

MARCH 2012 - DRAFT 1

**INVESTIGATION INTO THE PROVISION OF TOWNSHIP SERVICES FOR  
PROPOSED SIYATHUTHUKA EXTENSIONS 5, 6, 7, 8 AND 9  
FOR THE EMAKHAZENI LOCAL MUNICIPALITY**



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## **SECTION A: INTRODUCTION**

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### **A-1 TERMS OF REFERENCE**

Consolv Consulting Engineers has been appointed by Sisonke Development Planners to investigate the provision of township services for Siyathuthuka Extensions 5, 6, 7, 8 and 9. The townships are being developed by the Emakhazeni Local Municipality.

The study will be used as a supporting document for an application for the development rights in terms of the Town Planning and Townships Ordinance – Ordinance 15 of 1986.

### **A-2 OBJECTIVES**

The objectives of the investigation are the following:

- to investigate existing and available infrastructure, required bulk and connector services, as well as to propose appropriate levels of service for internal civil services;
- to evaluate all aspects pertaining to the internal and bulk engineering services to Siyathuthuka Extensions 5, 6, 7, 8 and 9, in order to enable all role players to make decisions on the provision of services to the development.

### **A-3 SCOPE OF INVESTIGATION**

The scope of the report includes:

- Study area and demarcation;
- Information and design criteria;
- Existing and anticipated development;
- Applicable Legislation;
- Water Supply:
  - Water Treatment
  - Bulk Water Supply
  - Storage facilities
  - Distribution
  - Proposed new infrastructure
- Sanitation:
  - Sewage Treatment
  - Sewerage flows and loading;
  - Outfall sewers;
  - Connector sewers ;



- Roads:
  - Existing roads network;
  - Future roads;
  - Proposed new roads;
- Storm Water Drainage:
  - Drainage areas;
  - Storm Water flows;
  - Proposed infrastructure;
- Environmental Issues;
- Financial Implications;
- Summary and Recommendations.

#### **A-4 BACKGROUND**

The development of Siyathuthuka Extensions 5, 6, 7, 8 and 9 is intended to address the shortage of residential, commercial and institutional properties for the expanding towns of Siyathuthuka and Belfast. The Emakhazeni Local Municipality does have spare capacity in their bulk water supply and sewage disposal infrastructure to accommodate the demands of the proposed developments but certain individual bulk service infrastructure elements will have to be upgraded.

Consideration is also being given by the Emakhazeni Local Municipality to the provision of engineering services for a planned new High Altitude Sport Training Centre.



## **SECTION B: SUMMARY AND RECOMMENDATIONS**

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### **B-1 SUMMARY**

- B.1.1 Siyathuthuka Extension 5 is located directly to the west of and adjacent to Siyathuthuka, extensions 6, 7 and 8 to the east of and adjacent to Siyathuthuka and extension 9 to the west of and adjacent to Belfast.
- B.1.2 Access to the developments will be from existing roads and streets in Belfast and Siyathuthuka. Siyathuthuka Extension 5 will have an access to Spitskop Road.
- B.1.3 The developments comprise a mix of land uses ranging from residential to commercial.
- B.1.4 Bulk water will be supplied by the Emakhazeni Local Municipality from the existing Water Treatment Plant which extracts raw water from the Belfast Dam.
- B.1.5 Sewage effluent from the developments will be conveyed via existing sewage pipelines and sewage pump stations as well as new infrastructure if required to the existing sewage treatment plant which serves Belfast and Siyathuthuka.
- B.1.6 The level of services to be provided for the developments are as follows:
- Water supply – metered connection per site for in-house supply;
  - Sanitation – full waterborne sewerage system with a connection for each site;
  - Roads – Class 4 (bus routes) - designed structure, surfaced and kerbed;  
Class 5 – designed light structure, surfaced and kerbed (if funding is available);
  - Storm Water drainage – kerb and gutter with underground pipes system (if funding is available);
  - Refuse removal – weekly door to door, owner supplies storage.
  - Electricity – full reticulation with a metered connection for each site.

### **B-2 RECOMMENDATIONS**

It is recommended that this report be considered by all role players.



## SECTION C: PLANNING

### PART I - GENERAL

#### C-1.1 STUDY AREA

The study areas comprises

The study area is located between contours 1848 and 1880 above mean sea level and the average annual rainfall is 878mm. The terrain is undulating with relative flat gradients and various natural waterways. The study area has been extended beyond Siyathuthuka Extension 5 to 9 only in so far as bulk services are concerned.

#### C-1.2 INFORMATION

Information has been obtained from the following sources:

- Fotogramensura : Topographical and cadastral information
- Sisonke Development Planners : Township Layout Plans
- CSIR Building and Construction Technology : Human Settlement Planning and Design
- Government Printer : Legislation, Topographical Maps
- BTW Consulting (Pty) Ltd : Emakhazeni Water Services Development Plan.  
Report 20174-REP-001, June 2007

#### C-1.3 TOWN PLANNING ASPECTS

A layout plans for Siyathuthuka Extensions 5 to 9 was compiled by Sisonke Development Planners Planners. These layout plans were used for the investigation into the provision of engineering services to the area. It is understood that the development will be implemented in multiple phases.

The following land uses have been allowed for in the township layouts:

ZONING	SIYATHUKUKA EXT. 5		SIYATHUKUKA EXT. 6		SIYATHUKUKA EXT. 7		SIYATHUKUKA EXT. 8		SIYATHUKUKA EXT. 9	
	NO. OF ERVEN	TOTAL AREA (m <sup>2</sup> )	NO. OF ERVEN	TOTAL AREA (m <sup>2</sup> )	NO. OF ERVEN	TOTAL AREA (m <sup>2</sup> )	NO. OF ERVEN	TOTAL AREA (m <sup>2</sup> )	NO. OF ERVEN	TOTAL AREA (m <sup>2</sup> )
Residential 1	260	116260	163	65458	244	90100	373	142119	500	433264
Residential 3	7	269190								
Municipal	2	70620							2	73914
Institutional	1	24126							3	14492
Business 1	2	10846	2	3584					3	6383
Special			2	1960	1	2576	1	1046	1	20145



Please note that the table above does not include streets or open spaces.

The townships have not been surveyed or pegged.

#### **C-1.4 EXISTING INFRASTRUCTURE**

There are no existing engineering services within the study areas.

#### **C-1.5 GOVERNING LEGISLATION**

The development of any area and the provision of services are inter alia governed by the following legislation:

- Constitution;
- National Environmental Management Act (Act 107 of 1996);
- Environmental Protection Act (Act 73 of 1989);
- Water Services Act (Act 108 of 1997);
- National Water Bill (Act 36 of 1998);
- Local Government Transitional Act: Second Amendment Act (Act 97 of 1996).
- Town Planning and Townships Ordinance – Ordinance 15 of 1986.

The main aspects with regard to legislation to be taken into account are the following:

- The right to a healthy environment and the protection of the environment are included in Chapter 2 of the Constitution as a basic human right. This means that any person can approach a court for relief should he or she be of the opinion that his or her human rights are threatened. This places restrictions on the development of areas and the provision of infrastructure.
- The **Environmental Protection Act (Act 73 of 1989)** gives the Minister the power to require full Environmental Impact Assessments (EIA) on certain projects. In September 1997 the Minister identified various activities that require full EIA's, which activities include the following:
  - Rezoning of any area for development Waste water treatment facilities;
  - Bulk water supply facilities for potable water;
  - Roads, air fields, railways, etc;
  - Canals and channels including diversion of normal river flows;
  - Disposal of water.
- The **Water Services Act** requires that a water services development plan be compiled for all areas supplied with potable water by the supply authority concerned. One of the main objectives of the Act is to monitor and control the use of water and to limit losses. This requires the provision of metering facilities together with network requirements to facilitate zone metering, etc if practical.





## **PART 2 : SERVICES DEMANDS**

### **C-2.1 GENERAL**

The level of services to be provided will depend on the availability of funds as well as practical considerations with regard to the rocky soil conditions.

### **C-2.2 DESIGN CRITERIA**

The design criteria as recommended in the "Guidelines for Human Settlement Planning and Design", issued by the CSIR - Building and Construction Technology are applied, except where indicated otherwise.

### **C-2.5 PROPOSED LEVELS OF SERVICE**

The levels of service adopted for the development are the following:

Water Supply	Metered Connection for in-house supply
Sanitation	Full waterborne sanitation to sewer system.
Roads (Class 4)	Designed structure surfaced and kerbed.
Roads (Class 5)	Designed light structure surfaced and kerbed (if funding allows otherwise gravel surface).
Storm Water drainage	Kerb and gutter with underground piped system (if funding allows otherwise road side channels and piped road crossings)
Refuse removal	Weekly collection door-to-door, owner supplies storage. Recycling is being considered.



## C-2.4 SERVICE DEMANDS

### C.2.4.1 Water Supply for Household Use

The anticipated Average Daily Water Demand is as follows:

#### Siyathuthuka Extension 5:

LAND USE	Res 1	Res 3	Municipal	Business 1	Institutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	260	808				
Net Area (m <sup>2</sup> )			70620	10846	24126	-
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			10593	3254	3619	-
<b>WATER DEMAND</b>						
Rate (l/stand)	750	500				
Rate (l/100m <sup>2</sup> )			400	400	400	400
AADD (kl/day)	195	404	42	13	14	-
GAADD (kl/day)	224	465	49	15	17	-
Storage (m <sup>3</sup> )*1	336	697	73	22	25	
<b>FIRE</b>						
Risk category	Low Risk Group 3	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk
Fire demand (l/min)	350	6000	6000	6000	6000	6000
Duration of fire flow	1	4	4	4	4	4
Fire storage (m <sup>3</sup> )	21	1440	1440	1440	1440	1440

#### Siyathuthuka Extension 6:

LAND USE	Res 1	Res 3	Municipal	Business 1	Institutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	163					
Net Area (m <sup>2</sup> )				3584		1960
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			0	1075	0	490
<b>WATER DEMAND</b>						
Rate (l/stand)	750	500				
Rate (l/100m <sup>2</sup> )			400	400	400	400
AADD (kl/day)	122.25	0	0	4	0	2
GAADD (kl/day)	141	0	0	5	0	2
Storage (m <sup>3</sup> )*1	211	0	0	7	0	3
<b>FIRE</b>						
Risk category	Low Risk Group 3	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk
Fire demand (l/min)	350	6000	6000	6000	6000	6000
Duration of fire flow	1	4	4	4	4	4
Fire storage (m <sup>3</sup> )	21	1440	1440	1440	1440	1440



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**Siyathuthuka Extension 7:**

LAND USE	Res 1	Res 3	Municipal	Business 1	Institutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	244					
Net Area (m <sup>2</sup> )						2576
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			0	0	0	644
<b>WATER DEMAND</b>						
Rate (l/stand)	750	500				
Rate (l/100m <sup>2</sup> )			400	400	400	400
AADD (kl/day)	183	0	0	0	0	3
GAADD (kl/day)	210	0	0	0	0	3
Storage (m <sup>3</sup> ) <sup>*1</sup>	316	0	0	0	0	4
<b>FIRE</b>						
Risk category	Low Risk Group 3	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk
Fire demand (l/min)	350	6000	6000	6000	6000	6000
Duration of fire flow	1	4	4	4	4	4
Fire storage (m <sup>3</sup> )	21	1440	1440	1440	1440	1440

**Siyathuthuka Extension 8:**

LAND USE	Res 1	Res 3	Municipal	Business 1	Institutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	373					
Net Area (m <sup>2</sup> )						1046
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			0	0	0	262
<b>WATER DEMAND</b>						
Rate (l/stand)	750	500				
Rate (l/100m <sup>2</sup> )			400	400	400	400
AADD (kl/day)	279.75	0	0	0	0	1
GAADD (kl/day)	322	0	0	0	0	1
Storage (m <sup>3</sup> ) <sup>*1</sup>	483	0	0	0	0	2
<b>FIRE</b>						
Risk category	Low Risk Group 3	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk
Fire demand (l/min)	350	6000	6000	6000	6000	6000
Duration of fire flow	1	4	4	4	4	4
Fire storage (m <sup>3</sup> )	21	1440	1440	1440	1440	1440



**Siyathuthuka Extension 9:**

LAND USE	Res 1	Res 3	Municipal	Bussiness 1	Insitutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	500					
Net Area (m <sup>2</sup> )			73914	6383		20145
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			11087	1915	0	5036
<b>WATER DEMAND</b>						
Rate (l/stand)	750	500				
Rate (l/100m <sup>2</sup> )			400	400	400	400
AADD (kl/day)	375	0	44	8	0	20
GAADD (kl/day)	431	0	51	9	0	23
Storage (m <sup>3</sup> ) <sup>*1</sup>	647	0	77	13	0	35
<b>FIRE</b>						
Risk category	Low Risk Group 1	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk
Fire demand (l/min)	900	6000	6000	6000	6000	6000
Duration of fire flow	2	4	4	4	4	4
Fire storage (m <sup>3</sup> )	108	1440	1440	1440	1440	1440

<sup>\*1</sup> storage assumed to be 36 hours of Gross Annual Average Daily Water Demand (GAADD)

It follows from the tables above that the estimated total Gross Annual Average Daily Water Demands are as follows:

- Siyathuthuka Ext. 5 - 769 m<sup>3</sup>/day
- Siyathuthuka Ext. 6 - 148 m<sup>3</sup>/day
- Siyathuthuka Ext. 7 - 213 m<sup>3</sup>/day
- Siyathuthuka Ext. 8 - 323 m<sup>3</sup>/day
- Siyathuthuka Ext. 9 - 514 m<sup>3</sup>/day

**C.2.4.2 Water Supply for Fire Fighting**

The water supply system caters for varying fire-risk categories varying from Low Risk Group 1 to Moderate and the following criteria must be met:

Design Fire Flow

Each trunk mains within the development are must be designed for a design flow equivalent to the sum of the design fire flow for the highest fire risk category given in the table below plus the design instantaneous peak domestic demand for the area served by it .



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<b>Fire Risk Category</b>	<b>Minimum Design Fire Flow (l/min)</b>	<b>Max no. of hydrants discharging simultaneously</b>
Moderate Risk	6000	All hydrants within a radius of 270m from any one of them
Low Risk Group 1	900	1
Low Risk Group 3	350	1

Water Storage

The storage capacity of reservoirs serving fire areas should, over and above the allowance for domestic demand, include for the design fire flow obtained from the table above for duration at least equal to that given in the table below:

<b>Fire Risk Category</b>	<b>Duration of Design Fire Flow (hours)</b>
Moderate Risk	4
Low Risk Group 1	2
Low Risk Group 3	1

The minimum additional storage capacity require for fire fighting is therefore 6000 l/min for a duration of 4 hours, which equates to 1440 m<sup>3</sup>.

**C.2.4.3 Sewage Disposal**

The anticipated Annual Average Daily Wet Weather Sewage flows are as follows:

**Siyathuthuka Extension 5:**

<b>LAND USE</b>	<b>Res 1</b>	<b>Res 3</b>	<b>Municipal</b>	<b>Business 1</b>	<b>Institutional</b>	<b>Special</b>
<b>DEVELOPMENT</b>						
<b>No of Housing units</b>	260	808				
<b>Net Area (m<sup>2</sup>)</b>			40620	10846	24126	-
<b>FAR</b>			0.15	0.3	0.15	0.25
<b>Floor Area (m<sup>2</sup>)</b>			6093	3254	3619	-
<b>SEWAGE FLOW</b>						
<b>Rate (l/stand)</b>	600	450				
<b>Rate (l/100m<sup>2</sup>)</b>			375	375	375	375
<b>ADDWF (kl/day)</b>	156	363.6	23	12	14	-
<b>ADWWF (kl/day)</b>	179	418	26	14	16	-



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**Siyathuthuka Extension 6:**

LAND USE	Res 1	Res 3	Municipal	Business 1	Institutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	163					
Net Area (m <sup>2</sup> )				3584		1960
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			0	1075	0	490
<b>SEWAGE FLOW</b>						
Rate (l/stand)	600	450				
Rate (l/100m <sup>2</sup> )			375	375	375	375
ADDWF (kl/day)	97.8	0	0	4	0	2
ADWWF (kl/day)	112	0	0	5	0	2

**Siyathuthuka Extension 7:**

LAND USE	Res 1	Res 3	Municipal	Business 1	Institutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	244					
Net Area (m <sup>2</sup> )						2576
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			0	0	0	644
<b>SEWAGE FLOW</b>						
Rate (l/stand)	600	450				
Rate (l/100m <sup>2</sup> )			375	375	375	375
ADDWF (kl/day)	146.4	0	0	0	0	2
ADWWF (kl/day)	168	0	0	0	0	3

**Siyathuthuka Extension 8:**

LAND USE	Res 1	Res 3	Municipal	Business 1	Institutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	373					
Net Area (m <sup>2</sup> )						1046
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			0	0	0	262
<b>SEWAGE FLOW</b>						
Rate (l/stand)	600	450				
Rate (l/100m <sup>2</sup> )			375	375	375	375
ADDWF (kl/day)	223.8	0	0	0	0	1
ADWWF (kl/day)	257	0	0	0	0	1



### Siyathuthuka Extension 8:

LAND USE	Res 1	Res 3	Municipal	Business 1	Institutional	Special
<b>DEVELOPMENT</b>						
No of Housing units	500					
Net Area (m <sup>2</sup> )			73914	6386		20145
FAR			0.15	0.3	0.15	0.25
Floor Area (m <sup>2</sup> )			11087	1916	0	5036
<b>SEWAGE FLOW</b>						
Rate (l/stand)	600	450				
Rate (l/100m <sup>2</sup> )			375	375	375	375
ADDWF (kl/day)	300	0	42	7	0	19
ADWWF (kl/day)	345	0	48	8	0	22

It can be seen from the tables above that the estimated total Annual Average Daily Wet Weather Flows are as follows:

Siyathuthuka Ext. 5	- 653 m <sup>3</sup> /day
Siyathuthuka Ext. 6	- 119 m <sup>3</sup> /day
Siyathuthuka Ext. 7	- 171 m <sup>3</sup> /day
Siyathuthuka Ext. 8	- 258 m <sup>3</sup> /day
Siyathuthuka Ext. 9	- 423 m <sup>3</sup> /day

#### C.2.4.4 Streets

The street hierarchy within Siyathuthuka Extensions 5 to 9 varies from Class 4 – Local Distributor roads to Class 5 access roads with classifications varying from Class 5a Access collectors (access for up to about 200 dwelling units) to Class 5e Access Courts (access for up to about 30 dwelling units).

#### C.2.4.5 Storm Water Management

Proper storm water management is essential to ensure protection of life and property from flood hazards and that the natural environment is protected. The objectives of storm water management can be summarized as follows:

- to provide a storm water drainage system for the convenience of the community and the protection of property from damage by runoff from frequent storms;
- to prevent loss of life and reduce damage of property from severe storms;
- to prevent land and watercourse erosion;
- to protect water resources from pollution;
- to preserve natural watercourses and their eco-systems;
- to achieve the foregoing objectives at optimal total cost.

The area generally drains to the Belfast Dam to the north. The 1:100 year floodlines have been calculated and are indicated on the drawings. No development will be allowed within the 1:100 year floodplain. A number of drainage gully's which flows through the development are from north to south will be used channel storm water to the Belfast Dam.



## C-2.5 DESIGN PARAMETERS

### 2.5.1 Water Supply

Item	Sub-Item	Criteria
Velocity	Maximum	1,2 m/s
	Preferred	0,6 m/s
Pressures	Minimum peak flow	12 m
	Maximum	90 m
Minimum storage capacity		36 h of ADWD
Fire Flow		Varying from Low Risk Group 1 to Moderate Fire Risk

### 2.5.2 Sewage Disposal (Waterborne Sewerage)

Item	Sub-Item	Criteria
Minimum pipe Ø		100 mm
Minimum manhole spacing		80 m
Minimum flow velocity		0,7 m/s (full flow)
Peak design flow		Full bore capacity of pipe
Allowance for extraneous flows		15 %
COD loading		600 g/stand/day
Nitrogen loading		60g stand/day





### 2.5.3 Streets

Item	Sub-Item	Criteria
Local Distributors (Bus Routes)	Road Category	Class 4
	Traffic Class	E2 (0,8-3,0 x 10 <sup>6</sup> E80's)
	Surfaced Width	6,8 m
Residential access collectors	Road Category	Class 5a
	Traffic Class	E1 (0,2-0,8 x 10 <sup>6</sup> E80's)
	Surfaced Width	5,5 m
Residential access roads	Road Category	Class 5b
	Traffic Class	E0 (0,05-0,2 x 10 <sup>6</sup> E80's)
	Surfaced Width	5,0 m
Access cul-de-sacs	Road Category	Class 5c
	Traffic Class	ER (<0,05 x 10 <sup>6</sup> E80's)
	Surfaced Width	4,5 m

### 2.5.4 Stormwater Drainage

Item	Sub-Item	Criteria
Mean annual rainfall		878 mm
Rainfall distribution		Triangle
Time to peak ration		0,39
Infiltration model		Horton
Starting infiltration value		45 mm/h
End infiltration value		15 mm/h
Decay constant		0,00115
Conduit routing		Time shift
Effective % area impermeable	Developed area	5-15
	Undeveloped area	1
Manning factor	Pipes	0,013
	Unlined canals	0,013
Design storm recurrence interval	Minor storms	1 year
	Major storms	20 years



## C-2.6 CONSTRUCTION REQUIREMENTS

### 2.6.1 General

The proposed construction and material requirements are indicated below and will be incorporated in the detail design.

### 2.6.2 Water Reticulation

ITEM	CRITERIA
Location	1,0 m from boundary within road reserve
Pipe material	uPVC Class 9 for distribution
	HDPe Class 10 Type 4 for house connections
Valves	Resilient seal valve anti-clockwise closing to SABS 664, socketed for uPVC or flanged to Table D
Valve chambers	600mm x 600mm brick with cast iron cover
Air valves	Single orifice plastic
Water meters	Kent meters, complete with chamber

ITEM	CRITERIA		
Fire Flow	Fire Risk category	Minimum Hydrant Flow Rate (l/min)	Minimum Residual Head (m)
	Moderate Risk	1500	15
	Low Risk Group 1	600	7
	Low Risk Group 2	500	6
	Low Risk Group 3	350	6
Hydrants	Fire Risk category	Location of Hydrants	
	Moderate Risk	Distance apart 180m maximum	
	Low Risk Groups 1 to 3	Distance apart 240m maximum	



### 2.6.3 Sewerage Reticulation

ITEM	CRITERIA	
Location	1,5 m from boundary	
Pipe material	Heavy duty PVC pipes	
Manholes	1 000mm diameter precast concrete	
Rodding eyes	ABC cast iron with cast iron cover and frame box	
Manhole covers	Cast iron Type 2A in roadways	
	Cast iron type 4 VP for midblock sewers	
Stand connections	110 mm diameter with end cap , location 1m x 1m on low point of stand	
Minimum pipe diameter	100 mm	
Minimum gradients	Diameter	Minimum gradient
	100	1:120
	150	1:200
	200	1:300
	300	1:400

### 2.6.4 Streets

ITEM	CRITERIA	
Location	Central in road reserve	
Side walks	750mm wide, grassed	
Kerbs	Figure 8c mountable	
	Figure 3 barrier on curves	
Edge restraints	Concrete 150 mm x 200 mm	
Wearing course	Premix, double seal or precast concrete paving blocks	
Structural design	Catalogue method	
Road markings	To SARTSM	

### 2.6.5 Storm Water Drainage

ITEM	CRITERIA	
Minimum diameter	450 mm Ogee	
Junction boxes	Brick, Precast with concrete lids	
Stormwater channels	V-shaped	
Kerb inlet	Open inlet, 600mm x 600mm internal dimension	



## **PART 3 – BULK SERVICES**

### **C-3.1 GENERAL**

In general, there is some spare capacity available in Belfast and Siyathuthuka for extension but certain bulk infrastructure elements must be upgraded. An technical report has recently been completed by BTW Consulting (Pty) Ltd which summarizes to bulk water supply and sewage disposal requirements.

### **C-3.2 WATER SUPPLY**

#### **C.3.2.1 Source**

Raw water is sourced from the Belfast Dam which has a consistent yield of 2 700 kl/day. The water in the dam is augmented with water pumped from the Kraaispruit Dam which has a consistent yield of 2 200 kl/day. The total available volume of raw water available is 4 900 kl/day. The current demand is estimated to be 3 035 kl/day and the water demand for Siyathuthuka Extension 5 to 9 is estimated at 1 967 kl/day. There will be a small shortfall in raw water (102 kl/day).

The Emakhazeni Local Municipality submitted an application to DWAF for an increased abstraction for Belfast and Siyathuthuka from the Belfast dam in June 2006 but has not received approval yet.

#### **C.3.2.2 Water Treatment**

The existing water purification plant at Belfast has a design capacity to treat 4 000 kl/day. The current volume of water treated by the plant is 3 035 kl/day and there is spare capacity of 965 kl/day. The water treatment plant will have to be upgraded to cater for the total proposed development.

#### **C.3.2.3 Storage**

There is sufficient storage in Siyathuthuka to cater for the additional demand for Siyathuthuka Extension 5 to 8 but the storage in Belfast will have to be increased to cater for Siyathuthuka Extension 9. With the existing shortfall of 828 kl, a total of 1 342 kl additional storage will have to be provided.

The elevated storage facilities in both Siyathuthuka and Belfast must be increased to cater for the increased demand.

#### **C.3.2.4 Distribution**

There is sufficient capacity in the potable feed to Siyathuthuka to cater for the additional demand for Siyathuthuka Extension 5 to 8 but the shortage in the capacity of the potable feed to Belfast will have to be increased to cater for Siyathuthuka Extension 9. With the existing shortfall of 486 kl/day, a total of 1 000 kl/day additional capacity will have to be provided.



### **C-3.3 SEWAGE DISPOSAL**

#### **C.3.3.1 Bulk Drainage**

There sewage pump stations which will have to upgraded/constructed to convey the increased sewage flows from Siyathuthuka Extension 5 to 9 to the sewage treatment plant.

#### **C.3.3.2 Treatment**

Sewage from Siyathuthuka Extensions 5 to 9 will treated at the Belfast Waste Water Treatment Plant. A first phase upgrading of the plant at was done in 2005 and the second phase must still be implemented. The existing Waste Water Treatment Plant is located in a higher . It has been suggested that consideration be given to constructing a new

#### **C-3.4 ACCESS**

Access to Siyathuthuka Extensions 5 to 9 will be from existing streets. Siyathuthuka Extension 5 will also have access from the Spitskop Road.

#### **C-3.5 STORM WATER MANAGEMENT**

The area generally drains to the Belfast Dam to the north t. The 1:100 year floodlines have been calculated and are indicated on the drawings. No development will be allowed within the 1:100 year floodplain. A number of drainage gulley's which flows through the development are fro north to south will be used channel storm water to the Belfast Dam.

#### **C-3.6 DISPOSAL OF SOLID WASTE**

The Emakhazeni landfill site at Belfast is in possession of a legal authorization to operate but rehabilitation of the site is required. Funding has been allocated from Municipal Infrastructure Grant (MIG) funds in the 2011/2012 financial year.

#### **C-3.7 ELECTRICITY SUPPLY**

The Emakhazeni Local Municipality is the supply authority for electricity for Belfast and Siyathuthuka. At present a single sub station supplies both towns but consideration must is being given to building a new substation next to Siyathuthuka which will then take over the supply to Siyathuthuka. Sufficient capacity must be designed to cater for the planned extensions.



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## SECTION C: PLANNING

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### PART 4 – INTERNAL SERVICES

#### C-4.1 GENERAL

The development will be provided with high order internal services which will consist of a metered water connection for each site, a waterborne sewerage connection for each site and access to a paved street network which will vary from graveled streets to surfaced roads of varying classification.

#### C-4.2 WATER RETICULATION

The proposed water reticulation network will consist mainly of uPVC Class 9 piping of varying diameters. The network will be designed to ensure a minimum peak flow pressure of 24 m to each stand, with a maximum static pressure of 90 m. Provision will be made for fire flow and fire hydrants will be provided.

The pipelines are located within the street reserves. The water meters will be located along the road reserve boundaries for easy access.

Isolating valves will be provided so that a maximum of four valves must be closed to isolate a section of the network for maintenance. Scouring will be allowed at low points with the provision of fire hydrants. Air valves will be provided where required.

#### C-4.3 SEWER RETICULATION

The sewer reticulation network will be installed with a minimum pipe size of 100mm (internal diameter) and a maximum manhole spacing of 80m. A house connection to each stand will be provided. Manholes will be located for convenient access.

The pipes will be placed on the inside or outside of the stands depending on practice in the area and availability of space within the street reserve. The pipes are located to minimize excavation depths due to the expected rocky formations.

#### C-4.4 STREETS

A road network will be provided to distribute traffic between activities within the development area. The types of road which will be provided vary from Class 4 Local Distributors (bur routes) to local Class 5 Access Streets. All roads will be surfaced with the minimum standard being graveled streets.

#### C-4.5 STORM WATER DRAINAGE

The stormwater channels and structures are designed for a 1:1 year storm recurrence, except at the piped crossings where a 1:5 year storm recurrence is catered for. Run-offs from 1:20 year storms will also be evaluated to prevent or limit possible damage.

#### C-4.6 ELECTRICAL RETICULATION

The electrical reticulation network will be installed and a house connection to each stand will be provided.



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## REFERENCES

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References used in the compilation of this report are the following:

1. DEPARTMENT OF HOUSING. *Guidelines for Human Settlement Planning and Design, CSIR 2000.*
2. BTW CONSULTING (PTY) LTD: Emakhazeni Local Municipality Water Services Development Plan. Report 20174 – REP 01, June 2007

Yours sincerely

**CONSOLV CONSULTING ENGINEERS**

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**S.J.Triegaardt Pr.Eng**