit process specifically designed and tailored to suit the unique circumstances applicable to the site and is not simply a catalogue selection from a standard range of models. This is especially important when considering the unique hydraulic and process requirements of specific works.

- The equipment supplied and installed in a mini works is of a generic nature and is specified on a performance basis by the designer. As such, it is possible for the equipment and the structures to be costed and selected on a conventional tender basis. This is due to the fact that the design is supplied by the designer who acts on behalf of the client and is not subject to “black box” technology or patented systems. Spares and service may thus be readily obtained directly from the local agent of the equipment in question and not necessarily from the original installer.

- Package plants, by definition are constructed off site, from catalogue designs which do not readily allow for variation between the various unit processes. This can lead to dangerous imbalances in certain circumstances. Naturally, these plants are designed to cater for size ranges and not necessarily specific to the actual needs of the site.

- Package plants are usually designed to produce an effluent complying with the General Limit Values of the Water Act and can be difficult to tailor for higher effluent standards (as in this case).

- In general, package plants are designed in low volume modules, often necessitating a multiplicity of units to cater for the design flows and loads. This leads to complexity of flow division, operation and maintenance.

- Package plants are often constructed of lightweight materials and some do not have the longevity required of a permanent works.

In general, the design concept adopted embodies the following principles:

a) Each unit process is sized specifically for the requirements of this site
b) The units process design factors into account the specific sewage characteristics
c) The units are designed for economy of construction, longevity, ease of operation and economy of operation
d) The units are designed using generic equipment, all of which may be supplied and installed by a number of suppliers and contractors.
e) A minimum number of units are employed, simplifying flow balancing, operation and maintenance.
f) In common with most commercial developments, the project is likely to be phased in stages that are developed as the market demand requires. This phasing will determine the module size and for the purposes of this report it is assumed that each module will be capable of treating 250 Kld. This results in a total of 8 modules to treat the ultimate capacity of 2 Mld. This is considered to be the minimum module size. For ease of operation, module sizes should be equal and in this instance, may be either 250 Kld, 500 Kld or 1 000 Kld
g) In the past, eThekwini Metro has not permitted the construction and operation of private wastewater treatment works with a capacity in excess of 2 000 Kld. For this reason and coupled with the more stringent Water Licencing requirements for plant larger than 2 000 Kld,, it I assumed that the maximum size of the plant will be 2 000 Kld

h) It is further understood that the Hammarsdale WWTW (owned and operated by eThekwini Metro) is expected to be in a position to accept sewage from the Cato Ridge area within the next 10 years. For this reason, the works in question is considered to be of a temporary nature and wherever possible the process units will be constructed from reusable or resaleable material

2.0 DESIGN PARAMETERS

2.1 Potable Water Supply

Potable water is supplied to this area from Umgeni Water sources, via eThekwini Metro and is via a metered connection. This potable water is used for domestic purposes only and is not used to dilute sewage or added in significant amounts to the process. As can be seen from the mass balances, we expect a total of 2 kl of potable water to be used on the site for domestic and chemical make up purposes. This amounts to 0,1% of the wastewater flow.

2.2 Nature of the Sewage

The sewage entering this treatment works will be confined to domestic sewage only, no industrial effluent will be permitted to enter the system.

2.3 Flows

The design flows to this works are predicted to be as follows:

Average dry weather flow	2 000 Kld (23 l/s)
Peak factor	2.65
Peak dry weather flow	61 l/s
Peak wet weather flow	70 l/s

2.4 Load and Chemical Parameters (at full design flow)

Chemical Oxygen Demand (COD)	1 504 kg COD/d (752 mg/l)
Biological Oxygen Demand (BOD)	752 kg BOD/d (376 mg/l)
COD: BOD Ratio	2:1
Total Kjeldahl Nitrogen (TKN)	115 Kg/d (58 mg/l)
Suspended Solids (SS)	340 Kg/d
SS Concentration	170/l

2.5 Effluent Targets

The effluent quality targets assumed for this works is assumed to be the General Limit Values as laid down in the Water Act.
A minor portion of the final effluent will be reused on the site for wash down purposes and also in the mechanical screen spray bars. Should a use for second class water become apparent in the future, an effluent complying with the General Limit Values will provide a sound basis for reuse (or further treatment to a higher standard.
The works has been designed to produce an effluent complying with this requirement as reflected in the following table:-

Determinand	**GLV Limits**
pH	5.5 - 9.5
Conductivity (mS/m)	+ 70 max <150 max T
COD (mg/l)	<75

Ammonia as N (mg/l)	<6.0
Nitrate as N (mg/l)	15
Phosphate (mg/l)	<10
Suspended solids (mg/l)	<25
E.Coli (CFU/100 ml)	<1000

3.0 SITE CONSTRAINTS

3.1 Wetland Buffers

The allocated site is possibly constrained by wetland buffers and this will need clarification before detail design.

3.2 Development Potential

The developable area is reflected in Annexure B on Drawing No 20207-DSWE 01 Revision D which is attached in Annexure A and the sewage demand table reflects the following:

Priority	Sewage Generation (Kl/d)	Accumulative Sewage (Kl/d)
1	1 310	1 310
2	1 577	2 887
3	430	3 317

Previously, the Department of Water and Sanitation have resisted developments that produce sewage flows in excess of 80% of the design capacity of the treatment works. If such restrictions are applied, then it is apparent that the extent of development that will be allowed (using the temporary treatment works) will be such as to generate 1 600 Kld of sewage.

Therefore, Priority1 and a portion of Priority 2 will be catered for.

4. PROCESS TRAINS (refer to process flow diagram and site layout drawing)

4.1 BNR Extended Aeration Activated Sludge by Sequencing Bioreactors

The process train for this option consists of:

1) Inlet works consisting:
    - Coarse hand raked bar screen
    - Fine hand raked bar screen (standby)
    - Fine mechanically raked bar screen
    - Screenings washing, dewatering and compaction
    - Vortex grit removal with air lift
    - Grit classifier
    - Flow measurement
2) Sequencing batch reactors consisting of circular steel tanks, HDPE lined, equipped with external venturi type aerators.
3) Reinforced concrete emergency storage / inlet pump station.
4) Disinfection by chlorination

5) Sludge wasting and disposal by mechanical means.
6) Siteworks, roads and fencing
7) A control building with ablutions
8) A second- class water supply for site washing and irrigation.
9) A standby diesel generating set.

5. MATERIALS BALANCE (at full design capacity)

5.1 Liquid Balance

Inputs

Raw sewage	1 996 500l/d
Potable water	2 000 l/d
Sodium hypochlorite solution	1 500l/d
Total	2 000 000 l/d

Outputs

Final effluent	1 998 500l/d
Liquid in sludge cake	1 500 l/d
Total	2 000 000 l/d

5.2 Solids Balance

Inputs

Screenings (0.008 m^3/Mld)	0.016m^3/d
Grit (0.034m^3/Mld)	0.068m^3/d
Activated sludge production	220 kg/d

Outputs

Screenings	0.016m^3/d
Grit	0.068m^3/d
Waste sludge	220 /d

6. FUNCTIONAL DESIGN SPECIFICATION

The sewage arrives at the site and flows into the inlet works.

Inlet Works (IW)

A coarse hand raked screen is situated in the screen channel at the head of the inlet works. This screen has 40mm gaps and is designed to protect the fine screen from heavy foreign objects. This screen is cleared by hand and the screenings placed in a bin for later removal.

From the hand raked screen channel, the sewage flows to a further set of screens (duty / standby), placed in two parallel channels.

The flow to these channels is controlled by handstops.

The duty channel is equipped with a mechanically raked screen This screen operates on a differential level basis to initiate the screening process. This is controlled by a level switch, monitoring the upstream sewage level in the screen channel.

The screenings from the mechanically raked screen are discharged into a screenings washer / compactor. This device washes organics from the screenings and these organics return to the sewage flow for further treatment. The washed screenings are compressed to reduce the water content and are then bagged for later removal. The bags are fitted and removed manually from the bagging device.

The standby channel is fitted with a hand raked screen. This screen is manually raked, and the screenings are placed in the screening's washer / compactor for disposal.

The exists to the screening channels are controlled by hand stops.

From the screenings channel, the screened sewage flow to the detritor. The flow to this detritor is controlled by hand stops.

The detritor settles grit contained in the sewage and this is removed via an airlift pump and flows to the grit classifier

The airlift pump is powered by air from an air blower and this is manually controlled.

The detritor is equipped with a rotating paddle driven by an electric motor and gearbox. This paddle keeps organics in suspension during periods of low flow and is operated manually.

The detritor is also fitted with a high-pressure water lance which is fed with high pressure water from the second-class water system. This lance is manually controlled and is used to break up any dense accumulation of grit in the hopper of the detritor.

The grit classifier removes any remaining organics from the grit and returns these to the system for treatment. The cleaned grit is elevated by s screw conveyor and discharged into a grit hopper for later disposal. The classifier is manually operated.

From the detritor, the screened, degritted sewage enters the delivery pipe to the recycle / feed pump station which is fitted with the inlet flow recorder (FR1) where the instantaneous flow rate and accumulated flow rates are measured and recorded by the flow recorder.

Feed Pump Station

The sewage enters the feed pump station.

The sump is equipped with a submersible mixer to keep solids in suspension and ensure homogeneity of contents.

The mixers are manually operated.

Sequencing Batch Reactors

The treatment process is explained below. Each of the SBR's will operate independently of each other, running a full batch treatment from start to finish before receiving any additional wastewater flow. The batch treatment volume, tank sizes and cycle time has been designed to ensure that each SBR will operate out of phase with the others and one tank will always be ready to accept sewage when the buffer storage in the recycle / feed sump reaches high level.

Flow into the tanks will be controlled by actuated valves and flow out of the tanks by actuated valves. These are actuated via signals from the PLC.

Manually operated valves are provided upstream of the actuated valves to facilitate fine tuning and maintenance.

Stage 1 – Fill

The treatment cycle starts at time T=0. It is assumed that the SBR has recently completed a treatment cycle so the volume is at low level, inlet valve and decant valve are closed and that the aerators are either off or in mixing mode.

When the duty feed pump starts, the actuator fitted to the inlet valve opens and the SBR starts to fill. The aerator continues to operate in mixing mode.

When the level indicator in the SBR reads HIGH the feed pump stops and the inlet valve is closed.

Stage 2 – Aeration

The treatment cycle is now at time T=+1 hour. SBR1 is at high level and inlet and decant valves are closed. The venturi aerator starts and commences the four hour aeration period. At this stage the SBR is operating as a conventional aeration tank. During the aeration cycle it is possible to use the aerator in a mixing mode for a selected period.

Stage 3- Settlement
The treatment cycle is now at time T= +5 hours. The aeration / mixing cycle is now complete and the auto timer switches off the venturi aerator Inlet and decant valves remain closed. At this stage the SBR is operating as a settlement tank to allow separation of solid and liquid phases.
Stage 4 – Decant
The treatment cycle is now at time T = +6 hours. During the preceding hour, the sludge has settled to the lower part of the SBR (importantly to below the level of the decant bellmouth) and clear treated effluent occupies the upper portion of the tank. The auto timer sends a signal to the actuator controlling the decant valve which opens. Simultaneously, the sodium hypochlorite dosing pump starts and runs until the decant valve closes. The level in the SBR starts to drop and treated effluent flows from the tank until the level recorded by reads LOW at which time the decant valve closes.
At the end of the decant stage the treatment cycle is complete and time is now at T= +7 hours. SBR is now ready to restart at stage 1, once sufficient wastewater has been collected in the sump of the feed / recycle pump station.
Chlorine Dosing
Sodium hypochlorite is dosed into the decant tank during the decant cycle to disinfect the effluent. This is done by sodium hypochlorite dosing pumps (duty / standby) interlocked with the decant vale operating cycle.
Waste Activated Sludge System
Excess activated sludge is wasted from the independent sequencing batch reactors when required. This is achieved by the manual operation of the waste activated sludge outlet valve on the SBR and then the waste activated sludge in admixture with the polyelectrolyte flows by gravity to the thin sludge holding tank.
The mechanical dewatering system is operated when the thin sludge holding tank is full and this system operates automatically, controlled by a PLC. The dewatered sludge is deposited into a skip for later removal. The filtrate from the dewatering process is returned to the feed pump station for further processing.
Final Effluent Flow Recorder
A final effluent flow recorder is provided to record instantaneous flow and total flow released to the environment.

7. WORKS RATING AND STAFFING REQUIREMENTS

7.1 Works Rating
Water and wastewater treatment works are subject to rating by DWS as laid down by the regulations published in the Government Gazette (Regulation No R 2834 dated 27 December 1985).
In terms of this, we are of the opinion that this works will be rated as a Class C works.

7.2 Staffing Requirements
The same regulations define the staffing requirements for each class of works.
In the case of a Class C works, the requirements are:

1 x	Trainee
2 x	Class I operators
1 x	Class II operator
1 x	Class IV person as supervisor
1 x	Class V person to carry out weekly inspections

2. MANAGEMENT SYSTEMS
8.1 Water Services Provider
The sewage treatment works is managed by a grouping of the contributors, which body is a designated water services provider, in terms of an agreement with eThekwini Municipality.
All of the functions and responsibilities of a water services provided are the responsibility of this group.
8.2 Description and Hierarchy of Operating Staff
The hierarchy of the operating staff is as follows:

- Water Services Provider Responsible Person
- Plant operator
- Works staff

These persons are supported by :
- Consulting Chemical Engineer
- Consulting Design Engineer
- SANAS accredited laboratory
- Mechanical and electrical service provider
- Sludge, screening and grit removal service providers.

8.3 Availability of Mechanical Maintenance Staff
The Water Service Provider has a term contract with a service provider for routine mechanical maintenance and breakdown interventions on the plant.

8.4 Availability of Electrical Maintenance Staff
The Water Service Provider has a term contract with a service provider for routine electrical maintenance and breakdown interventions on the plant.

8.5 Availability of Process Control Staff and Process Consultants
The Water Services Provider has a term contract with a firm of Consulting Engineers to provide this assistance to the staff employed.

8.6 Drainage By Laws
A set of drainage by laws is in place and is administered by the Water Services Provider, in conjunction with the Consulting Engineers.

9. IS THE WASTE TREATMENT PROCESS THE BEST OPTION

It is contended that the treatment process employed is the best option in this case for the following reasons:
- The ability to produce the required effluent standard
- The ease of constructing the plant in a modular fashion
- The small footprint of the plant
- The absence of fly breeding and odours applicable to this process
- The production of a mineralised, stable sludge within the process by aerobic means
- The ability of the process to denitrify and reduce nitrates as well as to recover alkalinity lost in the process.

3. IS THE BEST TECHNOLOGY IN USE

It is contended that the best technology is in use as all items of equipment employed are generic and may thus be replaced at any stage with similar equipment, without being beholden to any one original equipment suppliers.

4. WHAT ARE THE ALTERNATIVE OPTIONS FOR SEWAGE TREATMENT

Alternative options for treatment and disposal are:
- Biological filtration
- Rotating biological contactors
- Submerged fixed film reactors.

5. WHY WAS THIS OPTION CHOSEN

This option was chosen for the following reasons:
- Effluent quality produced
- Ease of extension
- Small footprint
- Low nuisance
- Ease of removal when main drainage connection is available.

13. OPERATIONAL MANAGEMENT PLAN

13.1 What are the Chances of System Failure.
System failure can be attributed to the following causes:

- Mechanical breakdown
- Electrical breakdown
- Electrical outage
- Process poisoning
- Operator actions

In the event of a mechanical breakdown, all essential items of equipment are provided with a standby to assume duty in the event of a failure.
Similarly, all electrical switchgear (excepting the transformer) is duplicated with the mechanical plant.
In the event of an electrical outage, the plant is provided with a diesel driven standby generator.
Process poisoning can occur if poisons find their way into the sewer system. This is unlikely as the system is for domestic sewage only and not for industrial effluents. Diligent application of the drainage by laws will also mitigate against this.

If the operation of the works is not diligent, then process failure can result. The Water Services Provider has an obligation to ensure that all routine and intervention actions are carried out by the operational staff.
Overall, the chances of a significant system failure are seen as being low.

13.2 What are the Implications of Such a Failure
The implications of such failure will be the loss of final effluent quality. This will result in an additional load being placed on the purification capacity of the adjacent wetland. If this capacity is ever exceeded, then pollution and nuisance will result.

13.3 What Safety Factors Have Been Used
As described earlier in this report, the following safety factors have been used:

- Conservative design criteria
- Generic equipment employed that can be replaced at short notice
- Domestic sewage only to be treated
- Professional process advice and monitoring
- Preventative maintenance of plant and equipment
- Standby equipment provided

13.4 What are the Management and Maintenance Plans
The day- to- day management of the works rests with the Water Service Provider who manages and guides the following;

- Finance and budgets
- Personnel and training plans
- Process and monitoring plans
- Mechanical and electrical maintenance plans
- Applications for new connections
- Compliance planning

13.5 Availability of Standby / Spare Equipment
All mechanical and electrical equipment is provided in a duty / standby configuration.
A standby generator is provided.
All equipment is generic and spares are readily available.

13.6 What are the Accident and Emergency Plans

In the event of an accident, first aid is available from Administration / Control building on the plant. First aid facilities are provided at this point.

Emergency services are available from various service providers in the vicinity.
Emergency breakdowns are handled by the contracted maintenance service providers.
Process emergencies are handled by the Consulting Engineers.

13.7 What Plans are there to Minimise the Pollution Hazard / Potential
Daily plant inspections by operating and supervisory staff.
Weekly plant inspections by maintenance service providers.
Monthly plant inspections by Consulting Engineers.

13.8 Are there Alarm Systems in All Pump Stations?
Alarm systems are provided.

13.9 Are there Notification Procedures for Downstream Users
These are in place.

14. DISPOSAL OF SOLID WASTE AND SLUDGES

14.1 Description of Solid Waste
Solid waste emanating from this works will be:

- Washed grit from the inlet works
- Washed and bagged screenings from the mechanical screen
- Dewatered waste activated sludge.

14.2 Quantity

The grit output is calculated to be	0.068 m³/d or 95 kg/d or35t/annum
The screenings output is calculated as	0,016 m³/d or 10kg/d or 3 650 kg/annum
The waste activated sludge output is	120kg dry solids / day or 44t per annum

14.3 Analyses of Sludges
On operation, sludge classification will be undertaken and results will be submitted to DWS

14.4 Classification of Sludges
No classification of sludge is as yet available.

14.5 Method of Disposal
The waste sludge is taken to a designated eThekwini Metro works for final disposal.

14.6 Description of Contract for Removal of Sludges
A service provider is contracted to transport the waste sludge to the designated eThekwini Metro works.

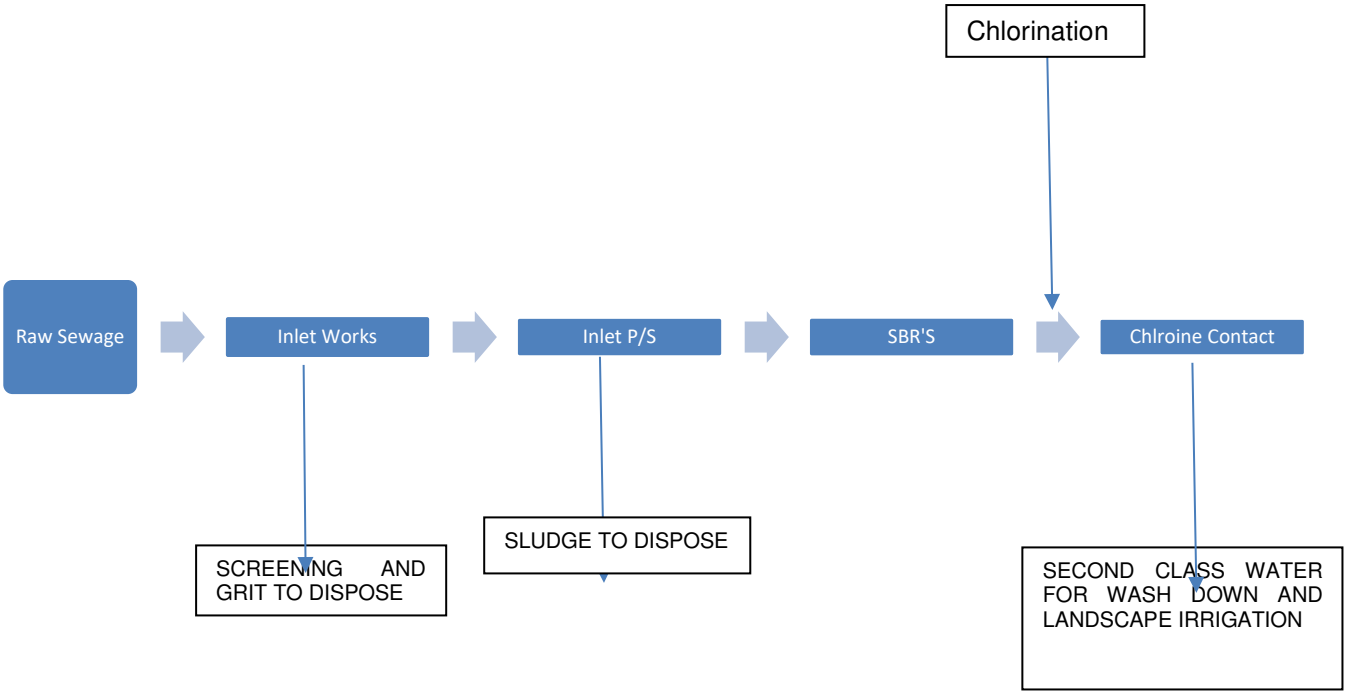
15 METRO APPROVAL

eThekwini Metro have, in the past, applied Guideline 12 as a means of controlling the design, construction and operation of privately owned wastewater treatment works. *Inter alia* this guideline demands the following:

a) Sewage shall only be from residential areas with a maximum of 20% being generated by commercial sources. Clearly, this development does not fall within the appropriate category and relief will have to be sought from this requirement
b) The works shall be designed by an experienced professional who shall be responsible for overseeing operation and maintenance for a period of 5 years after commissioning
c) The works shall be monitored monthly with reporting to EWS. Analyses to be undertaken by a SANAS accredited laboratory.
d) Application to construct and operate such a works shall be made to EWS in due form.

e) A guarantee amounting to 250% (2,5 times) the cost of the works (including VAT and Professional fees) shall be lodged with EWS on commissioning of the plant. The duration of this guarantee is for 5 years and is refundable if the works performance is satisfactory. If the works performance is unsatisfactory, then the guarantee monies may be used for rectification.

CATO RIDGE PROCESS FLOW DIAGRAM



Erosion Protection

The following recommendations are suggested:

- It is essential that appropriate erosion control measures need to be taken into consideration at the outlet of the mini wastewater treatment works to limit any erosion.

KANTEY AND TEMPLER CONSULTING ENGINEERS

KEVIN HOLHS
Pr. Eng. 20060264
EXECUTIVE ASSOCIATE

ANNEXURE A

Site Locality Plan

ANNEXURE B

Water, Sewer & Power Demand Drawing

ANNEXURE C

Sewer Layout Drawing