PHILIPPI ECONOMIC DEVELOPMENT INITIATIVE

MUNICIPAL SERVICES INVESTIGATION

DRAFT REPORT

HHO Africa
Infrastructure Engineers
Cape Town

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MUNICIPAL SERVICES INVESTIGATION

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MUNICIPAL SERVICES INVESTIGATION

DECLARATION OF INTEREST

The author of this report, Fred de Villiers, hereby declares that HHO Africa is an independent consultant appointed by PEDI and has no business, financial, personal or other interest in the activity, application or appeal in respect of which they were appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of the specialist performing such work. All opinions expressed in this report is his own.

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June 2015

PHILIPPI ECONOMIC DEVELOPMENT INITIATIVE

MUNICIPAL SERVICES INVESTIGATION

EXECUTIVE SUMMARY

The Philippi Economic Development Initiative (PEDI) is a non-profit organization that aims to unite business owners and residents of Philippi in order to promote economic development and investment that leads to urban renewal. PEDI is currently interested in an area which is approximately 287 ha of largely undeveloped land in Philippi Economic, which is situated within the City of Cape Town Municipality (CoCT). Currently about 54 ha of this land has been developed, either formally or informally.

Although some of the land is presently either developed or occupied, it is anticipated that approximately 105 ha of the site could realistically be developed for light industry in future. In addition, about 109 ha could be set aside low income housing development.

The August 2014 land invasions have had a significant impact on the study area, as the estimated number of dwelling units increased from approximately 950 to 4170. It is evident from the data that these have not been serviced in the interim by the waterborne sanitation system or been provided with access to potable water.

It is envisaged that the full development scenario would entail approximately 105 ha of light industrial development combined with about 109 ha of low income residential development. Together, these land uses would occupy about 75% of the study area, which measures 287 ha in extent. The remaining 25% of the site would be taken up by roads, public open spaces and detention ponds. A bulk factor of 0.48 has been applied to the light industrial development, resulting in a Gross Leasable Area (GLA) of 50.4 ha.

For the purposes of this study, the residential density has been assumed to be 60 dwelling units per hectare. This would equate to individual free standing properties of approximately $120m^2$ in size. It is thus envisaged that approximately 6500 dwelling units could be provided. Figure 0.1 below illustrates the development criteria used for the study. The following nomenclature has been adopted:

- **Existing Scenario**: The estimated state of development prior to the August 2014 land invasions;
- **Interim Scenario**: The development status since the August 2014 land invasions;
- **Full Development Scenario**: The final stage of development, after the realistic development potential of the study area has been realized.

Master plans are required for municipal services to develop, model and assess the future bulk infrastructure requirements of the Precinct. These should be based on broad development guidelines responding to PEDI’s vision.

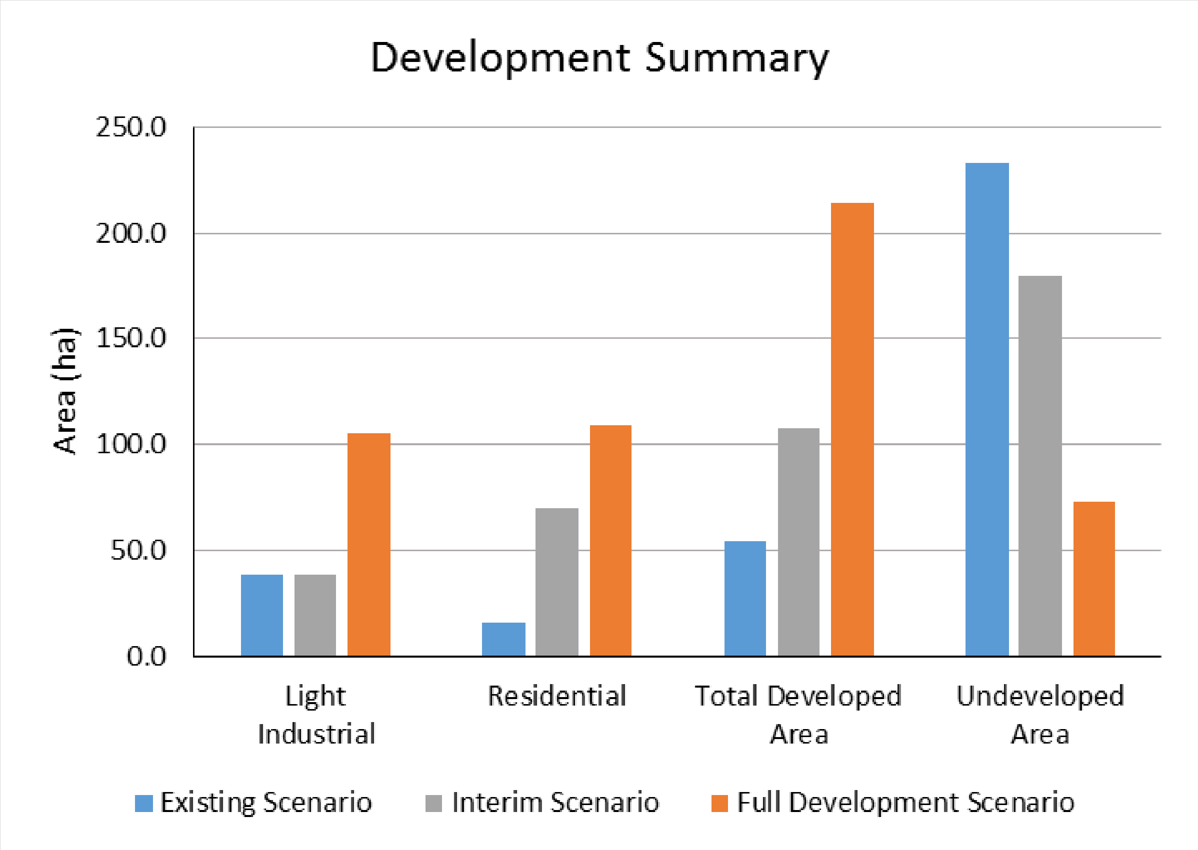

Figure 0.1 Summary of the development criteria used in the study

The study considered the capacity of the following municipal services:

- Potable water
- Foul sewer
- Storm water
- Electricity
- Telecommunications

The analysis of the services resulted in the following outcomes:

The existing water network has sufficient capacity for the existing development, but not the full development scenario. More specifically, during fire flow the operating pressures are below standard, while flow velocities are too high. Therefore, upgrading of smaller diameter supply pipes is required. It is also recommended that trunk mains be extended to create an interlinking network, which would provide some protection against pipe breakages.

The current foul sewer network is sufficient for the demands anticipated in the full development scenario. This was confirmed by the CoCT. It is recommended that a computer model, such as PCSWMM, be created and run to confirm the capacity and performance of the existing foul sewer network under the demands of the full development scenario. Lastly, once the planning of the proposed development has commenced, it would be advisable to apportion development in accordance with the calculated daily sewer demand and available spare capacity.

The existing stormwater infrastructure within the study area is sufficient to absorb and convey the 10 year RI storm. It is advised that a further 14.1 ha should be set aside for detention ponds in the full development scenario in order to accommodate the 50 year RI storm. This would increase the total area occupied by detention ponds from 8.2 ha to 22.3ha, or 7.8% of the study area. The use of a computer model, such as PCSWMM, would allow the impact of the full development scenario on the existing infrastructure to be more accurately determined. It should also be noted that once the planning of the proposed development has commenced, it will be necessary to include the treatment and attenuation of surface water runoff in the planning process. Any future developments would need to satisfy the CoCT's "Management of Urban Stormwater Impacts Policy." This policy describes the required treatment of surface water runoff in terms of quality and quantity.

Eskom supplies the bulk electricity to the study area. The study area is already at capacity, with peak load spare capacity at 3MVA. It is estimated that the full development scenario will require a further 18MVA. A new substation will be required to provide the full development's electricity needs. It is also advised that all cables are placed underground to prevent theft.

Telecommunications within the study area are supplied via Dark Fibre Africa (DFA) and Telkom. DFA has a fibre optic cable that passes through the site. It is assumed that future businesses could purchase a connection to this cable. Telkom currently has fibre optics, as well as copper cables that connect existing consumers to their service. Given the theft and security risks in the area, Telkom may propose a limited bandwidth wireless service to future residential customers. It is advisable for new businesses to apply for a direct link to the existing Telkom fibre optic network.

GLOSSARY

AADD	Annual Average Daily Demand
CoCT	City of Cape Town Municipality
CSIR	Council for Scientific Research and Industrial Research
DFA	Dark Fibre Africa
DN	*Diametre Nominale,* or nominal diameter
DU	Dwelling Unit
FH	Fire Hydrant
FSMP	Foul Sewer Master Plans
GIS	Geospatial Information System
GLA	Gross Leasable Area
ha	Hectare
kℓ	Kilolitre
ℓ	Litre
L	Length of longest collector
Mℓ	Megalitre
m^2	meter squared
m^3	cubic metres
MAP	Mean Annual Precipitation
MASL	Mean Annual Sea Level
NGL	Natural Ground Level
PEDI	Philippi Economic Development Initiative
RI	Recurrence Interval
SWMP	Stormwater Master Plan
SUDS	Sustainable Urban Drainage System
Tc	Time of Concentration
WMP	Water Master Plan
WWTW	Waste Water Treatment Works

1.0 INTRODUCTION

The Philippi Economic Development Initiative (PEDI) is a non-profit organization that aims to unite business owners and residents of Philippi in order to promote economic development and investment that leads to urban renewal. PEDI is currently interested in an area which is approximately 287 ha of largely undeveloped land in Philippi Economic, which is situated within the City of Cape Town Municipality (CoCT). Currently about 54 ha of this land has been developed, either formally or informally.

Although some of the land is presently either developed or occupied, it is anticipated that approximately 105 ha of the site could realistically be developed for light industry in future. In addition, about 109 ha could be set aside low income housing development.

This study considered the capacity of existing municipal infrastructure within the study area, and the likely demand of 105 ha of light industrial development and 109 ha of low income housing on this infrastructure. The following municipal services were investigated:

- Potable water
- Foul sewer
- Stormwater
- Electricity
- Telecommunications

Figure 1.1 Locality Plan

The site is bounded by New Eisleben Road in the west; Govan Mbeki Road in the north; Sheffield Road in the east; and the PRASA railway line in the south. Stock Road forms the main north-south access spine, whereas Sheffield Road traverses the site from east to west. Several smaller roads are found within the site boundaries. Figure 1.1 indicates the locality plan.

2.0 TERMS OF REFERENCE

HHO Africa was appointed by the PEDI in November 2014 to undertake a traffic impact and services investigation relating to their site of approximately 287 ha of largely undeveloped land in Philippi Economic. Whilst this report does not address the traffic impact aspects of the proposed development, a separate report is available in this regard.

In conjunction with PEDI it was calculated that, in addition to provision for housing, the maximum realistic total light industrial development potential of the site is approximately 105 ha. These land uses are in keeping with the current development environment in the greater Philippi area. The following municipal services have been investigated:

- Potable water
- Foul sewer
- Stormwater
- Electricity
- Telecommunications

The assignment was conducted as a part of a larger scope of works relating to the proposed upgrade of National Route 2 (N2) and the new Borcherds Quarry interchange. This proposed project would create vastly improved road access to the Philippi Economic area, thereby acting as a catalyst to development.

3.0 METHODOLOGY AND APPROACH

The following methodology was adopted for the purposes of this study:

1. A desktop study (including a literature review of municipal documentation) for the site and surrounding area was conducted;
2. Existing services and planning information was requested and obtained from the relevant service departments within CoCT;
3. Current capacity was calculated based on the information provided;
4. Anticipated demand was calculated based on the information provided;
5. Shortcomings in infrastructure provision were identified;
6. Discussions with service authorities were held to verify findings;
7. Recommendations were made to address infrastructure limitations;
8. A brief report was prepared.

4.0 STATUS QUO ASSESSMENT

It has been estimated that the existing scenario entails approximately 38 ha of office; municipal and light industrial development combined with about 16 ha of low income housing. Together, these land uses occupy about 19% of the study area, which measures 287 ha in extent. The remaining 81% of the site is either undeveloped, or contains roads, open spaces and detention ponds.

For the purposes of establishing the status quo, the residential density has been assumed to be 60 dwelling units per hectare. This would equate to individual free standing properties of approximately 120m^2 in size. From a municipal services point of view, it is thus envisaged that there are currently approximately 950 dwelling units in the study area in the existing scenario.

The August 2014 land invasions have had a significant impact on the study area, as the estimated number of dwelling units increased to approximately 4170. However, it is evident from the data that these have not been serviced in the interim by the waterborne sanitation system or potable water network. Alternatively, the municipal foul sewer and water data obtained from CoCT could predate this land invasion. It is also believed that certain informal settlements within the study area in the existing scenario have also not been provided with direct access to potable water. This is explained further in Paragraph 4.1.2.

Existing and interim land use can be summarized as shown in Table 4.0.1 and Figures 4.0.1 and 4.0.2.

Table 4.0.1 Summary of the current and interim land use

Description	Light Industrial	GLA	Residential	Dwelling Units	Total Developed Area	Undeveloped Area
Existing Scenario (ha)	38.3	18.4	15.9	953	54.2	233
Existing Scenario (%)	13%		6%		19%	81%
Interim Scenario (ha)	38.3	18.4	69.5	4170	107.8	179.4
Interim Scenario (%)	13%		24%		38%	62%
Increase (ha)	0	0	53.6	3217	53.6	-53.6
Increase (%)	0%	0%	338%	338%	99%	-23%

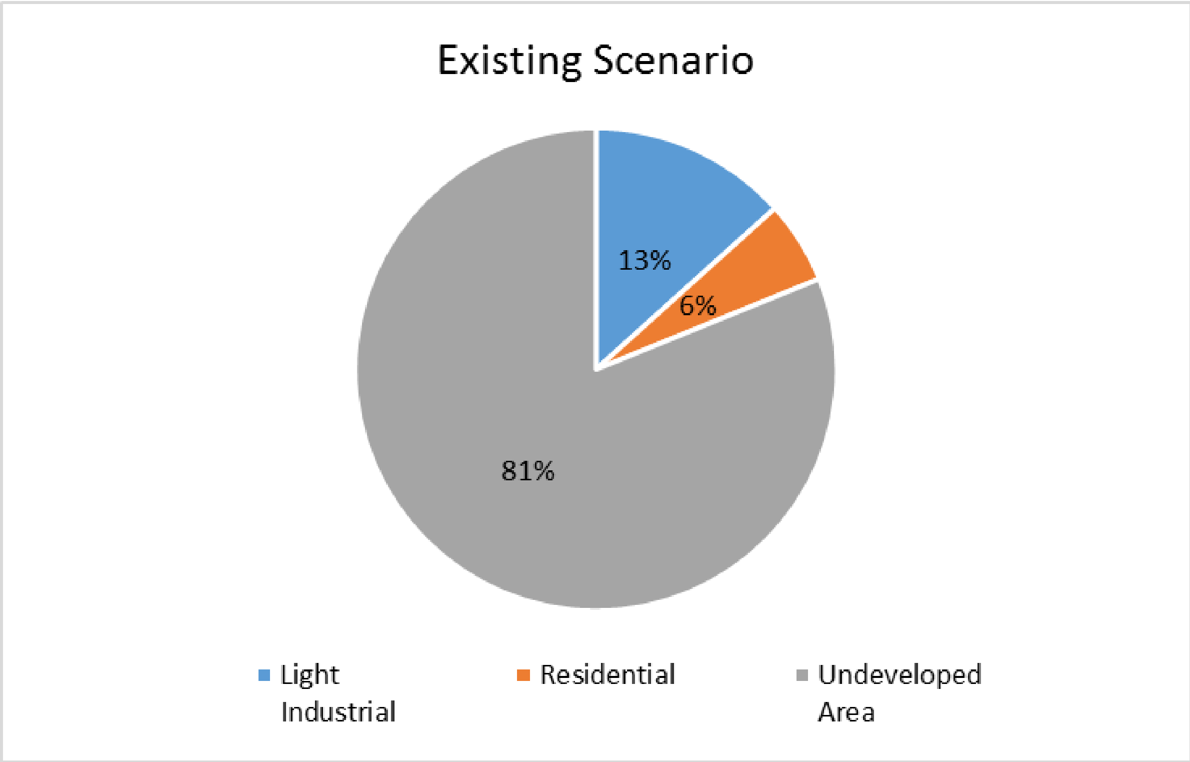

Figure 4.0.1 Pie chart indicating the existing scenario's land use characteristics

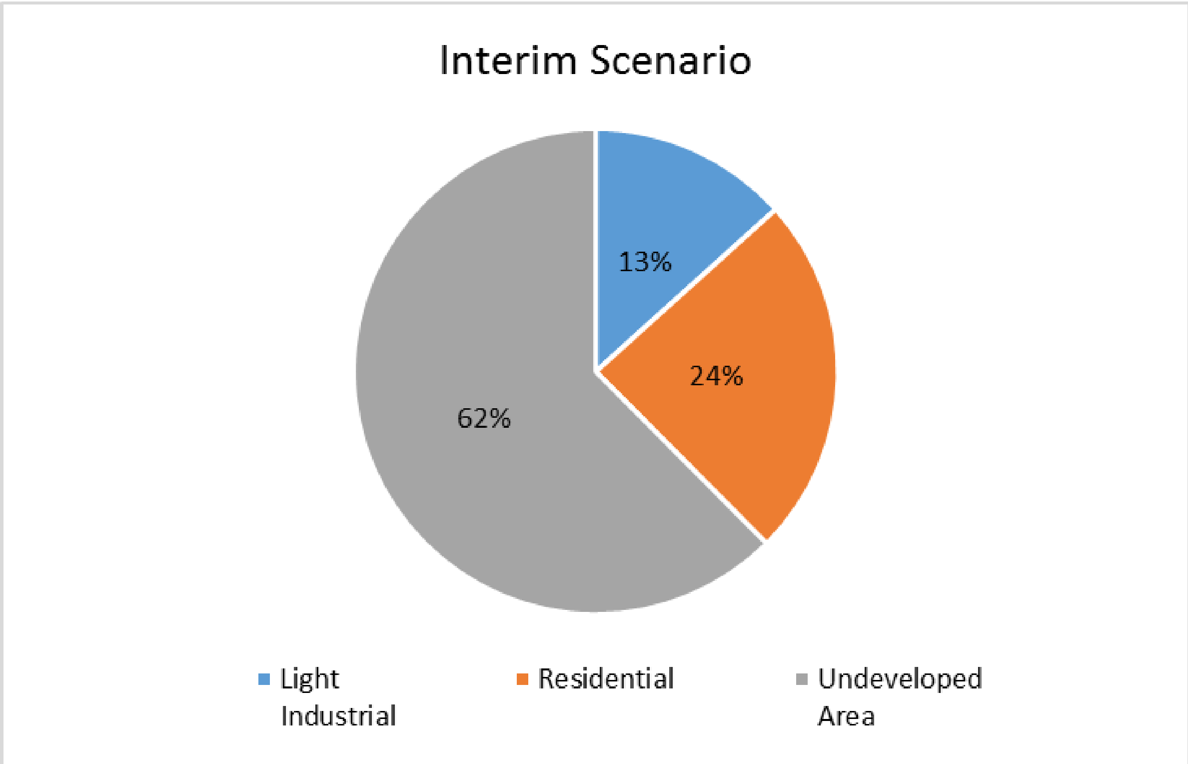

Figure 4.0.2 Pie chart indicating the interim scenario's land use characteristics

A brief synopsis of known existing municipal services follows below.

4.1 POTABLE WATER

The potable water infrastructure that is located within the study area is owned by and operated by the City of Cape Town. The CoCT infrastructure includes bulk, trunk and reticulation mains, valves, standpipes, water meters and any hydrants. There does not appear to be any pump station located in the study area.

GIS information and Water Master Plans (WMP) for the area were requested from the Water and Sanitation Department. Although no WMP information was received, GIS shape files were obtained. The data received clearly represented the existing scenario, as GIS water demand values did not indicate any high water usage in the location of the land invasions. Some shortcomings of the data included:

- No maximum water demand capacity indicated;
- Several discontinuities in the data.

It was therefore necessary to make certain assumptions based on experience and certain calculations. It should be noted that these calculations are first order estimates intended for the sole purpose of assessing the likely impact of the proposed development on the existing infrastructure. A definitive answer can only be obtained through a detailed computer software model such as EPANET.

4.1.1 Existing Infrastructure

The study area has been provided with the following water network infrastructure:

- A DN1830 bulk mains that runs along the southern boundary of the study area. This pipeline supplies water to the area from the south.
- A DN810 bulk mains that runs along the northern boundary of the study area. This pipeline supplies water to the area from the north.
- A DN300 supply main that runs along the north east boundary of the study area.
- A DN375 supply main that runs from north to south along Stock Road.
- A DN535 supply main that runs from south to north along Stock Road. This pipeline connects the DN1830 bulk supply line to the southern section of the study area.
- A DN380 supply main that runs from east to west along Sheffield Road. This pipeline intersects with the DN375 mains (mentioned above), as well as a DN300 reticulation mains.
- A DN300 supply main that runs from west to east along Sheffield Road.

Annexure A contains a layout drawing of the existing water network infrastructure and the water zones as described below.

4.1.2 Capacity Assessment

In order to assess the spare capacity of the CoCT water network, the following approach was adopted:

- The GIS data quantified the existing water demand of the study area. This information was extracted and assessed.
- The anticipated water demand for the existing development scenario was calculated based on the observed development scenario shown in Table 4.0.1 and Figure 4.0.1.
- The calculated flows were compared to the CoCT's GIS data.
- It was assumed that the land occupied since August 2014 had not been serviced by the water network. It was also assumed that informal settlements located in zones 4 and 5 had limited or no connection to the water network. This was evident in the water data obtained from the CoCT.
- The following water demand was adopted:
    - Light industrial, municipal and commercial: 400 ℓ /day/100m^2
    - Residential water demand (low cost housing): 600 ℓ /du/day
    - Residential density: 60 DU/ha
    - Peak factor: 1.50

Using these parameters, a good correlation was found with the CoCT GIS data as Table 4.1.1 shows. Only zone 1 differed considerably. It is believed that the CoCT GIS data is incorrect, as there are clearly industrial buildings located within zone 1.

Table 4.1.1 Correlation between CoCT data and calculated water demand for the existing scenario

Zone	**Calculated Q_{des} (l/s)**	**CoCT Data Q_{des} (l/s)**
1	1.9	0.3
2	4.4	4.3
3	8.7	9.1
4	4.1	4.0
5	0.2	0.1
6	3.4	3.0
Total	**22.7**	**20.8**

The following Annual Average Daily Demand (AADD) was calculated, as can be seen in Table 4.1.2.

Table 4.1.2 Annual Average Daily Demand for the existing scenario

Zone	AADD (kl/day)			Q_{AADD} (l/s)	Q_{des} (kl/day)
	Office	Res	Total		
1	108	0	108	1.2	162
2	123	132	256	3.0	384
3	362	142	504	5.8	756
4	0	235	235	2.7	352
5	0	10	10	0.1	15
6	142	53	195	2.3	293
Total	**736**	**572**	**1307**	**15.1**	**1961**

According to local authorities, the current water network is not under any constraints and velocities range from 0.1 to 1.5m/s.

4.2 FOUL SEWER

The City of Cape Town is the owner and custodian of all foul sewer infrastructure within the study area. All foul sewage emanating from the study area is treated at the Cape Flats Waste Water Treatment Works (WWTW). CoCT infrastructure includes manholes and gravity mains. There is no evidence of any pump stations or rising mains.

GIS information and any Foul Sewer Master Plans (FSMP) for the area were requested from the Water and Sanitation Department. Although no FSMP information was received, GIS shape files and data sets were obtained. The data contained the spare capacities of gravity mains. The following shortcomings were identified:

- It is evident from the data that the increased number of dwelling units due to the August 2014 land invasions have not been serviced in the interim by the waterborne sanitation system. Alternatively, the municipal foul sewer data provided may predate August 2014;
- No data was received for large parts of the study area;
- No pump stations were identified;
- Several discontinuities in the data.

Certain assumptions were made based on experience and calculations. These calculations are first order estimates intended only for the assessment of the likely impact of the proposed development on the existing infrastructure. A definitive answer can only be obtained through a detailed computer software model such as PCSWMM.

4.2.1 Existing Infrastructure

The study area has been provided with the following major foul sewer infrastructure:

- A DN600 bulk along Sheffield Road. This main traverses the site from east to west.
- A DN525 bulk along the northern section of New Eisleben Road. This main is situated along the western boundary of the site and conveys sewerage in a southerly direction.
- A DN400 collector sewer across open land to the east of the study area. This main runs from north to south and also terminates in the Sheffield Road sewer.
- A DN300 collector in Stock Road. This main bisects the site from north to south and terminates in the Sheffield Road sewer.
- A DN300 collector along the extension of Sports Road in the south-west of the site. This main runs in a northerly direction and terminates in the Sheffield Road sewer.
- The data contained no information on pump stations or rising mains on site.

Annexure C contains a layout drawing of the existing foul sewer infrastructure and the sewer zones as described below.

4.2.2 Capacity Assessment

In order to assess the spare capacity of the CoCT sewer network, the following approach was adopted:

- The data set quantified the spare capacities of gravity mains. This information was extracted for collector pipes and assessed.
- The anticipated sewer demand was calculated based on the observed existing development scenario shown in Table 4.0.1 and Figure 4.0.1.
- The calculated flows were compared to the CoCT modelled data.
- It was assumed that the land occupied since August 2014 has not been serviced by the waterborne foul sewer network.
- The following foul sewer demand was adopted:

    - Light industrial, municipal and commercial: 400 ℓ /day/100m^2
    - Low-income residential: 500 ℓ /day/household
    - Residential density: 60 DU/ha
    - Groundwater infiltration: 15%
    - Total peak factor: 1.43

Using these parameters, a good correlation was found with the CoCT GIS data as Table 4.2.1 shows.

Table 4.2.1 Correlation between CoCT data and calculated sewer demand for the existing scenario

Zone	Calculated Q_{des} (l/s)	CoCT Data Q_{des} (l/s)
1	1.8	2.0
2	3.9	3.9
3	7.9	7.0
4	3.2	3.4
5	0.1	0.6
6	3.1	7.0
Total	**20.0**	**23.9**

The following Annual Average Daily Demand (AADD) was calculated, as can be seen in Table 4.2.2.

Table 4.2.2 Annual Average Daily Demand for the existing scenario

Zone	AADD (kl/day)			Q_{AADD} (l/s)	Q_{des} (kl/day)
	Office	Res	Total		
1	108	0	108	1.2	154
2	123	110	234	2.7	334
3	362	118	480	5.6	687
4	0	196	196	2.3	280
5	0	8	7	0.1	12
6	142	44	186	2.2	266
Total	**736**	**476**	**1212**	**14.0**	**1733**

According to the CoCT GIS data, the current sewer network has ample capacity at present. The available spare capacity for each zone greatly exceeds the current demand, as can be seen in Table 4.2.3 below.

However, local officials have indicated that the Philippi collector sewer has collapsed in three places between the study area and the WWTW. These collapses are currently under investigation. By implication, the development of the study area may be hampered by the condition of downstream infrastructure.

Table 4.2.3 Spare capacity compared to the current sewer demand

Zone	Current Demand (l/s)	Spare Capacity (l/s)
1	2.0	118
2	3.9	150
3	7.0	161
4	3.4	190
5	0.6	90
6	7.0	Incl
Total	**23.9**	**268.0**

4.3 STORMWATER

The City of Cape Town is the owner and custodian of all current stormwater infrastructure within the study area. Their infrastructure includes catchpits; manholes; underground pipes; surface drainage channels and detention ponds.

GIS information and any Stormwater Master Plans (SWMP) for the area were requested from the Catchment, Stormwater and River Management Branch of the Transport, Roads and Major Projects Directorate. A SWMP completed in October 2000 by Phikon Engineers was received, as well as some GIS information. Although invaluable, the data was found to be incomplete.
Some of the more pertinent shortcomings included:

- Some pipe and culvert sizes were not provided;
- Invert levels were often missing, disenabling the calculation of pipe gradients;
- No pipe capacities, or spare capacities, were provided;
- Detention pond capacities and levels were not included;
- Several discontinuities or gaps in the data made it difficult to assess.

It was therefore, necessary to make certain assumptions based on experience and certain calculations. The results of these calculations were compared to those in the SWMP, which provided information on detention pond sizing for future development.

4.3.1 Existing Infrastructure

The study area has been provided with the following major stormwater infrastructure:

- A DN900 collector along Sheffield Road. This main traverses the site from east to west.
- Stock Road is well provided with underground infrastructure. Its stormwater collector increases in size from DN375 in the north to an 1800mm portal culvert in the south. This culvert terminates in a large detention pond adjacent Sheffield Road.

- A DN1350 collector along New Eisleben Road. This main is situated along the western boundary of the site and conveys stormwater in a southerly direction.
- There are three existing detention ponds in the study area. These are indicated in Table 4.3.1 below.
- There are no rivers on site, which implies that the proposed development is unimpeded by floodlines.

Table 4.3.1 Dimensions of detention ponds within the study area

Drainage zone	Detention Pond Area (ha)	Depth assumed (m)	Detention Pond Volume (m^3)
1	1.0	0.5	5000
2	4.0	0.5	20000
3	3.2	0.5	16000
Total	**8.2**	**0.5**	**41000**

Given the lack of data describing pipe capacity it was necessary to estimate the capacity of the major outfall pipes. It would appear from the data that the two outfall pipes have flat gradients and limited capacity. Table 4.3.2 below contains the results of capacity calculations:

Table 4.3.2 Capacity of major Stormwater outfall pipes

DN (mm)	S_o (1 in)	Q_{max} (m^3/s)
900	1250	0.51
1350	800	1.88

4.3.2 Catchment Hydrology

The study area is part of the greater Zeekoe catchment and drains in a westerly direction towards the Lotus River canal, which eventually discharges into False Bay. The topography is flat and characterized by the Cape Flats sandy soil. The groundwater table is high and at Natural Ground Level (NGL) during the winter months. This means that there is negligible infiltration during the wet winter season.

The Mean Annual Precipitation (MAP) is 587mm and has been determined from "Design Rainfall in South Africa" by JC Smithers and RE Schulze. Design rainfall has been calculated for the site as can be seen in Table 4.3.3.

Table 4.3.3 Design rainfall for the study area

Duration	(m/h/d)	Return Period (Years)						
		2	5	10	20	50	100	200
5	m	4.6	6.2	7.3	8.5	10.2	11.5	13.0
10	m	6.6	8.9	10.6	12.3	14.7	16.7	18.8
15	m	8.2	11.0	13.1	15.2	18.2	20.7	23.3
30	m	11.1	14.9	17.7	20.5	24.6	27.9	31.4
45	m	13.2	17.7	21.0	24.4	29.3	33.2	37.4
1	h	15.0	20.1	23.8	27.7	33.1	37.6	42.3
1.5	h	17.8	23.9	28.4	33.0	39.5	44.8	50.4
2	h	20.2	27.1	32.1	37.3	44.7	50.7	57.1
4	h	25.3	33.9	40.2	46.8	56.0	63.5	71.6
6	h	28.9	38.7	45.9	53.4	63.9	72.5	81.7
8	h	31.7	42.6	50.5	58.7	70.2	79.6	89.7
10	h	34.1	45.8	54.3	63.1	75.5	85.7	96.5
12	h	36.2	48.6	57.6	67.0	80.2	90.9	102.4
16	h	39.8	53.4	63.3	73.6	88.0	99.8	112.5
20	h	42.8	57.4	68.0	79.1	94.7	107.4	121.0
24	h	45.4	60.9	72.2	84.0	100.5	114.0	128.4
1	d	39.0	52.4	62.1	72.2	86.4	98.0	110.4
2	d	50.6	67.9	80.5	93.6	112.1	127.1	143.2
3	d	59.0	79.1	93.8	109.0	130.5	148.0	166.7
4	d	64.5	86.5	102.6	119.2	142.7	161.9	182.4
5	d	69.1	92.7	109.9	127.8	153.0	173.5	195.5
6	d	73.2	98.2	116.4	135.3	161.9	183.7	207.0
7	d	76.8	103.0	122.1	142.0	169.9	192.7	217.1

The immediate subcatchment that comprises the study area measures approximately 615 hectares in extent. This area can be further divided into two subcatchments for each of the major collector pipes shown in Table 4.3.4.

Table 4.3.4 Subcatchments relating to the major collector pipes

Subcatchment	Collector	Area (ha)
West (New Eisleben Road)	DN1350	181.4
East (Sheffield Road)	DN900	435.2
Total		**616.6**

Parts of the catchment have been developed into surfaced roads, housing (both formal and informal), and industry. Using the Rational Method, the following runoff coefficients are assumed (see Table 4.3.5).

Table 4.3.5 Runoff coefficients used in the Rational Method

	Developed Areas	Undeveloped Areas
Extent	40%	60%
Runoff Coefficient	0.7	0.3

Tables 4.3.6 and 4.3.7 below reveal the un-attenuated peak runoff flows and flood volumes that were calculated for the catchment, based on a calculated time of concentration of 2 hours:

Table 4.3.6 Un-attenuated peak runoff flows using a time of concentration of 2 hours

Subcatchment	Q_2 (m^3/s)	Q_5 (m^3/s)	Q_{10} (m^3/s)	Q_{20} (m^3/s)	Q_{50} (m^3/s)	Q_{100} (m^3/s)	Q_{200} (m^3/s)
West	1.2	1.7	2.3	2.9	4.3	5.9	6.7
East	2.8	4.2	5.4	7.0	10.4	14.2	16.0

Table 4.3.7 Un-attenuated flood volumes using a time of concentration of 2 hours

Subcatchment	V_2 (m^3)	V_5 (m^3)	V_{10} (m^3)	V_{20} (m^3)	V_{50} (m^3)	V_{100} (m^3)	V_{200} (m^3)
West	25281	37308	48208	62553	92865	126903	142923
East	60663	89523	115681	150103	222838	304518	342958
Total	**85944**	**126831**	**163889**	**212656**	**315703**	**431421**	**485880**

Since the two subcatchments contain a total of 15 identified detention ponds, along with underground pipes and manholes, a large degree of flood peak attenuation can be expected. Furthermore, the flat terrain is likely to offer significant depression storage. An attempt was made to quantify this so that the likely efficacy of the major stormwater infrastructure could be gauged. It is estimated that the 15 detention ponds have a combined storage volume of about 83,000m^3. This assumes an average water depth of 500mm in each pond. Thus, the combined effect of the detention ponds and the two large outfall pipes is as illustrated in Figure 4.3.1. It would seem from this simple analysis that the existing infrastructure could absorb a 10-year storm before roads and low-lying areas would begin to be significantly flooded.

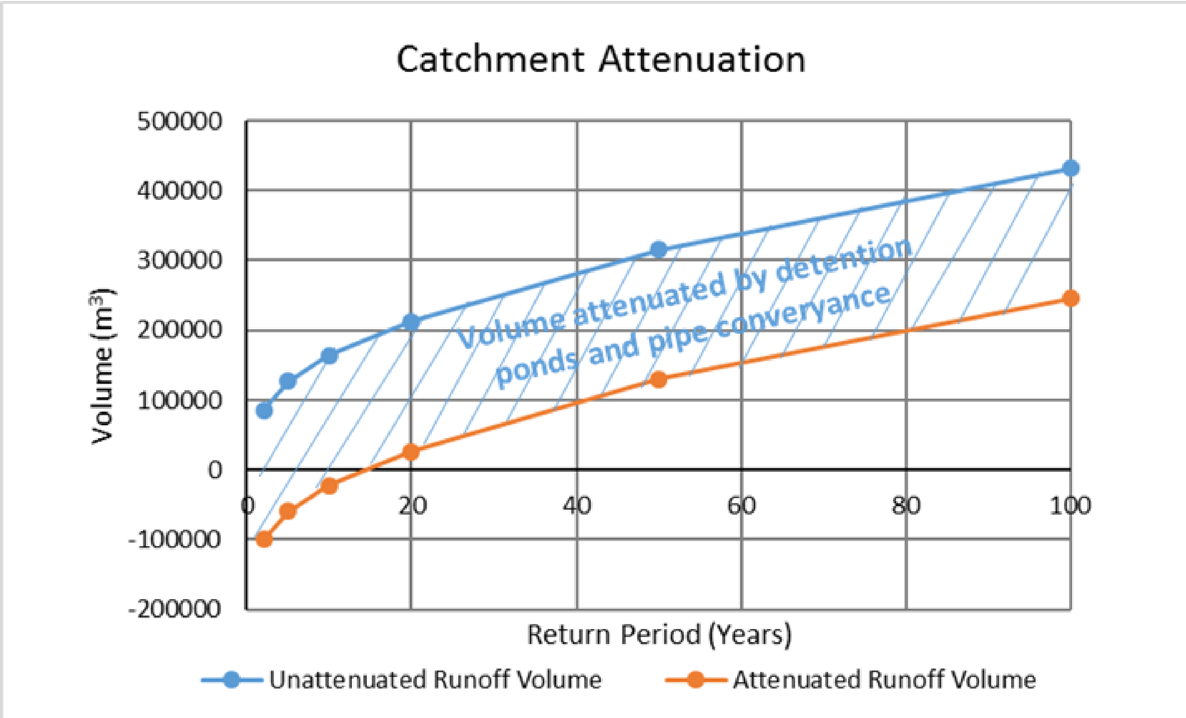

Figure 4.3.1 Catchment attenuation as a result of detention ponds and major outfall pipes

The Phikon stormwater master plan does not address the existing development scenario.

4.3.3 Study Area Surface Water Runoff

The study area, which measures 287 hectares in extent, can be divided into four smaller drainage zones, as illustrated in Annexure D and described in Table 4.3.8.

As was seen in Table 4.3.1, there are three existing detention ponds situated within the study area. These have a combined storage capacity estimated at $41000m^3$. The four drainage zones in the study area have varying levels of development and therefore differing runoff characteristics. Table 4.3.9 describes these.

Table 4.3.8 Drainage zones within the study area

Drainage zone	Area (ha)	L (km)	T_c (h)
1	26.7	0.7	1.0
2	143.8	1.7	1.5
3	16.8	0.7	1.0
4	99.9	1.5	1.4
Total	**287.2**		

Table 4.3.9 Development characteristics of drainage zones

Drainage zone	% Developed	% Undeveloped	C
1	20%	80%	0.40
2	50%	50%	0.55
3	20%	80%	0.40
4	1%	99%	0.31

Using the Rational Method, the following peak runoff flows and volumes were calculated (see Tables 4.3.10 and 4.3.11):

Table 4.3.10 Peak runoff flows calculated for drainage zones

Drainage zone	Q_2 (m^3/s)	Q_5 (m^3/s)	Q_{10} (m^3/s)	Q_{20} (m^3/s)	Q_{50} (m^3/s)	Q_{100} (m^3/s)	Q_{200} (m^3/s)
1	0.22	0.33	0.42	0.55	0.81	1.11	1.25
2	1.37	2.03	2.62	3.40	5.05	6.90	7.77
3	0.14	0.21	0.27	0.35	0.51	0.70	0.79
4	0.53	0.78	1.01	1.30	1.93	2.64	2.97

Table 4.3.11 Runoff volumes calculated for drainage zones

Drainage zone	V_2 (m^3)	V_5 (m^3)	V_{10} (m^3)	V_{20} (m^3)	V_{50} (m^3)	V_{100} (m^3)	V_{200} (m^3)
1	1202	1772	2289	2975	4404	6027	6780
2	11268	16635	21528	27933	41446	56636	63753
3	757	1116	1441	1873	2773	3795	4269
4	4066	6005	7785	10101	14977	20466	23025
Total	**17293**	**25528**	**33042**	**42882**	**63600**	**86924**	**97827**

As can be seen from Table 4.3.11, the existing detention ponds in the study area are adequate for design storms up to the 10-year storm. Any upgrades to the stormwater infrastructure in the study area needs to be done in conjunction with the greater catchment.

4.4 ELECTRICITY

Electrical infrastructure belonging to the CoCT and Eskom was investigated. The existing infrastructure includes copper cables, aluminium cables and substations.

Both the CoCT and Eskom were asked to supply information regarding the location of their existing infrastructure within the study area. Detailed maps were supplied, indicating the location of underground and overhead cables, as well as the voltage of these cables (i.e low, medium or high).

Shortcomings of the data included:

- Exact locations and depths of underground cables were not specified.
- The interaction between the CoCT's electricity supply and Eskom's bulk supply was not clear.

It was therefore necessary to meet Eskom officials to ascertain the extent and capacity of their infrastructure.

4.4.1 Existing Infrastructure

The CoCT's infrastructure is located within one small residential area. The area is made up of a low cost housing development. This can be seen in Annexure E. The CoCT supply is connected to one of Eskom's main cables. Eskom supplies electricity via the Vlakte 66/11kV substation which is located near Lanzerac Road. This substation already has limited capacity, with a peak demand in 2014 resulting in only 3MVA spare capacity. There are currently plans underway to reduce the peak load by 5MVA in the next three years.

4.5 TELECOMMUNICATIONS

Telecommunications infrastructure belonging to Telkom, Neotel and Dark Fibre Africa (DFA) was investigated. Telkom and DFA were found to have existing infrastructure within the study area. The existing infrastructure includes: fibre optic cables, copper cables, telephone poles, junction boxes and a technology cabinet.

The companies with existing services were asked to supply information regarding the location of their infrastructure within the study area. Telkom supplied a line drawing indicating the position of their fibre optic routes, as well as the local connections to individual consumers in the vicinity of the study area. DFA supplied an aerial photo with a line drawing showing the current location of their fibre optic cables.

Shortcomings of the data included:

- Exact locations and depths of underground cables were not specified.
- The accuracy of the Telkom map is questionable.

It was therefore necessary to make certain assumptions based on experience and certain calculations. The exact locations of cables can only be determined on site.

4.5.1 Existing Infrastructure

Telkom has a technology cabinet on the corner of Stock and Lanzerac Roads, which is connected to the exchange in Mitchells Plain. There is a large network of copper cables which have a wide coverage throughout the majority of the study area. However, theft of these cables is a common hindrance to service provision. Residential areas affected are now being supplied by a wireless service known as WCDMA which is connected to Mitchells Plain. The limiting factor of this technology is its slow internet speed which at best is 512kb/s, which is not enough for a video call, such as Skype. A Telkom fibre optic cable runs along the length of Stock Road and west from Stock Road along Sheffield Road. This can be seen in Annexure E. It is possible for businesses to have their own fibre optic connection from Telkom.

DFA has a fibre optic cable that runs along a section of the northern boundary of the study area, parallel to Govan Mbeki Road. The cable continues along Stock Road until Sheffield Road, where it heads west away from the study area.

5.0 FULL DEVELOPMENT SCENARIO

It is envisaged that the full development scenario would entail approximately 105 ha of light industrial development combined with about 109 ha of low income residential development. Together, these land uses would occupy about 75% of the study area, which measures 287 ha in extent. The remaining 25% of the site would be taken up by roads, public open spaces and detention ponds.

For the purposes of this study, the residential density has been assumed to be 60 dwelling units per hectare. This would equate to individual free standing properties of approximately 120m^2 in size. It is envisaged that approximately 6600 dwelling units could be provided. In terms of the provisions of the CSIR's "Guidelines for Human Settlements and Design" (the so-called Red Book), this would mean accommodation for some 46000 people, assuming low income. Table 5.0.1 and Figure 5.0.1 below illustrate the full development scenario.

Table 5.0.1 Land use characteristics for full development scenario

	Light Industrial	**GLA**	**Residential**	**Dwelling Units**	**Total Developed Area**	**Undeveloped Area**
Existing Scenario (ha)	38.3	18.4	15.9	953	54.2	233
Existing Scenario (%)	13%		6%		19%	81%
Full Development Scenario (ha)	105.0	50.4	109.3	6557	214.3	72.9
Full Development Scenario (%)	37%		38%		75%	25%
Increase	66.7	32.0	93.4	5606.6	160.1	-160.1
Increase (%)	174%	174%	588%	588%	295%	-69%

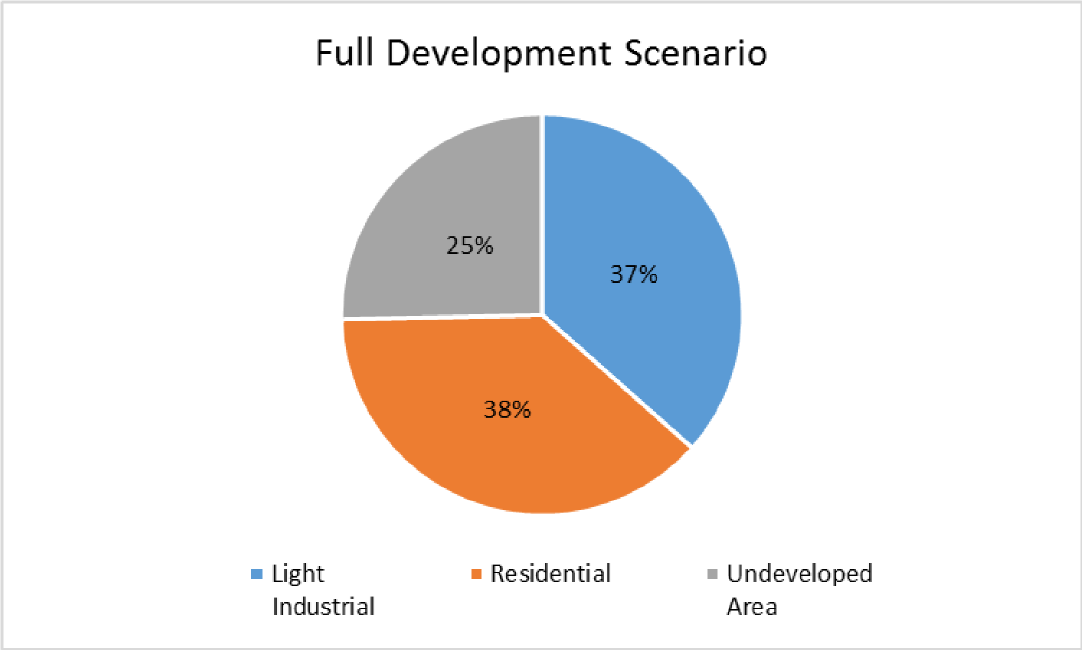

Figure 5.0.1 Pie chart indicating the full development scenario's land use characteristics

The anticipated demand of this development on the existing infrastructure has been calculated and is presented below. Recommendations have been added as applicable.

5.1 POTABLE WATER

5.1.1 Service Overview

As was stated in Paragraph 4.1.1, the study area has been well equipped with bulk water infrastructure. The ability of this infrastructure to cope with the anticipated post-development water demand is of the utmost importance and therefore, has to be estimated and assessed.

It should be noted that the observations below are first order estimates and that more definitive calculations can only be made during the planning phase. Detailed computer software analysis, such as EPANET, would need to be undertaken.

5.1.2 Capacity Analysis

Further to the assumptions listed in Paragraph 4.1.2, the following parameters were set for the estimation of water demand in the full Development scenario:

- Peak factor: 4.00
- Residential (lower income) water demand: 600l/erf/day
- Moderate fire risk instantaneous demand: 6000l/min

- Low fire risk instantaneous demand: 350l/min
- Design fire flow per hydrant in moderate risk: 1500l/min
- Design fire flow per hydrant in low risk: 350l/min

Table 5.1.1 reveals the proposed allocation of light industrial and residential development across the study area. A drawing showing the proposed water zone areas can be viewed in Annexure A. Table 5.1.2 shows the calculated water demand of the full development scenario.

Table 5.1.1 Proposed allocation of land use for full development scenario across the study area

Zone	Total Area (ha)	Dev Area (ha)	GLA (ha)	Res (ha)	Total Dev (ha)	DU
1	22.5	8.2	3.9	8.5	16.8	513
2	36.7	13.4	6.4	14.0	27.4	839
3	78.6	28.8	13.8	29.9	58.7	1796
4	72.5	26.5	12.7	27.6	54.1	1655
5	27.6	10.1	4.8	10.5	20.6	630
6	49.3	18.0	8.6	18.8	36.8	1125
Total	**287.2**	**105.0**	**50.4**	**109.3**	**214.3**	**6557**
		37%		38%	75%	

Table 5.1.2 Calculated water demand for the full development scenario

Zone	AADD (kl/day)			Q (kl/day)	Q_{des} (l/s) (without fire flow)
	Light Industry	Residential	Total		
1	157.6	307.6	465.2	1861.0	21.5
2	257.9	503.4	761.3	3045.4	35.2
3	552.1	1077.5	1629.6	6518.2	75.4
4	508.7	992.8	1501.5	6006.1	69.5
5	193.7	377.9	571.6	2286.4	26.5
6	346.0	675.2	1021.2	4084.8	47.3
Total	**2016.0**	**3934.5**	**5950.5**	**23801.9**	**275.5**

The calculated design flow for the full development scenario is compared to the design flow for the existing scenario in Figure 5.1.1.

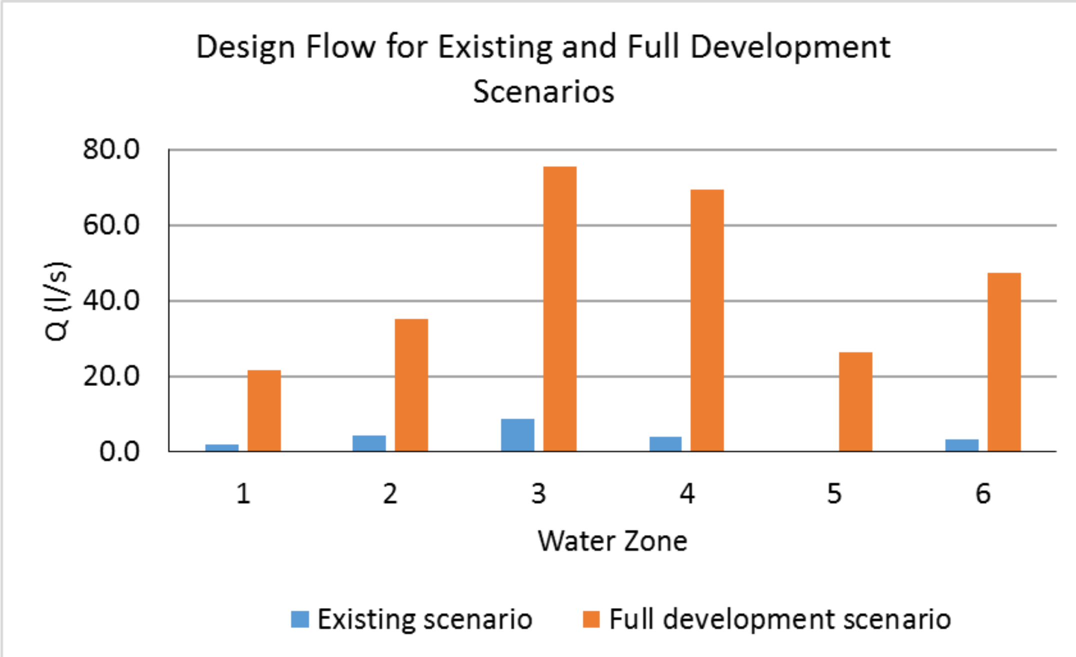

Figure 5.1.1 Comparison of the existing and full development scenarios' design flow

As indicated in Table 5.1.2, the design flow here excludes fire flow. It was determined that a maximum of 9 hydrants would be operational at one time, as per the requirements of the *Red Book* for a moderate risk zone. A total fire flow of 225l/s has been calculated.

Six fire scenarios were considered, namely one fire occurring in each zone (with no two fires occurring simultaneously). A minimum residual pressure of 15m and flow of 25l/s per hydrant was ensured. Three supply pipelines were assessed, and their total energy input into the study area was calculated using the CoCT's GIS data. This is shown in Table 5.1.3 below.

Table 5.1.3 Energy input due to bulk water feeds into the study area

Bulk feed	v (m/s)	Operating head (m)	Energy (m)
1	0.79	42.9	43
2	0.20	56.5	57
3	0.01	56.0	56
Total			**155**

Considering that the total energy available from the three bulk feeds is 155m, it was required to be seen whether the existing water network could support this water demand without hydrant residual pressures dropping below 15m. The most severe fire scenarios, which place the most strain on the water network, are when a fire occurs in zone 2 or zone 4. An approximation of the available head and resultant velocities for each zone is illustrated in Table 5.1.4.

Table 5.1.4 Water demand scenario during a fire in zone 4

Bulk feed	Pipe diameter of bulk feeder (mm)	Fire in zone 2			Fire in zone 4		
		Required water consumption (l/s)	v (m/s)	Head (m)	Required water consumption (l/s)	v (m/s)	Head (m)
1	300	21.5	0.30	55.5	21.5	0.30	55.5
2	225	260.2	6.55	0	35.2	0.89	12.4
3	375	75.4	0.68	15.7	75.4	0.68	15.7
4	225	69.5	1.75	0.6	294.5	7.41	0
5	150	26.5	0.37	30.2	26.5	0.37	30.2
6	535	47.3	0.21	40.5	47.3	0.21	40.5
Total		**500.5**			**500.5**		

The operating head that occurs during a fire is not in accordance with the *Red Book* standards. This is due to bulk feeds being undersized to support fire demands. The velocities are also too high. This is the case for zones 2, 4 and 5. It should also be noted that the current water network has limited provision for pipe breakages. Should a break occur in the trunk mains, a large number of users will be affected.

It would be advised to upgrade reticulation pipes and create more connections to existing trunk mains. This would create a grid pattern. A suggestion of such a water network layout can be seen in Annexure B. This kind of layout would help to combat low operating heads, high velocities during a fire, as well as ensure continuity of supply in the event of pipe breakages.

5.1.3 Recommendations

- Reticulation pipes smaller than DN300 in size should be upgraded to at least DN300.
- Existing supply mains should be extended where necessary to create new connections to lessen the risk associated with pipe breakages.
- In order to more accurately determine the capacity and performance of the existing infrastructure, and to gauge the impact of the proposed full-development scenario, a computer model, such as EPANET, should be created and run.

5.2 FOUL SEWER

5.2.1 Service Overview

As was stated in Paragraph 4.2.1, the study area has been well equipped with foul sewer gravity mains. Table 4.2.3 revealed that the existing infrastructure has ample capacity for the existing scenario. However, the ability of this infrastructure to cope with the anticipated increase in post-development foul sewer demand has to be estimated and assessed.

It should be noted that the observations below are first order estimates and that more definitive calculations can only be made during the planning phase. Detailed computer software analysis, such as PCSWMM would need to be undertaken.

5.2.2 Capacity Analysis

Further to the assumptions listed in Paragraph 4.2.2, the following parameters were set for the estimation of sewer demand in the full development scenario:

- Peak Factor: 1.80
- Total peak factor: 2.07 (including infiltration)

Table 5.1.1 revealed the proposed allocation of light industrial and residential development across the study area. A drawing showing the proposed sewer zone areas can be viewed in Annexure C. Table 5.2.2 shows the calculated sewer demand of the full development scenario.

Table 5.2.2 Calculated sewer demand of the full development scenario

Zone	**AADD (kl/day)**			**Q (kl/day)**	**Q_{des} (l/s)**
	Light Industry	**Residential**	**Total**		
1	157.6	256.3	414.0	856.9	9.9
2	257.9	419.5	677.4	1402.3	16.2
3	552.1	897.9	1450.0	3001.5	34.7
4	508.7	827.3	1336.0	2765.6	32.0
5	193.7	315.0	508.6	1052.8	12.2
6	346.0	562.7	908.7	1880.9	21.8
Total	**2016.0**	**3278.7**	**5294.7**	**10960.1**	**126.9**

Based on these results, the existing sewer infrastructure appears to have sufficient available capacity to accommodate the increase in demand. Table 5.2.3 and Figure 5.2.1 illustrate this. It has also been ascertained from local authorities that the Cape Flats WWTW has ample capacity for the increased volume.

Table 5.2.3 Comparison of total calculated sewer flow and spare capacity for the full development scenario

Zone	Total Flow (l/s)	Spare Capacity (l/s)	Difference (l/s)
1	9.9	118	108.1
2	116.9	150	33.1
3	78.9	161	82.1
4	44.2	190	145.8
5	12.2	90	77.8
6	Incl	Incl	Incl

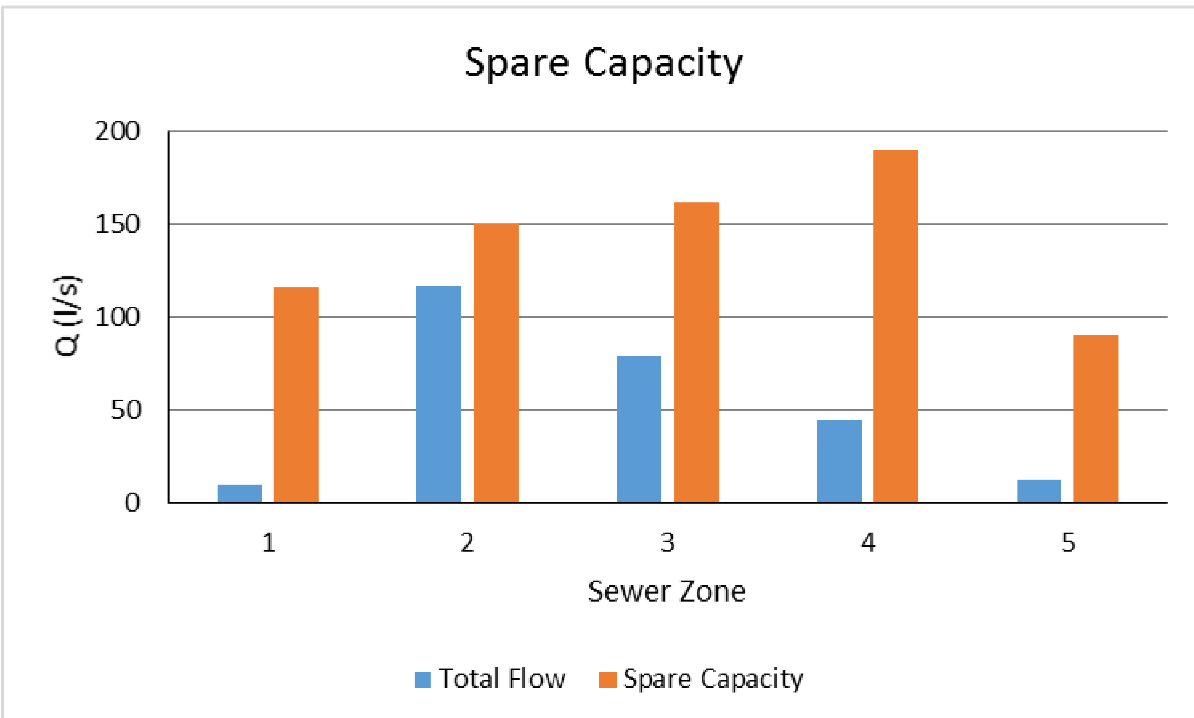

Figure 5.2.1 Spare capacity of each sewer zone in the full development scenario

5.2.3 Recommendations

- In order to more accurately determine the capacity and performance of the existing infrastructure, and to gauge the impact of the proposed full-development scenario, a computer model, such as PCSWMM, should be created and run.
- Once the planning of the proposed development has commenced, it would be advisable to apportion development in accordance with the calculated daily sewer demand and available spare capacity.

5.3 STORMWATER

5.3.1 Service Overview

As was stated in paragraph 4.3.1, the study area has three existing detention ponds and two major stormwater outfall pipes. The ability of this infrastructure to cope with the anticipated increase in post-development surface water runoff is clearly of critical importance.

In order to calculate the impact of the proposed full-development scenario, it was necessary to make certain assumptions. It should be noted that the observations below are first order estimates and that more definitive calculations can only be made during the planning phase. Detailed computer software analysis, such as PCSWMM would need to be undertaken. The SWMP completed in 2000 used Visual Hydro SWMM to analyse the area. From the analysis, the required volume of detention storage for a 50 year storm was provided. This is to be compared to the calculations below.

5.3.2 Capacity Analysis

The capacity of the existing stormwater infrastructure in the full development scenario was investigated. Table 5.3.1 reveals the proposed allocation of light industrial and residential development across the study area. The total developed area is 75%, which is comparable to that modelled in the SWMP of 70%. A drawing showing the proposed drainage zone areas can be viewed in Annexure D.

Table 5.3.1 Allocation of land use per drainage zone in the full development scenario

Drainage zone	Total Area (ha)	Developed Area (ha)	GLA (ha)	Residential (ha)	Total Development (ha)
1	26.7	9.8	4.7	10.2	19.9
2	143.8	52.6	25.2	54.7	107.3
3	16.8	6.2	3.0	6.4	12.6
4	99.9	36.5	17.5	38.0	74.5
Total	**287.2**	**105.0**	**50.4**	**109.3**	**214.3**
	100%	37%		38%	75%

As was seen in Table 4.3.1, there are three existing detention ponds situated within the study area. These have a combined storage capacity estimated at 41000m^3. For calculation purposes using the Rational Method, four drainage zones in the study area are expected to have the runoff characteristics shown in Table 5.3.2 below.

Table 5.3.2 Runoff characteristics for the study area in the full development scenario

Land Use	Runoff Coefficient C
Light industrial areas	0.8
Residential areas	0.7
Undeveloped areas	0.3
Combined	**0.64**

The following peak runoff flows and volumes were calculated, as can be seen in Tables 5.3.3 and 5.3.4. Figures 5.3.1 and 5.3.2 graphically compare the existing and full development scenarios.

Table 5.3.3 Peak runoff flows for the full development scenario

Drainage zone	Q_2 (m^3/s)	Q_5 (m^3/s)	Q_{10} (m^3/s)	Q_{20} (m^3/s)	Q_{50} (m^3/s)	Q_{100} (m^3/s)	Q_{200} (m^3/s)
1	0.35	0.52	0.67	0.87	1.29	1.76	1.99
2	1.59	2.34	3.03	3.93	5.83	7.97	8.97
3	0.22	0.33	0.42	0.55	0.81	1.11	1.25
4	1.09	1.62	2.09	2.72	4.03	5.51	6.19

Table 5.3.4 Runoff volumes for the full development scenario

Drainage zone	V_2 (m^3)	V_5 (m^3)	V_{10} (m^3)	V_{20} (m^3)	V_{50} (m^3)	V_{100} (m^3)	V_{200} (m^3)
1	1909	2813	3634	4723	6992	9569	10765
2	13011	19208	24857	32254	47856	65396	73614
3	1202	1771	2288	2974	4402	6025	6778
4	8466	12504	16209	21032	31186	42615	47942
Total	**24587**	**36297**	**46989**	**60982**	**90436**	**123605**	**139098**

As can be seen from Table 5.3.4, the existing detention ponds in the study area appear to be insufficient for design storms greater than the 5-year storm. As larger storms would cause flooding of roads and low-lying areas, it would be necessary to construct additional detention storage.

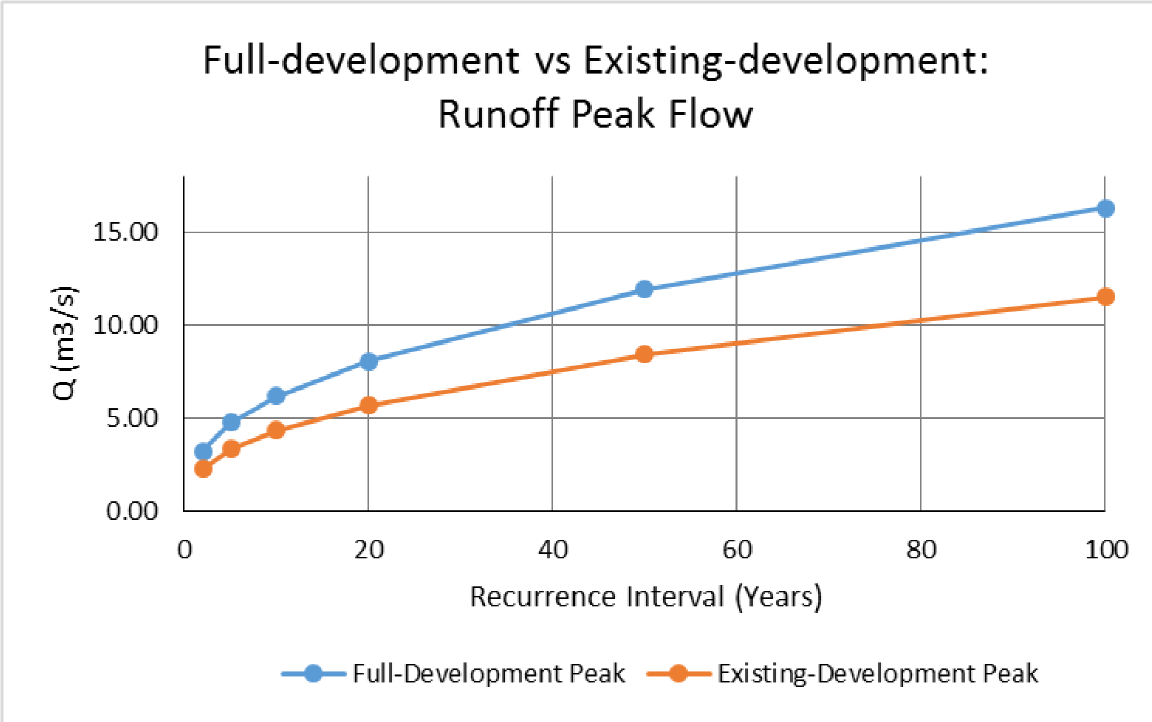

Figure 5.3.1 Comparison of the full-development and existing-development runoff peak flows for specified recurrence interval

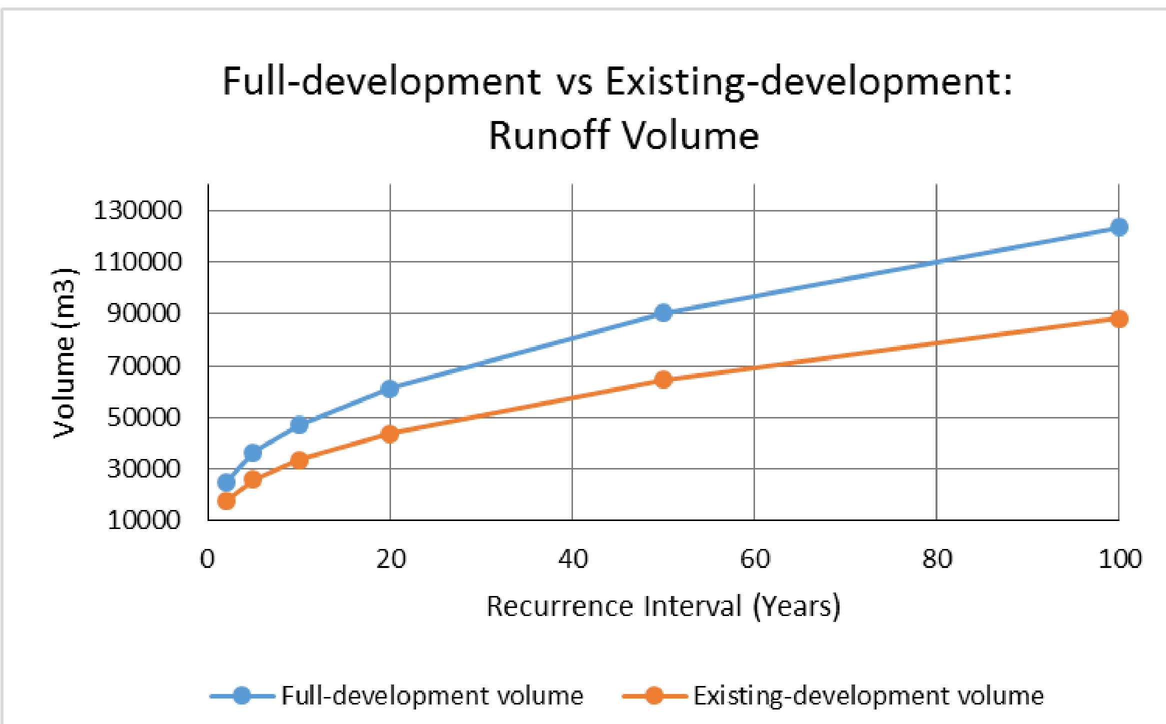

Figure 5.3.2 Comparison of the full-development and existing-development runoff volumes for specified recurrence intervals

Phikon completed a master plan that suggested the detention storage required for a 50 year RI storm in the greater catchment for the full development scenario. For the drainage zones described in section 4.3.3, the pro-rated required detention storage is 112500m^3. In the same way, HHO Africa calculated a volume of 111300m^3. This correlates well. A summary of the relevant calculations for the study area is given in Table 5.3.5.

Table 5.3.5 Summary of the study area runoff in 50 year RI storms

	Volume (m^3)
Full development scenario runoff	111300
Existing detention storage	41000
Required storage	70300

An additional 70300m^3 of additional detention storage is required for the study area which translates into 14.1 ha of detention ponds, 0.5m deep. This would increase the total area occupied by detention ponds from 8.2 ha to 22.3ha, or 7.8% of the study area. Figure 5.3.3 provides a graphical summary of the detention storage currently available on site and compares this with the demands of the full development scenario.

Figure 5.3.3 Detention storage available compared to storage required for various scenarios

5.3.3 Recommendations

- A further 14.1 ha should be set aside for detention ponds in the full development scenario. This would increase the total area occupied by detention ponds from 8.2 ha to 22.3ha, or 7.8% of the study area.
- In order to more accurately determine the capacity and performance of the existing infrastructure, and to gauge the impact of the proposed full-development scenario, a computer model, such as PCSWMM, should be created and run.
- Once the planning of proposed development has commenced, it will be necessary to include the treatment and attenuation of surface water runoff in the planning process. Any future developments would need to satisfy the CoCT's "Management of Urban Stormwater Impacts Policy." This policy describes the required treatment of surface water runoff in terms of quality and quantity.

5.4 ELECTRICITY

5.4.1 Service Overview

As was stated in paragraph 4.4.1, electricity is supplied by the City of Cape Town, as well as by Eskom. However, it has been assumed that Eskom provides the CoCT's portion via their Vlakte substation. The Vlakte 66/11kV substation has a capacity of 40MVA, with peak loads in 2014 having reached 37MVA.

5.4.2 Capacity Analysis

The full development scenario will require an estimate of 18MVA. According to Eskom, a portion of this can be absorbed by the Vlakte substation (approximately 4MVA). However, a substation upgrade or a new substation with a MV/MV switching station will be required to supply the remainder of the load.

5.4.3 Recommendations

- A new substation will be required to provide the future development's electricity needs.
- All cables must be underground to prevent theft from occurring.

5.5 TELECOMMUNICATIONS

5.5.1 Service Overview

As was stated in paragraph 4.5.1, the study area is well served by Telkom with a fibre optic cable traversing the site and many existing consumers having local connections. DFA also has a fibre optic cable within the study area.

However, theft of copper cables has affected the service provision and Telkom is currently hesitant to install a second technology cabinet. Currently Telkom supplies some nearby residential areas with a wireless service which removes the need for overhead copper cables. This could be used for future residential developments. It does not, however, provide suitable internet speeds for most businesses.

5.5.2 Capacity Analysis

Telkom would be able to supply future businesses with a fixed line connection to the existing fibre optic network. However, it is assumed that residential consumers will only be able to apply for a WCDMA connection. Telkom has indicated that they wish to install a second technology cabinet if local security is improved, which would be able to provide residential fixed line connections.

5.5.3 Recommendations

- New businesses should apply for a direct link to the existing Telkom fibre optic network.
- Residential areas should be provided with a WCDMA connection.

6.0 CONCLUSION

An investigation was carried out on behalf of the Philippi Economic Development Initiative (PEDI) in order to assess the capacity of existing municipal services in the Philippi Economic area. This included potable water, foul sewer, stormwater, electricity and telecommunications. After considering the existing scenario, the anticipated demand associated with a full development scenario was calculated. The full development scenario is made up of 38% light industrial, 37% low income residential and 25% open spaces (such as roads, detention ponds, green areas etc.). The comparison of the future demand and the existing capacity for each service provided a method of identifying any shortcomings, following which recommendations could be made.

The outcome of the analysis of municipal services is explained below, and the associated recommendations are given.

- Potable Water:
  - It is evident from the data that the area occupied in the August 2014 land invasion has not been serviced with standpipes. It is also believed that certain informal settlements in the existing scenario also have no access to a potable water supply.
  - It is recommended that supply pipes under DN300 in size should be upgraded to at least DN300.
  - Existing supply mains should be extended where necessary to create looped networks to lessen the risk of pipe breakages.
  - In order to more accurately determine the capacity and performance of the existing infrastructure, and to gauge the impact of the proposed full-development scenario, a computer model, such as EPANET, should be created and run.

- Foul Sewer:
  - It is evident from the data that the area occupied in the August 2014 land invasion has not been serviced in the interim by the waterborne sanitation system.
  - Notwithstanding the above, the existing CoCT foul sewer infrastructure has sufficient spare capacity to meet the anticipated demands of the full development scenario.
  - It must be noted that the Philippi Collector has collapsed in three locations between the study area and the Waste Water Treatment Works (WWTW). The capacity of downstream infrastructure may hamper development.
  - The Cape Flats WWTW has sufficient treatment capacity for the future development.

- Stormwater:
  - As there are no rivers on site, the proposed development is unimpeded by floodlines.

- The existing detention ponds and outfall pipes on site have sufficient capacity to attenuate and convey the 10-year Recurrence Interval (RI) storm in the current development scenario.
- Based on this preliminary analysis, the existing DN900 and DN1350 bulk stormwater outfall pipes on site appear adequate for the full development scenario, provided that on-site attenuation is improved and Sustainable Urban Drainage System (SUDS) principles are adopted.
- Notwithstanding the above, the capacity of downstream infrastructure should be ascertained.
- It is recommended that a further 14.1 ha be set aside for detention ponds in order to attenuate runoff in the full development scenario. This would bring the total surface area of detention ponds to 22.3 ha.
- In order to more accurately determine the capacity and performance of the existing infrastructure, and to gauge the impact of the proposed full-development scenario, a computer model, such as PCSWMM, should be created and run.
- Once the planning of proposed development has commenced, it will be necessary to include the treatment and attenuation of surface water runoff in the planning process. All future developments would need to satisfy the CoCT's "Management of Urban Stormwater Impacts Policy." This policy describes the required treatment of surface water runoff in terms of quality and quantity.

- Electricity

  - Electricity is provided by Eskom, except for a small low cost housing area, which is supplied by The CoCT.
  - Eskom currently has insufficient capacity for further development in the area. A portion of the required load, approximately 4MVA of the total 18MVA, can be absorbed by the existing substation.
  - A substation upgrade or a new substation with a MV/MV switching station will be required to supply the remainder of the future development.
  - It is recommended that all future cables are placed underground to prevent theft.

- Telecommunications

  - The location of existing services provided by Telkom and Dark Fibre Africa (DFA) within the study area was determined.
  - DFA's fibre optic cable could be used by businesses in the future development.
  - Telkom currently has an extensive network comprising of fibre optic cables, and local connections to individual existing consumers.
  - Security risks associated with cable theft pose a threat to Telkom's future service provision.
  - Future businesses would be advised to apply for a direct connection to Telkom's fibre optic network. This would ensure fast internet speeds.
  - Residential areas would most likely be required to use a more limiting wireless service.

7.0 REFERENCES

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