nelson mandela bay MUNICIPALITY

HUMAN SETTLEMENTS DIRECTORATE

CONTRACT NUMBER: SCM/15-36/C

PRELIMINARY DESIGN REPORT

FOR

DESIGN, INSTALLATION AND MONITORING OF CIVIL ENGINEERING SERVICES FOR LOW COST HOUSING IN SEAVIEW

MARCH 2017

PREPARED FOR:

The Executive Director
Human Settlements Directorate

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DOCUMENT CONTROL SHEET

Client Name	:	*Nelson Mandela Bay Municipality*
Project name	:	*Contract No. SCM 15-36/C Design, Installation and Monitoring of Civil Engineering Services for Low Cost Housing in Seaview*
Proposal Title	:	*Preliminary Design Report*
Gilgal Project No	:	*J201508*
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Consultant: Gilgal Development Consulting Engineers & Project Managers

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1. SYNOPSIS

Nelson Mandela Bay Municipality (NMBM) appointed Gilgal Development Consulting Engineers (Gilgal) for the installation of civil engineering services for the proposed low cost housing development in Seaview.

The ultimate objective of the proposed development is to provide the current residence of Zweledinga and New Rest with formal houses. Relocation/re-positioning of households situated in the way of construction will be required prior commencement of construction phase.

Seaview is located along the coastline, approximately 35 km west of Port Elizabeth city center in the NMBM. Coordinates: 34°0'25.29"S longitude and 25°21'12.63"E latitude, 60m above mean sea level.

The proposed development is located in Land Development Option 1 which comprises the following portions of land: Erf 237, 238, 240, 10/28, and 590. See attached Plan No LP1. The land can accommodate approximately 478 housing units. A road servitude through Erf 31/28 will be required to access the proposed development on Erf 10/28. The slope of these areas varies between 0.5% and 3%.

The Engineer's Project Cost Estimate based on preliminary information available for Land Development Option 1 is R 36,376,688.

Land Development Option 2 is situated on Erf 1/28 as indicated on Plan No LP1. The land is currently privately owned. The slope varies between 3% and 8%. This land has a potential to accommodate approximately 1050 housing units.

Should leach pit sanitation system be used for Land Option 2 then the Engineer's Project Cost Estimate would be R 76,661,277. However, should full waterborne sewerage system be considered, the required budget would be R 102,474,948.

The construction of this project is anticipated to commence on completion of the bulk water supply upgrade. According to the PIP it is envisaged that the construction phase would commence in July 2018 provided that the bulk water supply upgrade and all environmental processes have been completed.

The project will also benefit the local SMMEs and the local labour through creation of more job opportunities. Local labour will benefit from the project by getting temporary jobs for the duration of the construction.

The design parameters utilized to calculate the demand and requirements for civil services for this report are in accordance with "Guidelines for Human Settlement Planning and Design (Red Book)", SANS 1200, NMBM Design Requirements and Standard Infrastructure Details of 2007, UTG 4 - Guidelines for Urban Stormwater Management, City Engineer's Department Report on the update Of Rainfall Duration Frequency Curves, UTG 7 - Geometric Design of Urban Local Residential Streets, and TRH4 – Guidelines for Road Construction Materials.

2. INTRODUCTION

2.1 PROJECT APPOINTMENT

The Nelson Mandela Bay Municipality (NMBM) appointed Gilgal Development Consulting Engineers (Gilgal) for the Design, Installation and Monitoring of Civil Engineering Services for the proposed Low Cost Housing Development in Seaview.

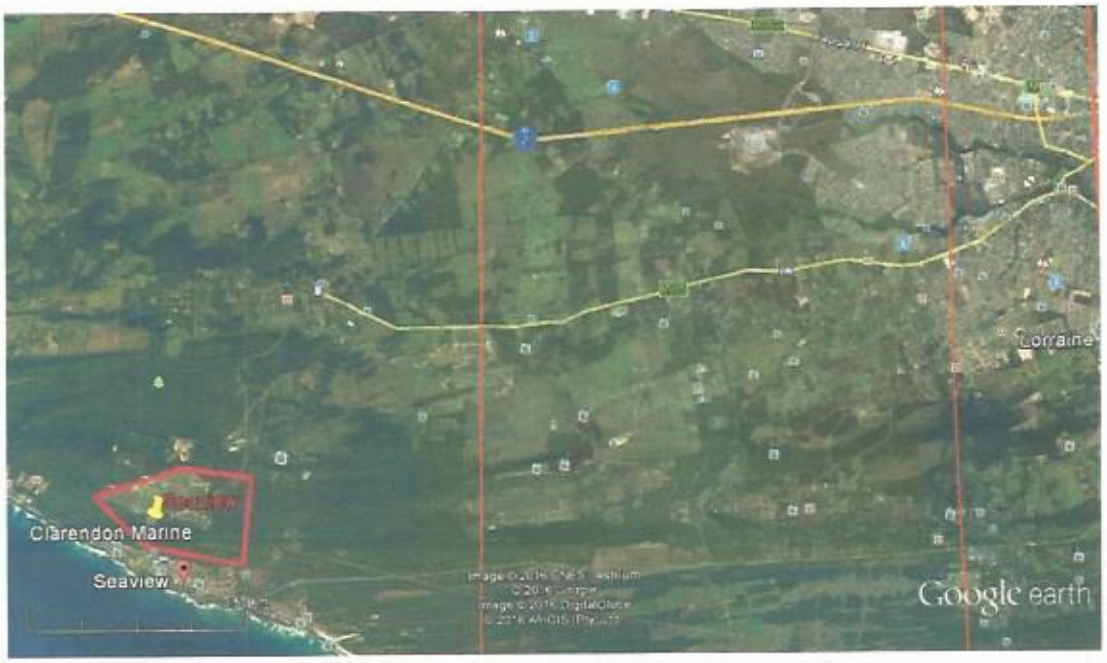
The following table illustrates the identification of the project:

Table 1: Project Identification

Project Name	Design and Installation of Civil Engineering Services in Seaview		
Client	Nelson Mandel Bay Municipality		
Consultant	Gilgal Development Consulting Engineers (Pty) Ltd		
	Option 1 (Leach Pit System)	**Option 2 (Leach Pit System)**	**Option 2 (Waterborne System)**
Professional Fees	R 1,966,000	R 4,296,089	R 5,018,855
Construction Estimate	R 34,410,687	R 72,365,188	R 97,456,093
Project Budget	R 36,376,688	R 76,661,277	R 102,474,948

2.2 PROJECT LOCATION

Seaview is located along the coastline, approximately 35 km west of Port Elizabeth city center in the NMBM as shown on the google map below. Coordinates: 34°0'25.29"S longitude and 25°21'12.63"E latitude, 60m above mean sea level.



2.3 AVAILABLE INFORMATION

Information in the form of reports from other professional service providers was received from the NMBM. Draft cadastral layouts were received from the NMBM for the purpose of establishing the viability of developing these areas in respect of engineering services.

2.4 PURPOSE OF THE REPORT

The purpose of this report is to:

- define the scope of works for the proposed new development
- determine the design parameters for the proposed civil engineering services
- determine the implementation options
- determine procurement requirements
- compile cost estimate
- compile a Project Implementation Plan (PIP)
- draw conclusions and make recommendations for implementation

3. PROJECT SCOPE

Proposed Land Development Option 1 comprises the following portions of land: Erf 237, 238, 240, 10/28, and 590. Land Development Option 2 is situated on Erf 1/28 and is privately owned. The project scope can be defined as follows:

3.1 CURRENT STATUS

Portions of Erf 590, 240 and 238 are currently occupied by informal settlements and will require relocation/re-positioning of households situated in the way of construction before the commencement of construction stage of the project.

Proposed Development Option 1 consists of land pockets located on Erf 238, Erf 240, Erf 10/28 and Erf 590. The development of these sites is limited only to existing open and degraded areas and is mostly characterized by forest protected areas. According to the Draft Layouts approximately 473 housing units can be accommodated, but due to stormwater problems 5 sites might forfeited and that bring the number down to 468.

The topography of these areas show that some portions of these areas are located at lowest points which will result in stormwater ponding problems. The slope of these areas is generally flat, varies between 0.5% and 3%.

The topography of Option 2 land is gently sloping in one direction from one end to the opposite end, which makes it more viable for the development in terms of the stormwater drainage and sewerage networks. The slope varies between 3% and 8%. This land has a potential to accommodate approximately 1050 housing units.

3.2 TOPOGRAPHICAL SURVEY

Quotations have been requested from the relevant service providers for a detailed topographical survey to all proposed development areas. The required procurement procedure will be followed to appoint a Sub-Consultant to provide a detailed survey. On site presence and guiding will be provided to the surveyor. Approved surveying methods and drawing presentation will be followed.

Due to the presence of dense bushes within the proposed development areas, survey work is not possible. Surveying fieldwork will be conducted by approved registered service provider as our Sub-Consultants once the bush clearing has been conducted.

3.3 GEOTECHNICAL INVESTIGATION

Quotations have been requested from the relevant service providers for a detailed geotechnical investigation to all proposed development areas. The investigation will include soil sampling, testing and documentation of results. On site presence and guiding will be provided to the surveyor. All geotechnical fieldwork will be conducted by approved registered service providers as our Sub-Consultants. Detailed designs will include recommendations from the geotechnical investigation.

3.4 ENVIRONMENTAL IMPACT ASSESSMENT

SRK has been appointed for the EIA investigation and to obtain the Record of Decision (RoD). SRK will develop the Environmental Management Plan and to ensure that the Contractor complies with the prevailing environmental regulations throughout the duration of the project.

3.5 TOWN PLANNING

Draft layouts for Option 1 development were received from the NMBM. Preliminary designs were prepared according to the draft layouts compiled by the NMBM Town Planning Department. Only after the receipt of approved town plan layouts, followed by draft General Plans, will the detail designs be completed and submitted for approval.

NMBM could not prepare layout for Option 2 development as the land is currently privately owned. The draft layout prepared by Urban Dynamics was used only for reporting purposes on the potential of the land for residential purposes.

Waste transfer sites on option 1 and 2 layouts have been positioned in such a way they are easily accessible through roads with minimum road reserve width of 12m to enable the turning of the trucks as well. Road reserves are wide enough to accommodate underground and aboveground services on road verges. Electricity supply will be drawn-off from the existing powerline and will be overhead lines located along road verges.

3.6 EXISTING BULK INFRASTRUCTURE

Currently there are no bulk sewerage and stormwater networks to service the proposed development in these areas.

Sanitation in the community of Zweledinga mostly comprises home-built pit latrines. New Rest communal chemical toilets are provided and are serviced by a Municipal appointed service provider. In the developed area of Seaview, most of the sanitation service is provided through septic tanks built by property owners and a few conservancy tanks. They are serviced at cost to the owners through a Municipal appointed service provider.

Water is currently supplied to standpipes located throughout both settlements.

Existing 200mm diameter bulk water main runs along the Seaview road verge to the existing developed residential area in Seaview. There is also a proposed bulk water upgrade by Bosch Stemele which consists of two additional reservoirs to supply the entire Seaview areas including proposed future developments. This upgrading is anticipated to commence in the year 2017. The proposed development will be fed from this 200mm bulk main only after the completion of the bulk water upgrade.

The access to the proposed development areas will be via the existing Seaview road. Currently there is no road access to the proposed development located on Erf 10/28. The proposed access will be via a private land on Erf 31/28 and this will require the procurement of the servitude for the access road from the owner of this portion of land.

4. PROPOSED UPGRADING REQUIREMENT

The proposed development Option 1 comprise the following pockets of land, namely Erf No 237, 238, 240, 31/28, and 590. Land Development Option 2 is situated on Erf 1/28. The designs are based on levels extracted from the contours, topographical survey could only be conducted once the bush clearing has been completed.

4.1 DESIGN CRITERIA

The designs are based on the following design criteria:

- SANS 1200
- Guidelines for Human Settlement Planning and Design (Red Book)
- NMBM Design Requirements and Standard Infrastructure Details, July 2007.
- UTG 4 - Guidelines for Urban Stormwater Management
- City Engineer's Department Report on the update Of Rainfall Duration Frequency Curves

- UTG 7 - Geometric Design of Urban Local Residential Streets
- TRH4 – Guidelines for Road Construction Materials

4.2 PROPOSED ROAD NETWORK

Road network will be designed and constructed to full municipal standard. Proposed roads consist of widths vary from 4m to 6m with the 2.5% crossfall and consist of the following layer works (to be revised when geotechnical investigation information is available):

- In-situ material (road-bed prep.), 150mm thick, compacted to 90% Mod AASHTO maximum density.
- Selected subgrade (G7) where required, 150mm thick, compacted to 93% Mod AASHTO maximum density.
- Subbase (G5), 150mm thick, compacted to 95% Mod AASHTO maximum density.
- Base (G2), 150mm thick, compacted to 100% Mod AASHTO maximum density or 85% BRD for roads with 5m and 6m widths.
- Base (G2), 100mm thick, compacted to 100% Mod AASHTO maximum density or 85% BRD for 4m road widths.
- Continuously graded surfacing consisting of MC30 prime coat and 30mm thick SANS medium mix using 80/100 penetration bitumen.

The minimum longitudinal slope of 0,5% was adopted to allow for the free drainage of stormwater.

The 6m wide roads will consist of barrier kerbs and channels on the upper side and mountable kerbs and channels on the lower side. The 4 and 5m wide roads will consist of mountable kerbs and channels on both sides. 10m radius bellmouths will be constructed at the intersections with adjoining roads. The road works will include trimming and shaping of verges.

Sidewalks will be constructed on the upper side of the road. The width of sidewalks will be 1.2m wide for the 4m roads, 1.5m wide for the 5m roads and 1.8m wide for the 6m roads.

A road servitude through erf 31/28 will be required for access road to portion 10/28 proposed development. As Erf 31/28 is privately owned, the road servitude will need to be procured by the NMBM.

4.3 PROPOSED STORMWATER DRAINAGE

The Rational Method (Q = CIA / 3.6) was used in calculating overland runoff, where C is the runoff co-efficient, I is the rainfall intensity in mm/hr and A is the catchment area in km². The rainfall intensity curves as contained in the City Engineer's Department's Report On The Update Of Rainfall Duration Frequency Curves was used (attached at the back of the report). Since this is a residential area, the pipe

system (minor) has been designed for 1 in 5 year flood and 1 in 20 year flood (major system) has been catered for in the roads.

Type 2 mountable kerbs and channels on the lower edges of the road will be used to collect the stormwater. A minimum road crossfall of 2.5% will ensure that the road and overland stormwater runoff safely drain off the road surface.

The final road surface will be a minimum of 100mm below natural ground level and will act as a stormwater conduit. The stormwater drainage will consist of 450mm diameter minimum, class 100D reinforced concrete pipes on Class B bedding.

Grid inlets and catchpits will be installed at low points on the roads as well as before intersections and at approximately 80m intervals.

The stormwater system of the proposed roads will drain into the proposed bulk stormwater detention ponds located at lowest areas within the development.

As indicated on the layouts some of the proposed sites on Erf 240 and Erf 10/28 for Option 1 are located in water lodged (depressions) areas. This will result in sites located in depressions not being able to be developed. These sites will be flooded during heavy rainfall seasons especially after the development has been completed as there will be more stormwater runoff. Hence it is proposed that some of these site should be utilized as stormwater detention earth ponds. The ponds will be designed to be play areas during dry seasons. This will result in reduction in the number of erven to be used for residential purposes.

Option 2 development site does not have any stormwater drainage problem as the topographic slope allows for a very good stormwater drainage. There might be a need for stormwater control measures i.e. detention pond or discharge outlets at the lowest point of the catchment area to manage the discharge.

4.4 PROPOSED SEWERAGE SYSTEMS

Currently there is no existing bulk sewerage infrastructure to service the proposed development in Seaview and it is evident in the existing surrounding areas where private owners make use of septic tanks.

Manong & Associates were previously appointed by the NMBM to conduct detailed investigations for the bulk sewerage infrastructure for the proposed construction of low-cost housing in Seaview. Makhetha Developmet Consultants were also appointed to investigate various alternative Sanitation Proposals for Seaview low-cost housing. According to the reports from the consultants above the following sanitation alternatives were investigated:

- **VIP Toilets** – low construction and maintenance capital; cannot normally be installed in the house; need extensive user education with repeated intervention; subject to abuse due to ease of "dumping" rubbish into the pit; difficult to desludge without appropriate equipment; rejected by the community. *Results: Not preferred by NMBM.*

- **Low Volume Flush Toilets draining to Leach Pits** - low construction and maintenance capital; pits are easy to construct; longer desludging periods than septic tanks due to leaching; many individual tanks to be handled at desludging time. *Results: Preferred by NMBM*

- **Full Waterborne** - High construction and maintenance capital; requires sewerage reticulation; uses more water for flushing; requires operation and maintenance. *Results: Preferred by NMBM.*

- **Chemical Toilets** - Low construction capital; operational costs increase due to required chemicals and regular emptying; need extensive user education with repeated intervention. *Not preferred by NMBM.*

- **Biogas Digester Systems** - Low construction capital, biogas bi-product may be used as an energy source when properly designed and operated; Technology not fully understood by community using it most of the time, resulting in malfunctions; need extensive user education with repeated intervention. *Not preferred by NMBM.*

- **Septic Tank** – Considerable construction capital, soak-away susceptible to blockage; considerable space required, require periodic sludge removal resulting in high maintenance costs. *Not preferred by NMBM.*

- **Communal Conservancy Tank** – Considerable construction capital, considerable space required, require periodic sludge removal resulting in high maintenance costs. *Not preferred by NMBM.*

Our designs were based on the sanitation alternatives that were accepted by the NMBM as follows:

4.4.1 Land Option 1 Sanitation Alternatives

i) Leach Pit System

Four pockets of land have a potential to accommodate approximately 478 housing units with average erf size of 250m² to accommodate on-site leach pit system. An onsite leach pit system has been opted as the most viable sanitation solution to be the used for the proposed Option 1 development. This will entail the construction of a leach pit in each property. The system comprised of low volume flush toilets flushing between 1 and 3 liters per flush consisting of a 100mm diameter on site drain to a lined and modified leach pit to accept both sewage and sullage.

Special modifications will be made to the leach pit to accommodate other water from the sink and the shower as well. This is deemed to be possible due to the sandy nature of the soil and possible higher percolation rates.

Ground water protocol investigation conducted by SRK indicates a low potential risk

of contamination to groundwater resources. Other special studies such as socio-economic study, traffic impact assessment etc. from sub-consultants appointed by SRK are underway.

Leach pit will be positioned on the lowest contour on the property to ensure that the whole erf can be drained. Positioning of leach pit to the front of the erf was considered to most of the sites to at least be able to service the house drainage, except in cases where it is not possible to drain it. The purpose is to ensure easy access to pits from the road during maintenance period. In such cases where the leach pit is to be located at the back, the vacuum tank truck will still be able to service it from the road with the extension of the suction pipes to reach the pit. That is what the municipality is currently doing when servicing sewers located in midblock.

The leach pits will be designed to require empting at intervals of five to ten year periods depending on the usage. Vacuum tank trucks from the municipality will be utilized in emptying the individual pits.

4.4.2 Land Option 2 Sanitation Alternatives

i) Leach Pit System

Erf 1/28 land has a potential to accommodate approximately 1050 housing units with average erf size of 250m². The erf size of 250m² would be to allow enough space for the onsite leach pit system should it be a preferred sanitation alternative. Special modifications will be made to the leach pit to accommodate other water from the sink and the shower as well.

ii) Waterborne Sewerage System

Erf 1/28 land has a great potential for a full waterborne sewerage system including the treatment and the disposal of effluent. The topography of this land allows for the reticulation to gravitate to the proposed treatment works / package plant to be located at the lowest side of this land. The pumping system might be required at the connection point at the treatment plant as sewers reach the plant at excessive depths.

The design flow contribution has been based on a category 5 development as shown in the table below:

Development Category	Socio-economic / Income Group	Average Erf size (m²)	ADWF / Erf (l/d/e)	People / Erf	Harmon Peak Factor	PWWF / Erf (l/s/e)
5	Site & Service	300	525	5.5	3.80	0.0462

Peak Factor: Harmon's Peak Factor (Attenuation applied for population >1000). $1+ [14/(4+p^{0.5})]$, where p = population in thousands:

Peak Dry Weather Flow (PDWF): ADWF x PF

Peak Wet Weather Flow (PWWF): 2 x PDWF

Flow Velocity: Min. = 0.7 m/s
Max = 2.2 m/s

Position of sewers: in road reserves at 1.3m from the erf boundaries

Position of manholes: 80m maximum intervals on straight & at deflections

Pipe Type: PVCu 400 KPa SANS 1601 Type 1

Pipe Size: 160mm diameter for the reticulation
250mm diameter for outfall sewer

Hydraulic calculations are based on the following:

- Pipe Flow: Manning's Formula

  $V = (R^{2/3}\ S^{1/2})/n$ where V = velocity (m/s)
  R = hydraulic radius (m)
  S = Grade (m/m)
  n = Manning Coefficient of 0,012

- Depth of flow at PWWF: 80% of inside pipe diameter

The anticipated flows for Option 2 development are as follows:

Residential Area	No of Erven	Flow (l/d)	ADWF (kl/d)	ADWF (l/s)	PF	PDWF (l/s	PWWF (l/s)
Option 2 (Erf 1/28)	1 050	525	551 250	6.38	3.8	24.24	48.49

Anticipated ADWF is 551 kl/d, will be used for calculating the size of the proposed Waste Water Treatment Plant. The proposed package plant would have the process capacity to treat 551 kl/day and hydraulically accommodate the PWWF of 48.5 ℓ/s.

The wastewater treatment plant process will consist of a Head of works, single aerobic-anoxic reactor, secondary settling tank, RAS recycle from the SST to the aerobic-anoxic reactor and chlorine disinfection.

The proposal is that the final effluent from chlorination basin will be discharged through a serious of maturation channels downstream of treatment plant. The channels are constructed as informal structures that are shaped with the natural contours on site. The channels are approximately 3m wide with a maximum water depth of 300mm. Defined overflow structures will be spaced at regular intervals. These channels will be planted with reeds. The construction of a polishing pond / reed bed downstream of the sewage treatment works that allows the final effluent to

dissipate naturally into the sandy formation. Effluent polishing takes place throughout the reed bed channel. Due to the reeds and the additional contact time, the residual chlorine is removed from the effluent by the time it leaves the reed beds.

Sludge will be wasted from scum box in Clarifier and scum draw off on reactor, which is then gravitated, to the sludge-drying beds. Scum is drawn of the secondary settling tank surface and gravitated to the sludge drying bed.

4.5 PROPOSED WATER RETICULATION

All water mains are located in road reserves at 2.5m from the erf boundaries. The propose water mains consist of pipe diameters ranging from 50mm to 110mm. Water demand of 500 l/erf/day was assumed in the design calculations and the designs in accordance with the NMBM Water Division's Design Requirements.

The anticipated water demand for the two development options are as follows:

Residential Area	No of Erven	Demand (l/erf/d)	AADD (kl/d)	AADD (l/s)	PF	ADPD (l/s
Option 1: Residential Zone 3	478	500	239 000	2.77	3.5	9.68
Option 2: Residential Zone 3	1 050	500	525 000	6.08	3.5	21.27

The average annual daily demand (AADD) for Option 1 development is 239 kℓ/day or 2.77 ℓ/s. Peak water demand for the 478 erven development is estimated to be 3.5 times AADD which equates to a flow of 9.68 ℓ/s.

For Option 2 development which consists of 1050 erven, the AADD is 525 kℓ/day or 6.08 ℓ/s. Peak water demand for the development is 21.27 ℓ/s.

The firefighting requirements for a development of this nature will be low risk with a minimum design fire flow rate of 900 l/min or 15 ℓ/s.

Preliminary design for the reticulation are based on the following parameters:

- Average water consumption of Zone 3 residential properties is 500 ℓ/erf/day;
- Peak factor of 3.5;
- Minimum hydrostatic pressure head under peak flow conditions: 24 m;
- Maximum hydrostatic pressure head under peak flow conditions: 90 m;
- Maximum velocity under peak flow conditions not to exceed 1.2 m/s;
- Fire risk category of development: Low-risk Group 1;
- Fire hydrants not to be installed on pipe sizes smaller than 75 mm;
- Individual erf connection.

5. PROJECT STRUCTURE

The project will consist of the following main work packages:

(i) Project Management;

(ii) Site Investigation and Upgrading Design;

(iii) Documentation Compilation for tender and contract;

(iv) Tender and tender evaluation;

(v) Contract Management; and

(vi) Site Monitoring.

6. SCOPE OF PROFESSIONAL SERVICES REQUIRED

The scope of professional services for this project will be covered under the standard stages of project development as defined by the latest issue of Government Gazette and will include the following:

- Consultation with the Client;
- Preliminary investigation, planning and preliminary design;
- Searching for, obtaining, investigating and collating available data, drawings and plans relating to the works;
- Detailed Design and Tender;
- Working Drawings;
- Contract Administration;
- Construction Monitoring; and
- Conduct acceptance test and comprehensive commissioning.

7. DELIVERABLES

The following deliverables will be submitted to the Client for approval at the appropriate stages in the project:

- Preliminary design report (this report), which includes investigation, planning, cost estimates, programme, general arrangement drawings and services requirements;
- Detail design report, which will include the final designs and working drawings, detailed project costs and project programme;
- Tender documentation (conditions of tender and contracts, specifications, tender drawings, bill of quantities);
- Tender evaluation report and recommendation on tender adjudication (if required);

- Construction progress reports;
- Construction administration reports;
- As-built drawings; and
- Close-out report.

8. PROJECT IMPLEMENTATION PLAN (PIP)

The proposed project programme is summarised in table 2 below:

Table 2: Programme

Activity	Duration (Weeks)	Start Date	Finish Date
1. Design			
1.1 EIA Process			30-Sep-17
1.2 Topographic Survey & Geotechnical Investigatio	4	30-Jan-18	27-Feb-18
1.3 Prepare preliminary designs & report	21	25-Oct-16	21-Mar-17
1.4 Preliminary design report approval by NMBM	8	5-Apr-17	31-May-17
1.5 Survey, Pegging & Draft GP	17	2-Oct-17	31-Jan-18
1.6 Relocation & Re-positioning (for Option 1)	8	3-Jan-18	28-Feb-18
1.7 Prepare detail design & report	4	1-Feb-18	1-Mar-18
1.8 Detail design report approval by NMBM	8	1-Mar-18	26-Apr-18
2. Tender			
2.1 Prepare tender document	4	1-Feb-18	1-Mar-18
2.2 Prepare tender drawings	4	1-Feb-18	1-Mar-18
2.3 Tender Approval by NMBM	8	1-Mar-18	26-Apr-18
2.3 Tender Advertisement	1day	3-May-18	3-May-18
2.4 Tender period	4	3-May-18	31-May-18
2.5 Tender evaluation	4	31-May-18	28-Jun-18
2.6 Tender Award	4	28-Jun-18	26-Jul-18
3. Implementation			
3.1 Letter of acceptance	1	26-Jul-18	2-Aug-18
3.2 Site handover	1 day	2-Aug-18	2-Aug-18
3.3 Contractual conditions met	2	2-Aug-18	16-Aug-18
3.4 Construction period	48	2-Aug-18	4-Jul-19
4. Retention			
4.1 Retention period	52	4-Jul-19	3-Jul-20

9. FINANCIAL IMPLICATIONS

Based on preliminary information available, the project cost estimate for Option 1 development in the amount of R 36,376,459 as set out in Table 3 below will be required to complete the project.

However, should Option 2 land be pursued by the Client and the leach-pits as preferred sanitation system, the project budget in the amount of R 76,661,278 will be required to complete the project.

Should Option 2 land be pursued by the Client and full waterborne sewerage system be preferred, the project budget in the amount of R 101,752,182 will be required to complete the project.

The estimates include construction costs, professional fees and VAT. These estimates are provided for budgeting purposes only, more accurate estimates will be determined at detailed design stage when the actual scope of works have been established.

9.1 PROJECT COST ESTIMATE

Table 3: Project Cost Estimate

Items	OPTION 1 (LEACH PITS) Amount	OPTION 2 (LEACH PITS) Amount	OPTION 2 (WATERBOURNE) Amount
Preliminary and General	R 4 234 682	R 8 905 476	R 11 993 238
Cost of Works	R 21 173 410	R 44 527 382	R 59 966 190
Sub Total	**R 25 408 092**	**R 53 432 858**	**R 71 959 428**
Add 10% Contingencies	R 2 540 809	R 5 343 286	R 7 195 943
Sub Total	**R 27 948 901**	**R 58 776 144**	**R 79 155 371**
Add CPA (8%)	R 2 235 912	R 4 702 092	R 6 332 430
Total Construction Cost	**R 30 184 813**	**R 63 478 236**	**R 85 487 801**
Professional Fees	R 754 620	R 1 586 956	R 1 586 956
Additional Services	R 710 000	R 1 600 000	R 1 600 000
Disbursements	R 35 000	R 90 000	R 90 000
Contingencies @ 15%	R 224 943	R 491 543	R 491 543
Total Indirect Cost	**R 1 724 563**	**R 3 768 499**	**R 3 768 499**
Total Direct and Indirect Cost	**R 31 909 376**	**R 67 246 735**	**R 89 256 300**
Add 14% VAT	R 4 467 313	R 9 414 543	R 12 495 882
Total Project Cost	**R 36 376 689**	**R 76 661 278**	**R 101 752 182**

The cost breakdown of the Construction Costs and Professional Fees are detailed under item 9.2 and 9.3 below.

9.2 CONSTRUCTION COST ESTIMATE

Items	OPTION 1 Amount	OPTION 2 (LEACH PITS) Amount	OPTION 2 (WATERBORNE) Amount
Preliminary and General	R 4 234 682.00	R 8 905 476.00	R 11 993 238.00
Road Works	R 8 446 500.35	R 20 785 402.00	R 20 785 402.00
Sewers	R 5 686 670.00	R 11 636 035.00	R 27 074 843.00
Water Reticulation	R 1 857 248.00	R 2 700 773.00	R 2 700 773.00
Kerbing & Channeling	R 2 204 999.60	R 3 565 497.20	R 3 565 497.20
Stormwater Drainage	R 2 977 991.75	R 5 839 674.60	R 5 839 674.60
Sub Total	**R 25 408 092.00**	**R 53 432 858.00**	**R 71 959 428.00**
Add 10% Contingencies	R 2 540 809.00	R 5 343 286.00	R 7 195 943.00
Sub Total	**R 27 948 901.00**	**R 58 776 144.00**	**R 79 155 371.00**
Add 8% CPA	R 2 235 912.00	R 4 702 092.00	R 6 332 430.00
Sub Total	**R 30 184 813.00**	**R 63 478 236.00**	**R 85 487 801.00**
Add 14% VAT	R 4 225 874.00	R 8 886 953.00	R 11 968 292.00
Total Project Cost	**R 34 410 687.00**	**R 72 365 189.00**	**R 97 456 093.00**

9.3 PROFESSIONAL FEE ESTIMATE

The professional fee for the project scope are based on the guidelines of the Engineering Profession Act in terms of Section 34(2) of the Engineering Profession Act 2000 (Act no 46 of 2000).

Items	OPTION 1 Amount	OPTION 2 (LEACH PITS) Amount	OPTION 2 (WATERBORNE) Amount
1. Normal Services Fees			
Inception (5%)	R 37 731	R 79 348	R 106 913
Concept & Viability (25%)	R 188 655	R 396 739	R 534 566
Design Development (25%)	R 188 655	R 396 739	R 534 566
Documentation & Procurement (15%)	R 113 193	R 238 043	R 320 740
Contract Admin & Inspection (25%)	R 188 655	R 396 739	R 534 566
Close-Out(5%)	R 37 731	R 79 348	R 106 913
Normal Fees Total	R 754 620	R 1 586 956	R 2 138 264
2. Additional Services Fees	R 710 000	R 1 600 000	R 1 600 000
3. Expenses & Costs	R 35 000	R 90 000	R 90 000
Sub Total	**R 1 499 620**	**R 3 276 956**	**R 3 828 264**
Add 15% Contingencies	R 224 943	R 491 543	R 574 240
Sub Total	**R 1 724 563**	**R 3 768 499**	**R 4 402 504**
Add 14% VAT	R 241 439	R 527 590	R 616 351
Total Fees	**R 1 966 002**	**R 4 296 089**	**R 5 018 855**

9.4 PROJECT CASH FLOW ESTIMATE

The cash flow forecast for Option 1 development, which is based on the Engineer's Construction Estimate for Option 1 is detailed as follows:

Table 4: Project Cash Flow Estimate

Period Months	Direct Costs Contractor	Indirect Costs Consultant	Combined Costs	Cumulative Total
Sep-16	R -	R 66 515	R 66 515	R 66 515
Oct-16	R -	R 17 179	R 17 179	R 83 694
Dec-16	R -	R 19 523	R 19 523	R 103 217
Jan-17	R -	R 85 016	R 85 016	R 188 233
Feb-17	R -	R 12 500	R 12 500	R 200 733
Apr-18	R -	R 110 000	R 110 000	R 310 733
Jun-18	R -	R 72 000	R 72 000	R 382 733
Jul-18	R -	R 70 000	R 70 000	R 270 733
Aug-18	R 1 892 588	R 70 000	R 1 962 588	R 2 233 321
Sep-18	R 2 064 641	R 75 033	R 2 139 674	R 4 372 995
Oct-18	R 2 064 641	R 70 000	R 2 134 641	R 6 507 636
Nov-18	R 2 408 748	R 70 000	R 2 478 748	R 8 986 384
Dec-18	R 2 752 855	R 70 000	R 2 822 855	R 11 809 239
Jan-19	R 2 752 855	R 70 000	R 2 822 855	R 14 632 094
Feb-19	R 2 752 855	R 70 000	R 2 822 855	R 17 454 949
Mar-19	R 2 752 855	R 70 000	R 2 822 855	R 20 277 804
Apr-19	R 2 752 855	R 70 000	R 2 822 855	R 23 100 659
May-19	R 2 752 855	R 70 000	R 2 822 855	R 25 923 514
Jun-19	R 2 752 855	R 70 000	R 2 822 855	R 28 746 369
Jul-19	R 2 752 855	R 70 000	R 2 822 855	R 31 569 223
Aug-19	R 2 752 855	R 70 000	R 2 822 855	R 34 392 078
Aug-20	R 1 204 374		R 1 204 374	R 35 596 452
Total	**R 34 410 687**	**R 1 966 002**	**R 35 778 452**	

10. RECOMMENDATION

Should the NMBM prefer to develop land Option 1, based on the preliminary information at hand, it is recommended that the Budget of R 36 376 689 all inclusive, be made available to successfully complete the project. It should also recommended that a portion of 31/28 be purchased and registered as an access road servitude to proposed development on portion of erf 10/28.

Should the NMBM prefer to develop land Option 2 with leach pits used as preferred sanitation system, the budget of R 76 661 278 all inclusive, will be required to successfully complete the project.

Option 2 land will need to be purchased as it is currently private land. The budget excludes the purchasing price for the land.

Should the NMBM prefer to develop land Option 2 with full waterborne sewerage system preferred, the budget of R 101 752 182 all inclusive, will be required to successfully complete the project. Option 2 land will need to be purchased as it is currently private land. The budget exclude the purchasing price for the land.

11. CONCLUSION

The project scope entails the Design, Installation and Monitoring of Civil Engineering Services for the proposed Low Cost Housing Development in Seaview.

The proposed Land Development Option 1 comprises the following portions of land: Erf 237, 238, 240, 10/28, and 590. The land has a potential to accommodate approximately 478 housing units with average erf size of 250m². A road servitude through Erf 31/28 will be required to access the proposed development on Erf 10/28.

Based on preliminary information available, the project cost estimate in the amount of R 36,376,459 will be required to complete the project. The construction duration is estimated to be twelve (12) months.

Land Development Option 2 is situated on Erf 1/28 and is privately owned. Erf 1/28 land has a potential to accommodate approximately 1050 housing units with average erf size of 250m². This land has a great potential for a full waterborne sewerage system including the treatment and the disposal of effluent.

Should leach pit sanitation system be used for Land Option 2 then the Engineer's Project Cost Estimate would be R 76,661,277. However, should full waterborne sewerage system be considered, the required budget would be R 102,474,948. The construction duration is estimated to be twenty-four (24) months.

The construction of this project is anticipated to commence on completion of the bulk water supply upgrade. According to the PIP it is envisaged that the construction phase would commence in July 2018 provided that the bulk water supply upgrade and all environmental processes have been completed.

The project will also benefit the local SMMEs and the local labour through creation of more job opportunities. Local labour will benefit from the project by getting temporary jobs for the duration of the construction.

M.J. Nyila

24/03/2017

James Nyila Pr Tech Eng
Director
For **Gilgal Development Consulting Engineers and Project Managers**

Date

ANNEXURE A

Drawings

ANNEXURE B

Package Plant Proposal