De Heus (Pty) Ltd Karoo, Middelburg EC

PRELIMINARY DESIGN REPORT:

THE COMPILATION OF A SERIVCES REPORT FOR THE DEVELOPMENT OF PTN 15 of PTN1 OF THE FARM BULTFONTYN, MIDDELBURG EC

submitted by

MDCC (Pty) Ltd.

CONSULTING ENGINEERS
ARCHITECTS
PROJECT MANAGERS

Date: 29 June 2021 (Version 2.0)

Prepared for:

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SPECIFICATION VERSION CONTROL

Version	Date	Author	Change Description
0.0	26 May 2021	Mr. C Grewar	Preliminary Design report
1.0	14 June 2021	Mr. C Grewar	Revision, general update, information added
2.0	29 June 2021	Mr. S Maharaj	Revision, Biomass Waste Disposal, edited.

APPROVAL

Action	Name and Surname	Designation	Signature	Date
Prepared by:	Mr. C Grewar	MDCC (Pty) Ltd		14 June 2021
Reviewed by:	Mr. J Styger	MDCC (Pty) Ltd		14 June 2021
Authorised by:	Mr. M Janse van Rensburg	MDCC (Pty) Ltd		14 June 2021
Approved by: (Client) 1				
Approved by: (Client) 2				
Approved by: (Client) 3				

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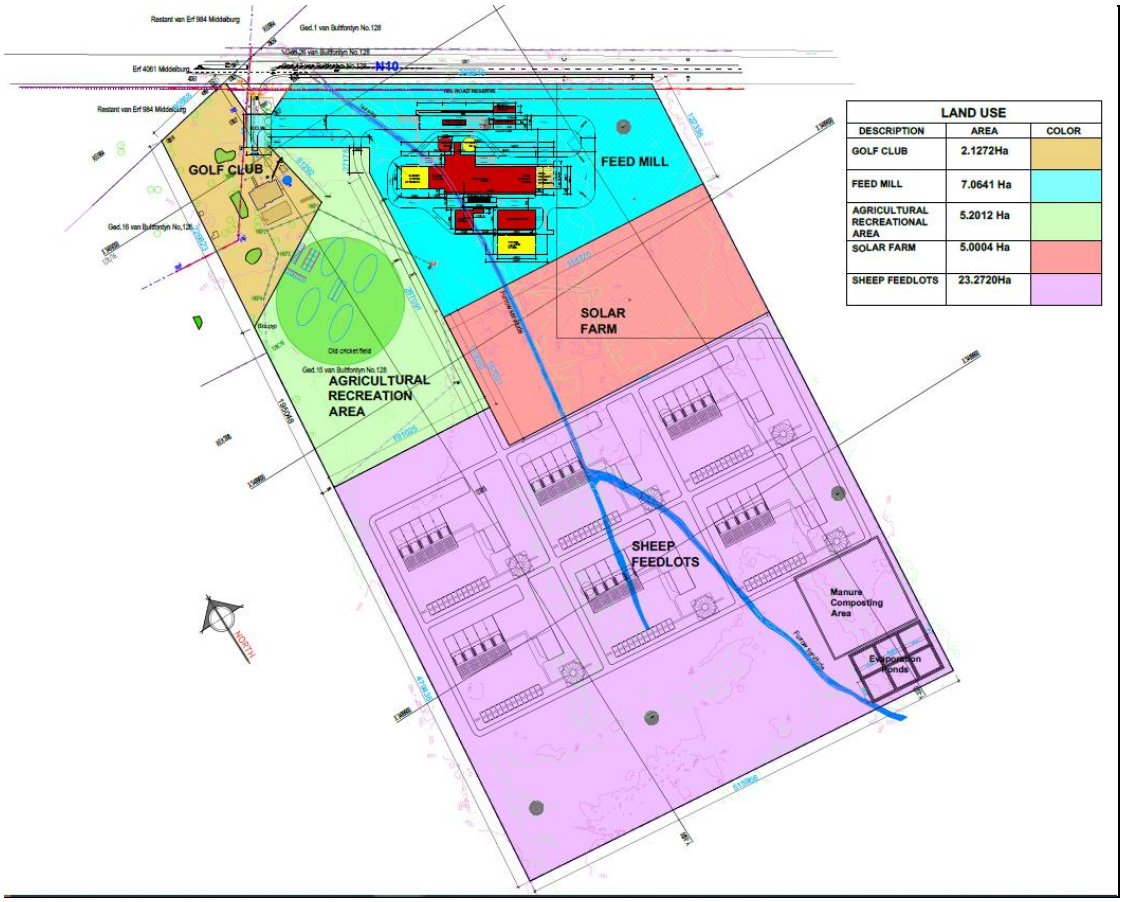
1. INTRODUCTION

1.1 Background

Our Client, De Heus (Pty) Ltd, wish to extend their operations by developing a greenfields site (approximately 428266m2) situated along the N10, 4.5km south east of Middelburg, Eastern Cape. The construction on site will be for a new mixed-use facility which includes a Feed mill, recreational area, solar farm and a sheep feed lot.

A Locality plan illustrating the extents of construction for the developable area is shown



MDCC (Pty) Ltd, has been appointed by the Cient to undertake project management duties, design, contract administration and site monitoring of the project which will be outlined within this report.

The Client de Heus (Pty) Ltd has appointed the following subconsultants:

• Southern Geotechnical Engineering	Pieter Oosthuizen	082 823 7794
• Hansen Land Surveyors Inc	Ivan Hansen	045 838 2052
• Aquatox Environmental Consultants	Erika van der Linde	083 441 0239
• AB Enviro Consult	JP de Villiers	083 548 8105
• Town Planning Solutions	Wilhelm Rust	0892 662 1105

These professionals are appointed to assist in pursuing the planning tasks in order to achieve the requirements set out by the client. Documentation from / by these Consultants is in this report where appropriate.

Refer to Annexure A for the copy of the Appointment Letter, as well as the Professional Team list

1.2 Purpose of report

The purpose of this Preliminary Design Report is to provide the execution methodology in terms of consulting, design and construction services and also to enable MDCC (Pty) Ltd. to establish a services agreement with Inxuba Yethemba Local Municipality (IYLM), part of the greater Chris Hani District Municipality (CHDM).

The Preliminary Design Report will be followed by:

- A Detailed Design Report, final bill of quantities and detailed design working drawings,
- Establishment and finalization of a service agreement with the applicable municipality (local authority) or service provider, if required.
- Confirmation of any wayleave applications and approvals required.
- Confirmation of any servitudes and/or expropriations required.
- Documentation required for the procurement of a contractor for execution of the works (if required).
- A tender documentation evaluation report (if required).
- Construction administration documentation, i.e. progress reports, monthly certificates and quality assurance.
- A close-out report.
- Section 101 and 82 certificates (if required).

2. APPROACH AND OVERVIEW

The design and construction work for this project comprises out of the water supply and reticulation, the sewer drainage and treatment/outfall as well as the stormwater management for the site.

As this is a greenfields project there is no basic services infrastructure provided at the stage and no electrical infrastructure is provided. In terms of typical developments, the services deemed necessary would include, water and sewer, roads and stormwater and electricity.

2.1 Location

The site is located on the outskirts of Middelburg along the N10 in the direction of Cradock. The site is approximately 42.8266 ha. The site is situated on Portion 15, of Portion 1 of the Farm BULTFONYN (Middelburg, Eastern Cape Province).

The site is characterized by being used previously for agricultural purposes as grazing lands for sheep. There is an irrigation furrow, now unused, and for which the servitude is to be cancelled.

The approximate extent and location of the development is indicated in Drawing 4669 / 0001, in Annexure K.

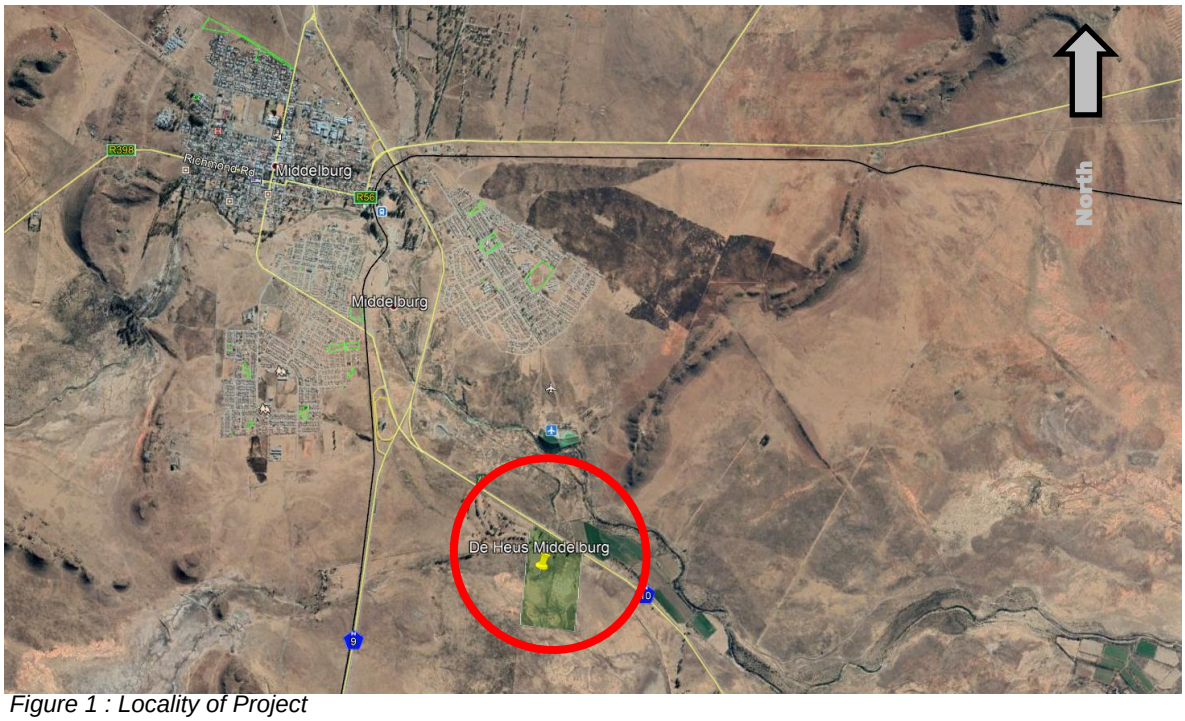


Figure 1 : Locality of Project

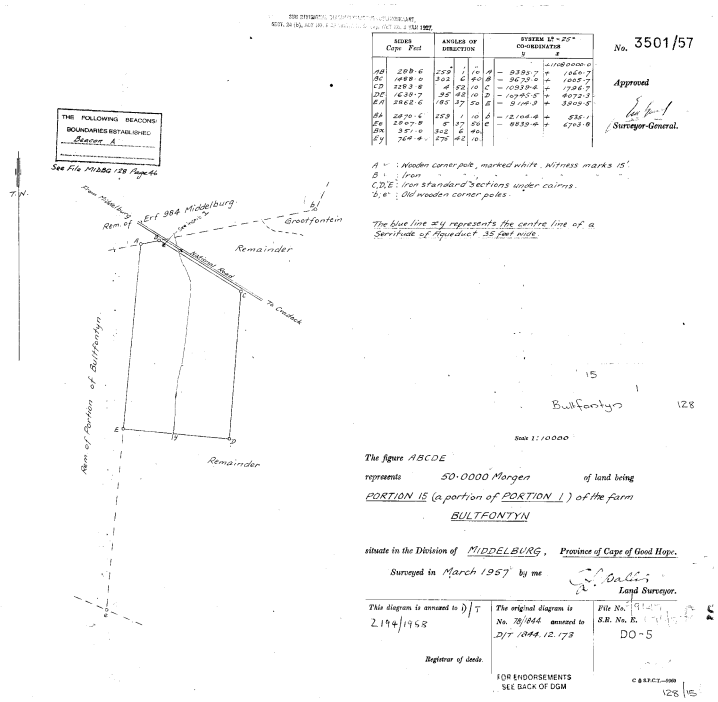


Figure 2: Cadastral Layout of proposed township

2.2 Land-use

The land-use for the proposed development is indicated in the table below:

Table 1 : Ptn15 of Ptn1 of Bultfontyn Land-use summary

LAND-USE				
Stand	**Erf Numbers**	**Land Use**	**Use**	**AREA**
Ptn15 of Ptn 1of Bultfontyn	N/A	SPECIAL	GOLF CLUB	2.12ha
Ptn15 of Ptn 1of Bultfontyn	N/A	AGRICULTURAL	FEED MILL	7.06ha
Ptn15 of Ptn 1of Bultfontyn	N/A	AGRICULTURAL	AGRICULTURAL RECREATIONAL AREA	5.20ha
Ptn15 of Ptn 1of Bultfontyn	N/A	SPECIAL	SOLAR FARM	5.00ha
Ptn15 of Ptn 1of Bultfontyn	N/A	AGRICULTURAL	SHEEP FEEDLOT	23.28ha

Drawing 4669/0001, in Annexure H, illustrates the extent of the land-use.

2.3 Information received

The proposed development is positioned within the urban boundaries of Inxuba Yethemba Local Municipality jurisdiction.

2.4 Topography and Drainage

The site has a gentle slope from the Northern side to the South east corner. The average slope of land is 0.25%, and is considered very flat. The elevation on the northern side with the N10 is on average 1223.0 meters above mean sea level (AMSL) dropping to the southern boundary at 1220.0 meters (AMSL).

The development area is not affected by any flood lines.

2.5 Geology

Southern Geotechnical Engineering was appointed to undertake a geological investigation of the site. Below is a summary of the report.

According to the 1:250 000 scale Geological maps 3124 Middelburg, the site is underlain by calcrete, alluvium and colluvium. Other geological formations around the site but not shown to directly underly the site include intrusive dolerite formations and red, purple and grey mudstone with subordinate sand stone.

The site is located in a dry region with a Weinert N-value exceeding a value of 5 suggesting mechanical weather processes will be dominant (as opposed to chemical weathering)

No dolomite was encountered in the area or trail pits.

The following development constraints may be encountered on the site:

- Piling of structures are not recommended
- Collapsible soils to be treated with High Energy Impact Compaction
- Highly expansive soils within pan areas, construction in these areas is to be avoided

The details of the shallow depth exploration and geotechnical study are provided in **Annexure L**

3. DESIGN METHODOLOGY

3.1 Water Methodology

The following methodology is adopted in the design of the water reticulation system:

- Establish design criteria applicable to the bulk water supply and water reticulation network.
- Calculate water demand and peak flows.
- Conduct a hydraulic analysis of the proposed system to determine optimum pipe sizes and pipe pressure classes.
- Determine valve, fire hydrant and erf connection positions.
- Calculate water meter sizes.
- Borehole, Pump and Tank positions
- Compilation of layout plans.

3.2 Sewer Methodology

The following methodology is adopted in the design of the sewer reticulation network:

- Establish design criteria applicable to the treatment of effluent, the specialist installed package plant and sewer reticulation network.
- Establish connection points and determine possible link pipe routes for the proposed development.
- Calculate sewage demand and peak flows.
- Conduct a hydraulic analysis of the proposed system to determine optimum pipe sizes.
- Compilation of layout plans.

3.3 Roads and Stormwater Methodology

The following methodology is adopted in the design of the access roads and stormwater drainage reticulation network:

- Establish design criteria applicable to the class and functionality of the internal roads, also considering drainage potentials of stormwater on carriageway.
- Establish connection points at the existing municipality services and determine possible link pipe routes (storm water) for the proposed development.
- Calculate storm water run-off generated and peak flows.
- Implementation of a stormwater management plan for the site, with special focus on the Feedlots, which include drainage channels, sedimentation ponds and evaporation ponds.

- Conduct a hydraulic analysis of the proposed system to determine optimum pipe sizes.
- Compilation of layout plans.

3.4 Waste Management Methodology

The following methodology is adopted in the design of the site Waste Management:

- Determining of classification on types of Waste
    - Hazardous waste
    - General Waste
- Generation of Waste.
- Management and Treatment of Waste
- Compilation of layout plans.

4. SERVICES DESIGN

During various meetings with the Client and MDCC, a scope of works was developed and a level of service was determined.

The design and subsequent installation of an internal conventional services network which meets the developments demands is to be implemented.

4.1 WATER DESIGN

4.1.1 Existing Infrastructure

The following existing infrastructure is applicable to this site:

- No existing municipal potable water systems exist for the site

4.1.2 Water Design Criteria

The design criteria listed in the tables below were used in the design of water reticulation network.

Table 2 : General design criteria for water reticulation network

DESIGN PARAMETER	VALUE
Special-Industrial& Buildings	0.4 kl/100m²/day
1. Feed Mill (Population)	50 l/day
2. Feedmill (Washwater)	1500 l/day
3. Recreational Area (Population)	30 l/day
4. Recreational Area (Washwater)	500 l/day
5. Recreational Area (Animal Water)	3000 //day
6. Solar Farm (Population)	50 l/day
7. Solar Farm (Washwater)	1500 l/day
8. Sheep Feedlot (Population)	50 l/day
9. Sheep Feedlot (Adult Sheep)	28800 l/day

10. Sheep Feedlot (Lambs)	12000 l/day
11. Sheep Feedlot (Lambs)	36000 l/day
Peak Factors	3.3 (Peak Hour Factor)
Pipe type	UPVC, SABS 966
Minimum pipe class (Hydrants and Domestic)	Class 12
Fire flow at any one hydrant under the condition of domestic peak flows	40 l/s (for two hours) (Hydrants are boosted)
Minimum residual head (Fire Hose Reels only)	24m
Maximum linear flow velocity under conditions of fire-fighting	2.2m/s
Minimum residual head (Domestic Supply))	20m (Normal)
(Domestic Supply) flow velocity	1.5m/s
(Domestic Supply) flow	2 l/s
Boundary roughness (K-Value)	0.1mm
Flow formula	D'Arcy Weisbach
Fire hydrants	110mm diameter
Fire hydrant spacing (Feedmill)	180m maximum (moderate risk)
Fire hydrant spacing (Sheep Feedlot)	240m maximum (low risk)

A summary of the water demand calculations is presented in the table below; the detailed calculation is attached to Appendix H of this report.

Table 3 : Water Demands for Development

WATER DEMAND				
Land use	**Unit**	**No of Units**	**Unit demand (Kl/day)**	**Total (Kl/day)**
GOLF CLUB	ha	2.12	N/A	N/A
FEED MILL (Production)	ha	7.06	18.46	18.46
FEED MILL (Population)			6.50	6.50
AGRICULTURAL RECREATIONAL AREA	ha	5.20	6.50	6.50
SOLAR FARM	ha	5.00	1.65	1.65
SHEEP FEEDLOT (Production)	ha	23.28	92.20	92.20
SHEEP FEEDLOT (Population)			0.50	0.50
SUB TOTAL				**125.81 (126)**
			PLUS UAW (15.00% of Total AADD) Average Annual Daily Demand	**18.87**
			Total Average Demand (AADD) Average Annual Daily Demand	**144.68 kl/day**
			Peak Demand (Excl. Fire Flow)	**55 l/s**
			Fire Flow (Medium Risk)	**40 l/s**
			TOTAL	**95 l/s (145 kl/day)**

4.1.3 Bulk water supply

No municipal Bulk Water lines are available to supply the site with its calculated water demand.

As part of the development of the site, new borehole/s will be installed to supply the site's water demands. The Geohydrologist will provide a report on Borehole supply capacities, daily run times, and treatment of water (if required). Once more information is available, the layout will be updated to reflect borehole positions and tank positions.

The proposed water line routes in the drawings are represented by the blue lines. These drawings are contained in Annexure B of the report (Water layout).

4.1.4 Pipe routing

The design of the water reticulation network is done to provide water to demand nodes within the site, which will include fire hydrant nodes.

4.1.5 Hydraulic analysis of the water reticulation network

The water distribution network is analysed by utilizing Civil Designer's Aquanet Software. The appropriate pipe diameters were established by calculating peak draw-off flows from nodes and then adding fire hydrant flow (40 l/s) at each specific location.

Two Fire Hydrants for the feed mill production have been allocated. Allowing 75

The Client requests 7 days storage for potable water. Therefore, the following table:

DESIGN PARAMETER	VALUE
Daily consumption requirements	126 kl/day
Water storage for 7 days	882 kl
Fire supply storage (2400l/min pump x 2 hours)	144 kl
TOTAL COMBINED STORAGE	**1026 kl**

Water storage tanks will be installed on site to accommodate the water storage requirements. From there the water will be distributed to the network. Outlets from tanks are to be baffled for domestic and fire storage control.

Pipes are sized to limit flow velocities below 1,5 m/s for peak domestic flow only and 2,2 m/s for fire flow included.

4.1.6 Servitudes required

No servitudes are required at this stage.

4.1.8 Bulk Contributions

The bulk contributions (if applicable) will be calculated by the Local Authority Inxuba Yethemba Local Municipality, upon approval of this PDR. The details of the Bulk Contribution costs will be stipulated in the DDR (Detailed Design Report).

4.2 SEWER DESIGN

4.2.1 Existing Infrastructure

The following existing infrastructure is applicable to this proposed development:

- No Existing municipal Sewerage systems exist for the site

4.2.2 Sewer Design Criteria

The design criteria listed in the tables below were used in the design of sewer reticulation network.

Table 4 : General Sewer demand for site

SEWER DESIGN CRITERIA FOR INDUSTRIAL USE			
BUILDING POPULATION	**POPULATION**	**USAGE**	**TOTAL**
GOLF CLUB	N/A	N/A	N/A
FEED MILL (Production)	100	0.3kl/day/100 m²	12
FEED MILL (Population)	0	0	0
AGRICULTURAL RECREATIONAL Area (Population)	100	0.3kl/day/100 m²	1.5
SOLAR FARM (Population)	3	0.3kl/day/100 m²	0.9
SHEEP FEEDLOT (Production)	0	0	0
SHEEP FEEDLOT (Population)	10	0.3kl/day/100 m²	3
SUB TOTAL	213		**17.4kl/ day**

Table 5 : Design Criteria for Sewer reticulation network

DESIGN PARAMETER	VALUE
Special-Industrial& Buildings	0.3kl/100m²/day
Peak Factors	2.5 (Peak Daily Factor)
Stormwater Infiltration	15%
Capacity of Sewer	To flow 70 % of full capacity, measured in terms of flow depth
Sewer Pipe Type	UPVC Class 34, Heavy Duty Soil Pipe, SANS 966
Minimum velocity	0.7m/s
Maximum velocity	2.5m/s
Manning friction coefficient	0.012
Minimum depth of cover:	1.000m
Minimum pipe size	160 mm diameter

A summary of the sewer outflow calculations is shown in **Annexure G**.

Table 6 : Design criteria for Sewer Pipe Lines

SEWER PIPE LINE DESIGN CRITERIA	
Minimum diameter – Connections	110mm (Nominal Dia.)
Minimum diameter – Main lines	160mm (Nominal Dia.)
Bedding Type	Class B (SANS 1200 LB)
Minimum cover	1000mm
Maximum distance between manholes	80.0m

Table 7 : Sewer pipe materials criteria

SEWER PIPE MATERIALS	
Diameter Range (mm)	**Specification**
110 to 160	UPVC Class 34 complying to SANS 966 using spigot and socket rubber ring joints.

All pipes, fittings and accessories shall comply with the latest edition of the relevant SANS 1200 specification.

Table 8 : Sewer outflow generated from the development

SEWER FLOW				
Land use	**Unit**	**No of Units**	**Unit demand (Kl/day)**	**Total (Kl/day)**
GOLF CLUB	No.	N/A	N/A	N/A
FEED MILL (Production)	100m^2	40	0.30	12
FEED MILL (Population)	100m^2	0	0	0
AGRICULTURAL RECREATIONAL Area (Population)	100m^2	5	0.30	1.5
SOLAR FARM (Population)	100m^2	3	0.3	0.9
SHEEP FEEDLOT (Production)	ha	0	0	0
SHEEP FEEDLOT (Population)	100m^2	10	0.3	3
SUB TOTAL				17.4
			PLUS UAW (15.00% of Total AADD) Average Annual Daily Demand	**2.61**
			Total Average Demand (AADD) Average Annual Daily Demand	**20 kl/day**
			Peak Daily Dry Weather Sewage Flow	**0.23 l/s**
			TOTAL	**0.23 l/s**

4.2.3 Package Plant and on-site treatment

Sewerage generated by the site will discharge into the conventional pipe network and make its way to a new Waste water package plant. The Package plant will be designed to accommodate all the effluent generated from the human populated areas. A specialist company will be approached to provide a turn-key solution for the site.

Treated sewerage effluent (TSE) will be utilised for irrigation or dust suppression control in the feedlot areas. Therefore, after treatment in the Package Plant, the TSE will discharge into a storage tank, sized at two times the AADD (40kl) for utilization. Any excess TSE greywater will be let out into the evaporation pond.

4.2.5 Effluent from Sheep Feedlots

The Effluent that is generated from the sheep feedlots will be managed by manual cleaning and grading of the feed pens with water or mechanical equipment. The effluent will discharge into channels that will then make its way to the sedimentation pond where the solids will settle to the bottom, any overflow from this will discharge in to the evaporation pond via a weir structure. Both the sedimentation and the evaporation pond will be subject to periodic cleaning as and when required.

4.2.6 Pipe routing

4.2.6.1 Route selection

The internal sewer drainage network was designed as a gravity system. The design was done to provide a sewerage connection to each required point with an optimised route to the Waste Water Package Plant. The Package Plant will be located just south of the feed mill plant, this location is chosen for optimisation of location and usage.

4.2.7 Hydraulic analysis of the network

The sewer reticulation network is hydraulically analysed by utilising Civil Designer software. The appropriate pipe diameter is determined by Civil Designer and adjusted to the minimum requirements of 160mm.

4.2.8 Servitudes required

No servitudes are required for the sewer mains at this stage.

4.2.9 Bulk Contributions

The bulk contributions (if applicable) will be calculated by the Local Authority Inxuba Yethemba Local Municipality, upon approval of this PDR. The details of the Bulk Contribution costs will be stipulated in the DDR (Detailed Design Report).

4.3 ROADS AND STORM WATER DESIGN

4.3.1 Existing Infrastructure

The following existing infrastructure is applicable to this proposed development:

- The N10, which forms the northern boundary of the site has periodic concrete culverts beneath it which assist the movement of stormwater from north to south, in line with the natural topography, these culverts disperse the stormwater on to the lower areas, where evaporation and infiltration to the soil occurs
- There is an existing stormwater drainage ditch which runs north to south across the site, which is abandoned due to changes up stream, it was previously protected by a servitude, which has since been cancelled. This ditch will be filled and closed up.
- Access to the proposed development will be from the N10, from which there is an existing widening of the road and a splay for dedicated traffic to the site.

4.3.2 Roads Design Criteria

The following relevant Codes of Practice, Policy and Guidelines will be utilized to design the roads network:

- DoT: TR&S: Specification 01: Construction of Vehicular, Pedestrian and Wheelchair
- Access Crossings and Access Ramps.
- UTG 5: Geometric Design of Urban Collector Roads
- UTG 7: Geometric design of Local Residential Streets.
- UTG 10: Guidelines for the Geometric Design of Commercial and Industrial Local Streets.
- Road Access Guidelines (Second Edition – May 2001)
- National Building Regulations

The design criteria listed in the tables below were used in the design of access Roads and/or Streets network.

Table 9 : Roads Identification Criteria

ROADS IDENTIFICATION CRITERIA (TRH 26)		
Service	**Item**	**Criteria**
Local distributor	Road Category	Class 4
	Traffic Class	E3 (1.0-3.0 x 10^6 E80's)
	Surfaced Width	7,0 m

Table 10 : Roads Design Criteria

ROADS DESIGN CRITERIA	
Criteria	
Minimum Longitudinal slope	0.5%
Maximum longitudinal slope	5.0%
Minimum cross fall slope	2.0%
Maximum cross fall slope	3.0%
Minimum super elevation	3.0%
Maximum super elevation	8.0%

The maximum grade for approach legs to an intersection	5.0%
A maximum grade for intersections	3.0% to 4.0%
Kerbing (straights)	Edge Beam With Fig 8(b) at bell
Kerbing (Curves)	Fig. 8(b), unless intersection
Intersecting roads should where possible meet at	90°.

Table 11 : Road Design - Minimum curve criteria

MINIMUM CURVE RADII		
Road Category	**Bellmouth Radii (m)**	**Horizontal inside Curve Radii (m)**
Mixed (higher order) Link (Class 3District Distributor)	10 - 12	350
Mixed (middle order) Link (Class 4, Local Distributor)	10 - 12	80
Mixed (lower order) Link (Class 5, Access Collector)	8 - 10	50
Mixed (lower order) Link (Class 5, Access Street)	6 -10	30

Table 12 : Road Design - Pavement design details

MINIMUM STANDARD FOR PAVEMENT LAYERS.		
Road Category	**Surfacing**	**Pavement Layers**
UC (Local Distributor) Class 4	40mm medium continuously graded Asphalt	150mm G3 Basecourse / 80mm BTB 150mm C4 Cemented Subbase / 225mm G3 150mm G7 Subgrade 150mm G9 Subgrade
UD (Access Street) Class 5	80mm Interlocking Concrete Paver (35MPa)	150mm C4 Cemented Subbase 150mm G7 Subgrade

4.3.3 Access to site

The internal roads will be private roads, the Roads will be 7m wide and be designed to accommodate slow moving heavy livestock trucks.

- The internal roads will be classified as a local distributor, class 4, primarily due to the heavy load requirements

The structural design of the road pavement will be done according to the standards prescribed in the “Guidelines for Human Settlement and Planning” and TRH 14 (Catalogue Specification for Pavements).

Provision will be made for the installation of pre-cast concrete kerbs or edge beams on both sides of streets.

The long sectional gradient of the road will be varied, but will be a minimum of 0.5%.

4.3.3 Storm Water Design Criteria

Stormwater will be accommodated on the surface in the road prism. Shallow earth lined channels will be created to direct stormwater away from the roads and eventually discharge to the sedimentation pond and then the Evaporation Pond.

For the Sheep feedlot area, a special stormwater management plan will be implemented to comply to guidelines.

The following Standard Reference Documents, Codes of Practice, Policies and Guidelines will be used in the design of the stormwater drainage systems:

- TRH 15 – Subsurface Drainage for Roads.
- Guidelines for Human Settlement Planning and Design – (Red Book).
- Guideline for the Provision of Engineering Services in Residential Townships (Blue book).
- DoT Minimum Standards for Civil Engineering Services in Townships Draft
- SANRAL Road Drainage Manual
- SANS 1200 DB : 1989 – Earthworks (Pipe Trenches)
- SANS 1200 GA : 1982 – Concrete (Small Works)
- SANS 1200 GE : 1984 - Precast Concrete (Structural)
- SANS 1200 LB : 1983 – Bedding (Pipes)
- SANS 1200 LE : 1982 - Stormwater Drainage

Table 13 : Stormwater Design Modelling

STORMWATER DESIGN CRITERIA		
Item	**Sub-item**	**Criteria**
Mean annual rainfall	(SA Weather Bureau)	500 mm
Rainfall distribution		Triangulation
Time to peak ration		0,39
Infiltration model		Horton
Starting infiltration value		45 mm/h
End infiltration value		15 mm/h
Decay constant		0,00115
Conduit routing		Time shift
Effective % area impermeable	Developed area	5-15
	Undeveloped area	1
Manning friction factor	Pipes	0,012
	Unlined canals	0,012
Design storm recurrence interval	Minor storms	2 years
	Major storms	5 years

Table 14 : Stormwater recurrence intervals

DESIGN STORM RECURRENCE INTERVAL PER DEVELOPMENT TYPE	
Development	**Design storm recurrence interval (years)**
General commercial & industrial	5
Evaporation pond	**20**

Table 15 : Strom water conduit criteria

STORMWATER CONDUIT DESIGN CRITERIA	
Mannings coefficient of friction (n)	0.012
Minimum Diameter – Main lines	450 mm (nominal dia.)
Pipe / culvert material	Reinforced concrete (Bearing SANS mark)
Pipe joint type	Spigot and socket (including rubber ring)

Pipe class: (all diameters)	Generally 50D (Loading conditions for each application to be confirmed, particularly construction loadings on the smaller diameter pipes)
Bedding type	Class B (SANS 1200 LB)
Position in road reserve	1.70m, from road edge
Minimum slope: Connections	1:60 (1.67 %)
375mm dia.	1:360 (0.28 %)
450mm dia. and larger	Minimum velocity criteria applies
Minimum velocity (80% full flow)	0.9 m/s
Maximum velocity (Without checking for hydraulic jump)	3.5 m/s
Maximum velocity (Checking for hydraulic jump)	5.0 m/s (Minimum pipe class 100D)
Anchor blocks	375mm to 450mm dia pipes steeper than 1:6 (16.67%) 450mm dia and larger pipes steeper than 1:8 (12.50%)
Minimum cover (road intersections)	1000mm
Minimum cover (general)	750mm
Maximum distance between manholes	80.0m

4.3.4 General Development Considerations

(a) Shallow earth lined stormwater channels will be allowed, for ease of maintenance**.**

(b) Runoff will be caught in stormwater channels and eventually discharge into the sedimentation pond for where settling occurs and then overflow In to the evaporation pond.

(c) Periodic Maintenance of the stormwater system will be needed to clead out sludge. The sludge will be transported to the manure composting area where it will be mixed and utilised for compost.

4.3.5 Connections to existing road and stormwater infrastructure

(a) New roads of the proposed development will link with existing main surfaced National Road N10

(b) All stormwater systems will discharge into the new Sedimentation and Evaporation ponds as part of the sheep feedlot design

4.3.6 Servitudes required

None at this stage.

4.3.7 Bulk Contributions

The bulk contributions will be calculated by the Local Authority (If Applicable), upon approval of this PDR. The details of the Bulk Contribution costs will be stipulated in the DDR (Detailed Design Report).

4.4 SOLID WASTE MANAGEMENT

4.4.1 Existing Infrastructure

The following existing infrastructure is applicable to this proposed development:

- No existing Solid Waste management exists for the site.
- The site is not serviced by municipal Waste collection services

4.4.2 Feed Mill Production

The Waste generated by the feed mill will be collected into skips and transported to the municipal waste disposal site, this will be managed by the Clients operations team and will occur on routine frequency as required.

4.4.2 Sheep Feed lot Production

Manure effluent will be cleaned out from the feeding pens routinely. Two actions take place in terms of management:

- Manure is manually collected and transported to the Manure Composting Area where it will be aired, dried and process as a by-product from the sheep feedlot
- In the event of rainfall, the manure will discharge into the Stormwater channels and flow towards the sedimentation pond, where settling will occur and then overflow will then enter the evaporation pond.
- The evaporation pond has been sized to accommodate the 1:20 year rainfall return period, and accompanied with high evaporation (Based on S-Pan) values, will only overflow in rare occurrences.
- Waste generated by the Sheep Feedlots will be managed by the Clients operations team and will occur on routine frequency as required.

4.4.3 Sheep Feed lot Mortality – Biomass Waste Disposal

A predicted mortality rate of 2 sheep / day should be considered whereby each sheep could have a maximum estimated mass of 75kg. Therefore, an anticipated mass of 150kg / day will be considered in the disposal process.

- **Manure Composting**

  Carcasses will be disposed into the manure composting area, whereby it will take approximately 5-6 months to decompose, per carcass, with respect to mass. Based on all facilities at full capacity (worst case scenario), calculations are as follows:

i) Expected Volume of Manure (~ 10 000 livestock) = **16m³/day**
ii) Volume of 1 manure stockpile (45m long x 5m wide x 2m high) = **150m³**
iii) Days to fill 1 manure stockpile (ie: [ii] / ([i]) = **9.4 days**
iv) Total volume of manure (based on 15 stockpiles within composting area) = **2200m³**
v) Days to fill 15 manure piles (ie: [iv] / [i]) = **138 days (4.6 months)**
vi) Cyclic sheep handling process (ie : Feeding, Raising, Fattening) = **107 days (3.6 months)**

Based on the above information, it can be anticipated that as the 15th manure stockpile is at maximum capacity (after 138 days), the sheep carcasses within the 1st manure stockpile would be approaching full decomposition. The cyclic handling period of livestock would also be reached (at 107 days) and therefore a manure composting area of 100m x 50m is sufficient.

5. WAYLEAVE AND APPLICATIONS

Wayleave applications seek to obtain approval of various services providers, departments, state organs etc. for permission / right of way granted by a landowner, typically for purposes such as the laying of pipes, roads, or any other infrastructure related services. It is also a valuable way of determining the positions of existing services that could affect the site.

Wayleave applications shall be made to the following institutions and approval will then be obtained during the Design Development process, should any of these institutions be affected by the new development. Information and/or conditions set by these institutions shall be noted in the Detailed Design Report for the site.

<u>The institutions are as follows:</u>

- SANRAL
- Middelburg Roads and Stormwater Department
- Middelburg Water and Sanitation Department
- Middelburg Parks Department
- Middelburg Electrical Department
- Transnet
- Randwater
- SASOL Gas
- Eskom
- Dark Fibre Africa for fibre optic cables servicing MTN, Vodacom and other networks.
- Telkom
- MTN/ Vodacom

6. CONCLUSION

MDCC has identified a feasible solution to servicing the site. We are of the opinion that the preliminary design for the development of the site conforms as best possible at the stage to the design standards, and that all relevant existing information made available to us has been incorporated into the designs of the various infrastructure elements.
We are furthermore of the opinion that the most cost-effective design strategies have been followed and applied in generating a preliminary design which balances all the economic, technical, quality and environmental considerations.

We trust that you will find this report in order and should you have any queries, please don't hesitate to contact us. Your comments will assist us in better serving you.

Annexure - A

(Appointment letter)

Annexure B

(Water Reticulation Layout Plan)

Annexure C

(Sewer Reticulation Layout Plan)

Annexure D

(Access Road Layout Plan)

Annexure E

(Stormwater Drainage Layout Plan)

Annexure F

(Water Demand Calculations)

Annexure G

(Sewer Demand Calculations)

Annexure H

(Water Reticulation Cost Estimate)

Annexure J

(Sewer Reticulation Cost Estimate)

Annexure K

(Township Development Layout Plan)

Annexure L

(Geotechnical report)

(Southern Geotechnical Engineers)