



**DRAFT BASIC ASSESSMENT REPORT:
Proposed development of a Midlands Biogas & Fertiliser Plant,
uMshwathi Local Municipality, KwaZulu-Natal**

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REVISION 0**

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TITLE: DRAFT BASIC ASSESSMENT REPORT:
PROPOSED DEVELOPMENT OF A MIDLANDS BIOGAS & FERTILISER PLANT, UMSHWATHI LOCAL MUNICIPALITY, KWAZULU-NATAL

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SYNOPSIS

Basic Assessment Report written in compliance with GNR 982, Environmental Impact Assessment (EIA) Regulations (2014) for the proposed development of a Midlands Biogas and Fertiliser Plant, uMshwathi Local Municipality, KwaZulu-Natal.

KEY WORDS:

Draft, BAR, GNR 982, EIA Regulations (2014), Midlands Biogas

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QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882



Verification	Capacity	Name	Signature	Date
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EXECUTIVE SUMMARY

JG Afrika (Pty) Ltd has been appointed by Midlands Biogas & Fertiliser, a subsidiary company of Renen Energy Solutions and Sunshine Seedling Services, to undertake the environmental services required for the proposed development of a Biogas and Liquid Fertiliser Plant, uMshwathi Local Municipality, KwaZulu-Natal. The proposed development requires Environmental Authorisation and a Waste Management Licence (WML) prior to construction and operation commencing.

The primary input of the Biogas and Fertiliser Plant is animal manure, proposed to be sourced from a local bovine feedlot. The animal manure is mixed with water to the desired consistency and processed via an anaerobic digester. The estimated input of animal manure, running at full capacity, will be 18 tons/day. The outputs are threefold, namely:

1. 80m³/day liquid fertiliser;
2. 6 tons/day solid compost; and
3. 40 – 80m³/hour biogas.

In terms of utilization, the following will apply:

- The liquid fertiliser will be used at the existing Sunshine Seedling Services nursery;
- The compost will be applied to existing sugarcane fields and will be utilized in the existing Sunshine Seedling Services nursery; and
- The biogas will be utilized as a fuel source for heating the existing Sunshine Seedling Services nursery tunnels during the winter months; firing boilers in a purpose-built essential oil distillery and for generating electricity in a closed combustion engine which will assist in powering the Biogas and Fertiliser Plant. Any excess biogas generated will be flared.

The Public Participation Process involves consultation with the relevant authorities, non-government organisations (NGO's), neighbouring landowners, community members and other identified Interested and Affected Parties (IAPs). Newspaper advertisements were published at the outset of the project to inform the general public of the Environmental and WML Process. Advertisements were published in English on 05 April 2016 in the Witness newspaper and in the Maritzburg Fever newspaper on 06 April 2016. Site notices were erected on site and at the intersection of the P25-1 and the existing site access road on 06 April 2016. Further, notification letters were distributed via post and email to neighbouring landowners and identified stakeholders. A Public Meeting was not held as significant interest was not received by the surrounding community for such.

A Heritage Impact Assessment was undertaken by Active Heritage cc. to determine if any items of cultural or historical value would be impacted on during construction; Terratest (Pty) Ltd developed a Stormwater Management Plan (SWMP) to ensure the practical and effective management of stormwater on-site, as per GN704 of the National Water Act (Act 36 of 1998); a Risk Assessment was undertaken by Riscom (Pty) Ltd to determine the impact that the operation of the Biogas and Fertiliser Plant would have on surrounding community in terms of health and safety; and a Geohydrological Assessment was undertaken by JG Afrika

(Pty) Ltd to determine if the development would have any negative impacts on the underground water resources in the area. No fatal flaws were identified by any of the Specialist Studies.

The Draft Basic Assessment (BA) Report and Environmental Management Programme (EMPr) have been circulated to IAPs for review and comment. Comments received on the Draft BA Report and EMPr will be consolidated and included into a Final BA Report, which will be submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (EDTEA) for a decision on Environmental Authorisation and a WML.

This BA Report has been drafted in accordance with the EIA Regulations (2014) and adheres to the requirements contained in Appendix 1 of GNR 982, as noted in Table 1-1.

TABLE 1-1: Content of a BA Report (2014 EIA Regulations)

2014 EIA Regulations	Description of EIA Regulations Requirements for BA Reports	Location in the BAR
Appendix 1, Section 3 (a)	Details of – (i) The EAP who prepared the report; and the expertise of the EAP; and (ii) The expertise of the EAP, including a curriculum vitae.	Section 2 & Appendix 1
Appendix 1, Section 3 (b)	The location of the activity, including – (i) The 21-digit Surveyor General code of each cadastral land parcel; (ii) Where available, the physical address and farm name; (iii) Where the required information in items (i) and (ii) is not available, coordinates of the boundary of the property or properties	Section 3
Appendix 1, Section 3 (c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is – (i) A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Section 4
Appendix 1, Section 3 (d)	A description of the scope of the proposed activity, including – (i) All listed and specified activities triggered; (ii) A description of the activities to be undertaken, including associated structures and infrastructure.	Section 4
Appendix 1, Section 3 (e)	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.	Section 5
Appendix 1, Section 3 (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location.	Section 6
Appendix 1, Section 3 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including- (i) Details of all alternatives considered; (ii) Details of the Public Participation Process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 7 Section 8 Section 8 Section 9 and 10

2014 EIA Regulations	Description of EIA Regulations Requirements for BA Reports	Location in the BAR
	<p>(v) The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which the impacts-</p> <ul style="list-style-type: none"> (aa) Can be reversed; (bb) May cause irreplaceable loss of resources; and (cc) Can be avoided, managed, or mitigated. <p>(vi) The methodology used in deterring and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;</p> <p>(vii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographic, physical, biological, social, economic, heritage and cultural aspects;</p> <p>(viii) The possible mitigation measures that could be applied and level of residual risk;</p> <p>(ix) The outcome of the site selection matrix;</p> <p>(x) If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and;</p> <p>(xi) A concluding statement indicating the preferred alternatives, including preferred location of the activity.</p>	<p>Section 12</p> <p>Section 12</p> <p>Section 13</p> <p>Section 14</p> <p>Section 14</p> <p>Section 7</p> <p>Section 14</p>
Appendix 1, Section 3 (i)	<p>A full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including-</p> <ul style="list-style-type: none"> (i) A description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures. 	Section 12 and 13
Appendix 1, Section 3 (j)	<p>An assessment of each identified potentially significant impact and risk, including-</p> <ul style="list-style-type: none"> (i) Cumulative impacts; (ii) The nature, significance and consequences of the impact and risk; (iii) The extent and duration of the impact and risk; (iv) The probability of the impact and risk occurring; (v) The degree to which the impact and risk can be reversed; (vi) The degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) The degree to which the impact and risk can be avoided, managed or mitigated. 	Section 14
Appendix 1, Section 3 (k)	<p>Where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report.</p>	Section 11
Appendix 1, Section 3 (l)	<p>An environmental impact statement which contains-</p> <ul style="list-style-type: none"> (i) A summary of the key findings of the environmental impact assessment; (ii) A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives. 	Section 15
Appendix 1, Section 3 (m)	<p>Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr.</p>	Section 16

2014 EIA Regulations	Description of EIA Regulations Requirements for BA Reports	Location in the BAR
Appendix 1, Section 3 (n)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	Section 16
Appendix 1, Section 3 (o)	A description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	-
Appendix 1, Section 3 (p)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Section 16
Appendix 1, Section 3 (q)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised.	Section 17
Appendix 1, Section 3 (r)	An undertaking under oath or affirmation by the EAP in relation to- (i) The correctness of the information provided in the report; (ii) The inclusion of the comments and inputs from stakeholders and interested and affected parties; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	Section 19
Appendix 1, Section 3 (s)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.	-
Appendix 1, Section 3 (t)	Where applicable, any specific information required by the Competent Authority.	-
Appendix 1, Section 3 (u)	Any other matter required in terms of section 24(4) (a) and (b) of the Act.	-

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DRAFT BASIC ASSESSMENT REPORT: Proposed development of a Midlands Biogas & Fertiliser Plant, uMshwathi Local Municipality, KwaZulu-Natal

1 INTRODUCTION

Midlands Biogas and Fertiliser, a subsidiary company of Renen Energy Solutions and Sunshine Seedling Services, appointed JG Afrika (Pty) Ltd to undertake the environmental services required for the proposed development of a Biogas and Fertiliser Plant, uMshwathi Local Municipality, KwaZulu-Natal.

The primary input of the Biogas and Fertiliser Plant is animal manure sourced from a local feedlot. The output of the Biogas and Fertiliser Plant is digestate, which is processed through a screw-press to produce liquid fertiliser and solid, organic compost. A by-product of the process is biogas.

As per GN R982 of the EIA Regulations (2014), a Basic Assessment (BA) Process must be undertaken in such a manner that the environmental outcomes, impacts and residual risks of the proposed activities are assessed accordingly by the Environmental Assessment Practitioner (EAP). In this regard, the requirements of the BA Process are noted in the EIA Regulations (2014), Listing Notice 1, Appendix 1 of GNR 982 and are consequently adhered to in this report (please refer to Table 1-1 of the Executive Summary).

Further, given the utilisation of waste (i.e. animal manure) in the Biogas and Fertiliser Plant during operation, a Waste Management Licence (WML) is required as per the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM: WA). The requirements of the NEM: WA follow the same as those stated in the BA Process and consequently the EIA Regulations (2014). As such, this report meets the requirements of both sets of Regulations.

Ultimately, the outcome of the BA Process is to provide the Competent Authority, the Department of Economic Development, Tourism and Environmental Affairs (EDTEA), with sufficient information to provide a decision on the Application in terms of Environmental Authorisation (EA) and a WML, in order to avoid or mitigate any detrimental impacts that the activity may inflict on the receiving environment.

2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

As noted previously, JG Afrika (Pty) Ltd has been appointed by Midlands Biogas & Fertiliser to undertake the BA and WML Processes for the proposed Biogas and Fertiliser Plant, uMshwathi Local Municipality, KwaZulu-Natal. Details of the qualified EAPs involved in undertaking the BA and WML Processes are noted in Table 2-1 and the Curriculum Vitae (CV) of the relevant EAPs attached as Appendix 1.

TABLE 2-1: EAP details

COMPANY NAME: JG AFRIKA (PTY) LTD			
EAP	Qualifications & Professional affiliations	Experience at environmental assessments	Contact details
Mr M. van Rooyen Executive Associate	MPhil (Environmental Management), Pr. Sci. Nat, IAIAsa	12 years	JG Afrika (Pty) Ltd Tel: (033) 343 6700 Email: vanrooyenm@jgafrika.com
Mr G. von Mayer Snr Environmental Scientist	BSc. Chemistry and Applied Chemistry, IAIAsa, WISA, IWMSA, NICOLA	15 years	JG Afrika (Pty) Ltd Tel: (033) 343 6700 Email: vonmayerg@jgafrika.com
Ms L. Dralle Environmental Scientist	BSc. Hons Environmental Management, IAIAsa	10 years	JG Afrika (Pty) Ltd Tel: (033) 343 6700 Email: drallel@jgafrika.com
Ms. I. Summers Environmental Scientist	BSc, Hons (Environmental Science); IAIAsa	4 years	JG Afrika (Pty) Ltd Tel: (033) 343 6700 Email: summersi@jgafrika.com

3 LOCATION OF THE ACTIVITY

The proposed activity is located within Ward 9 of the uMshwathi Local Municipality (Figure 3-1). The property description, 21-digit Surveyor General (SG) code and property co-ordinates are provided in Table 3-1.

TABLE 3-1: Site details

PROPERTY DESCRIPTION	Portion 45 of the Farm Riet Spruit No. 997
21 DIGIT SG CODE	N0FT0000000099700045
CO-ORDINATES	29°31'37.14S; 30°28'25.77"E
TOTAL PROPERTY AREA	150.9ha
SITE AREA (WITHIN PROPERTY)	1ha (Construction) - 0.9ha (Operation)

The site identified for development is zoned as agriculture and is currently planted to sugarcane. Immediately adjacent to the identified site is Sunshine Seedling Services, which is an existing and operational nursery specialising in the propagation of vegetable, timber and flower seedlings. Sunshine Seedling Services will be the recipients of the produced liquid fertiliser, solid compost and biogas. Any excess solid compost will be spread on existing sugarcane fields.

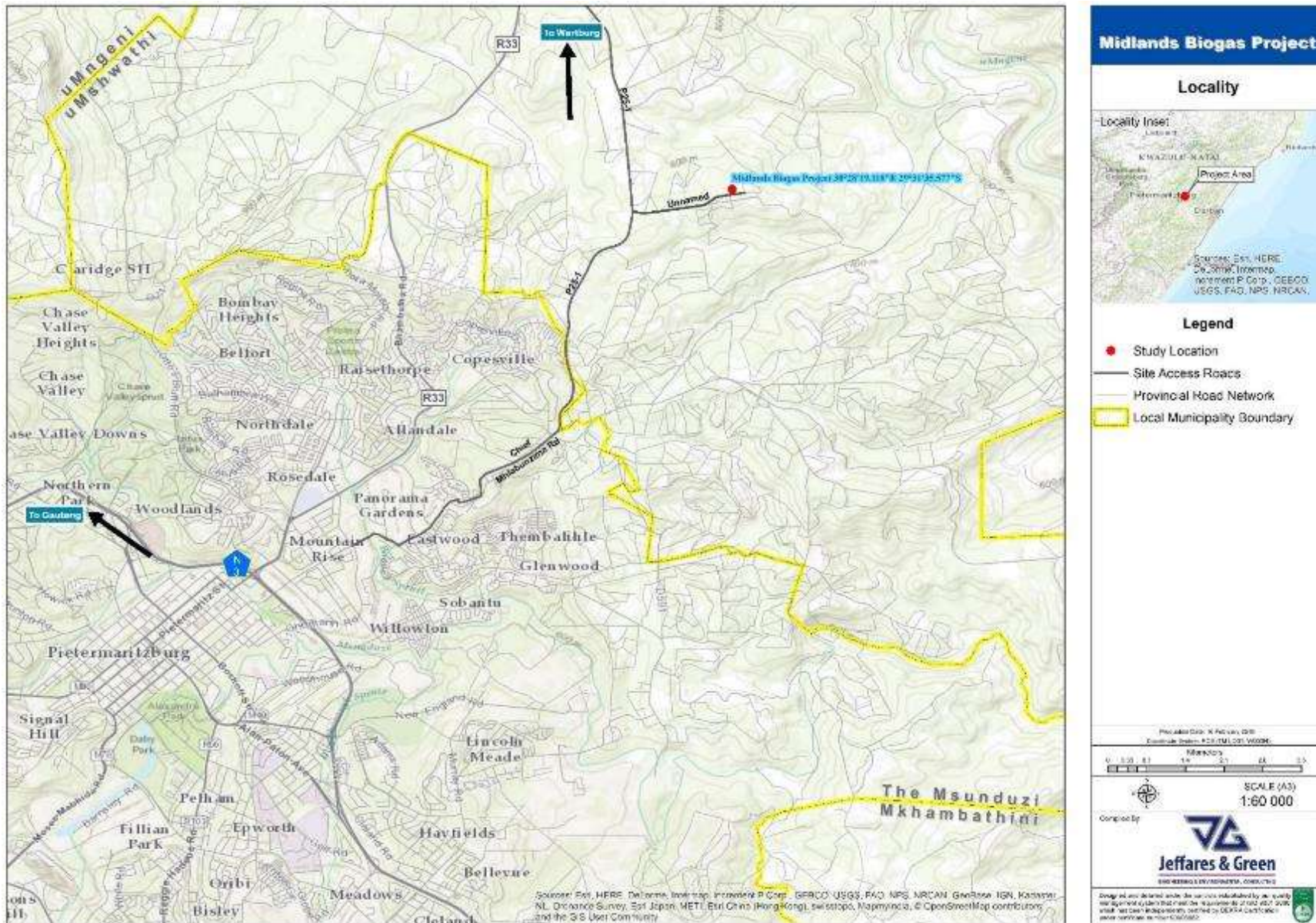


FIGURE 3-1: Locality Map

4 ACTIVITY DESCRIPTION

4.1 APPLICABLE LISTED ACTIVITIES

4.1.1 EIA REGULATIONS (2014)

In terms of the Environmental Impact Assessment (EIA) Regulations (2014), promulgated in terms of the National Environmental Management Act, (Act No. 107 of 1998) (NEMA), certain Listed Activities are specified for which either a BA (GN R 983 and 985) or a full Scoping and EIA (GN R 984) is required.

The following Listed Activities in Government Notice (GN) R 983 (Listing Notice 1), requiring a BA Process are applicable to the proposed development of the Biogas and Fertiliser Plant:

- **GNR 983, Activity 14:** “The development of facilities or infrastructure, for the storage, or for the storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more, but not exceeding 500 cubic meters.”
 - *Biogas comprises 65% methane, 30% carbon dioxide and <1% hydrogen sulphide. According to SANS10234, a flammable gas at 13% in air is a hazardous good. The methane content of biogas at 13% is ~8.5%, which falls within its range of flammability and is therefore a dangerous good. As the biogas is proposed to be stored in two subterranean bladders (refer to Figure 4-3), with a capacity of 240m³ each, this Listed Activity is triggered.*

- **GN R983, Activity 28:** “Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1 April 1998 and where such development (ii) occurs outside an urban area, where the total land to be developed is bigger than 1ha; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.”
 - *The entire development footprint is not equivalent to, nor will it exceed 1ha. In total, the proposed development footprint will amount to 0.9ha, inclusive of roads and the proposed manure storage area. However, during the construction phase, however, laydown areas etc. may result in the need to utilise more than 1ha of land and as a result, this Listed Activity is being applied for.*

Based on the above activities a BA Process is required. No Listed Activities under GNR 984 (Listing Notice 2) are triggered by the proposed development and an assessment of the area has also revealed that no Listed Activities under GNR 984 (Listing Notice 3) would be triggered by the proposed development.

4.1.2 NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (ACT NO. 59 OF 2008)

In terms of the NEM: WA, there are certain Listed Activities related to the re-use, storage, treatment and disposal of waste that requires a Basic Assessment (Category A), an EIA Process (Category B) or Norms and Standards as gazetted by the Minister to be adhered to (Category C). In this regard, the following Listed Activities are triggered in terms of the WML Application:

- **Category A, Activity 5:** “The recovery of waste including the refining, utilisation or co-processing of waste in excess of 10 tons, but less than 100 tons of general waste per day or in excess of 500kg, but less than 1 ton of hazardous waste per day, excluding recovery that takes place as an integral part of an internal manufacturing process within the same premises.”
 - *This activity is applicable as approximately 40m³ of manure (amounting to a net weight exceeding 10 tons, but not 100 tons) will be utilised during the manufacturing process.*

- **Category A, Activity 12:** “The construction of a facility for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity).”
 - *This activity is applicable given that the proposed construction of the Biogas and Fertiliser Plant would necessitate the processing of 40m³ of animal manure.*

- **Category C, Activity 1:** “The storage of general waste at a facility that has the capacity to store in excess of 100m³ of general waste at any one time, excluding the storage of waste in lagoons or temporary storage of such waste.”
 - *This activity is applicable as the receiving and therefore consequent storage of animal manure in the designated storage area, may exceed the storage of 100m³, as a stockpiled material.*

The associated combined Environmental Authorisation (EA) and Waste Management License (WML) Application form is attached to this Report as Appendix 2 and an organogram of the BA and WML Processes is provided in Figure 4-1 for reference purposes.

4.1.3 NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT (ACT NO. 39 OF 2004)

In assessing the proposed development, JG Afrika (Pty) Ltd reviewed the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM: AQA) to ensure that the operational process proposed did not trigger any Listed Activities. In this regard, the following Listed Activity was identified under GNR 893 of NEM: AQA:

- **Activity 10:** “Processes for the rendering cooking, drying, dehydrating, digesting, evaporating or protein concentrating of any animal matter not intended for human consumption.”
 - *As animal manure is not considered to be animal matter, this Listed Activity is not triggered.*

Based on the above, an Air Emissions Licence has not been applied for.

4.1.3.1 NEM:AQA Regulation No 831: Declaration of small boiler as a controlled emitter and establishment of emission standards

The declaration of small boilers applies to all boilers with a design capacity of greater than 10MW but less than 50MW heat input unit per unit. The proposed use of the biogas is through a Combined Heat and Power (CHP) engine which generates electricity and the resultant waste heat is used to power the distillery boilers. These distillery boilers are yet to be specified, however, the heat input is below the threshold of 10MW heat input. Thus the regulations and the emissions standards do not apply.

4.1.3.2 NEM:AQA Regulation 172: Declaration of greenhouse gases as priority pollutants

The facility will produce both methane and carbon dioxide, declared priority pollutants as per the aforementioned regulation. These regulations require a pollution prevention plan to be submitted to the Minister for approval should the emission of a priority pollutant exceed 0.1Mt per annum. The specification proposed falls below this threshold and thus does not require the pollution prevention plan.

4.1.4 LOCAL REGULATIONS

4.1.4.1 Umshwati Local Bylaws

A review of the uMshwati bylaws dated 15 January 2016 did not identify any bylaws which were pertinent to the environmental management of the proposed facility, other than standard planning regulations. This was reviewed in regards to stormwater management, emissions and pollution prevention.

4.1.4.2 UMgungundlovu District Bylaws

The 2015 uMgungundlovu district model spatial planning land use management bylaws were reviewed and were not found to contain relevant bylaws relating to the emissions and pollution management of the facility, other than standard planning regulations.

With respect to the bylaws, the applicant is deemed to be responsible for administering this through the relevant municipal processes.

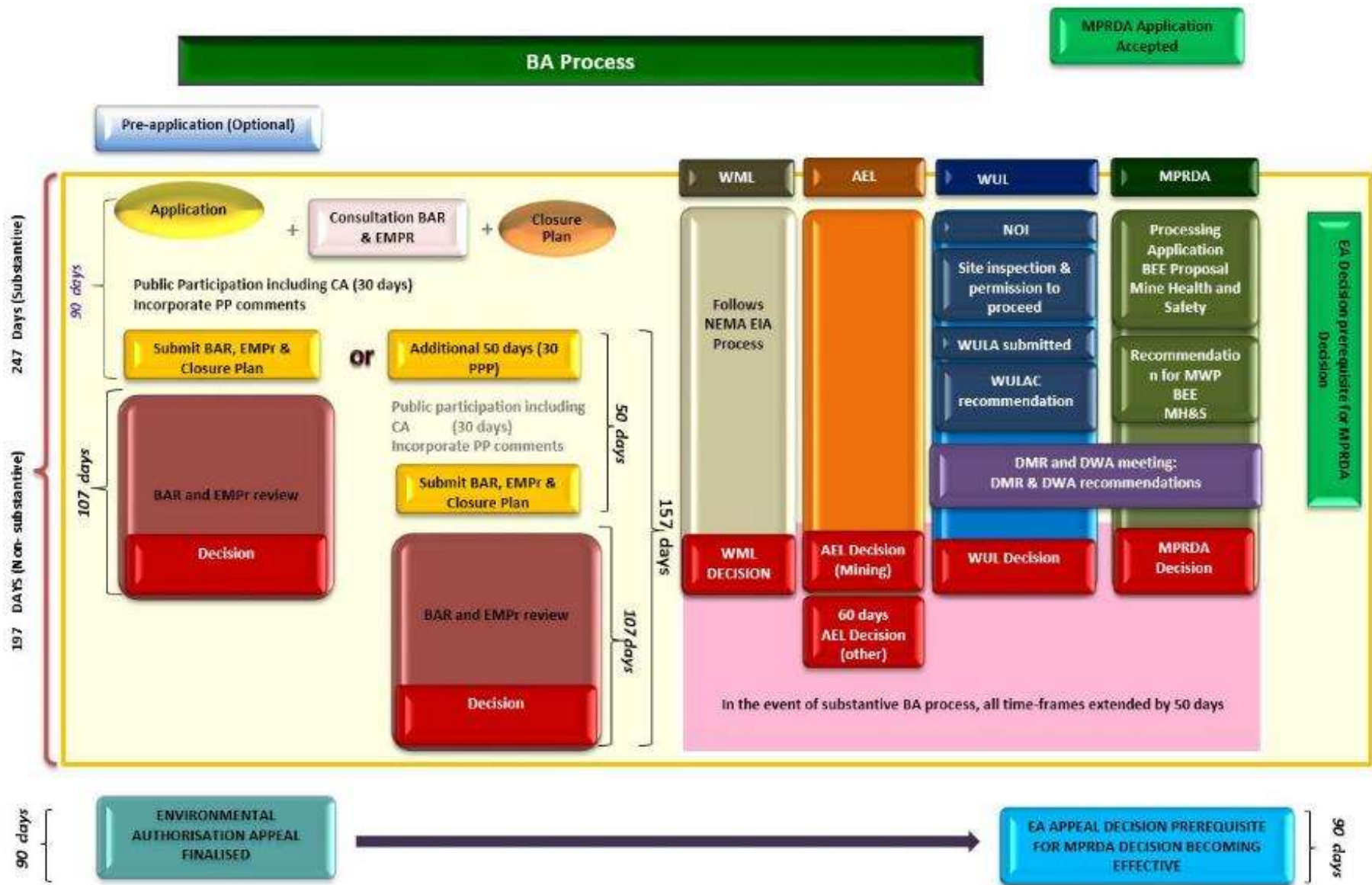


FIGURE 4-1: Basic Assessment (BA) and Waste Management Licence (WML) Process Organogram.

4.2 EDTEA PRE-APPLICATION MEETING

A Pre-Application Meeting was held with the EDTEA on 01 March 2016. The minutes thereof are attached as Appendix 3. The purpose of the Pre-Application Meeting was to introduce the project to the EDTEA, present and confirm the relevant Listed Activities and identify the required Specialist Studies to be conducted.

4.3 DESCRIPTION OF THE ACTIVITY

4.3.1 PROJECT OVERVIEW

The proposed Biogas and Fertiliser Plant is to be constructed based on an existing model utilised in the United States of America. The main component of the Biogas and Fertiliser Plant is a vertical anaerobic digester, termed an Induced Blanket Reactor (IBR). The IBR produces a high quality, nutrient rich liquid fertiliser, as well as a solid, organic compost and biogas. The sustainable nature of the technology is that it utilises a renewable waste source in the form of animal manure to produce a high quality fertiliser and a sustainable energy source in the form of biogas.

An existing local bovine feedlot is situated approximately 6km northwest of the site. Given the proximity of this resource, it is proposed to utilise the accumulated and readily available bovine manure produced at this facility as the primary fuel resource in the Biogas and Fertiliser Plant. Intermittently, chicken litter and vegetation debris may be added to the bovine manure mixture. However, under no circumstances will any animal carcass be utilised.

It is important to note that current practices on site include for the collection and transportation of raw bovine manure from the same proposed local feedlot. This raw bovine manure is applied as a fertilising medium to the existing sugarcane fields on the property proposed for development. Therefore, given the existing practice and the proposed, there will be no net increase in transportation impacts when compared to the status quo.

On a basic process level, the collected animal manure will be mixed with water to the desired consistency and processed via an anaerobic digester. The estimated input of animal manure, running at full capacity, will be 18 tons/day. The outputs (i.e. product), post-processing, will be threefold, namely:

- 80m³/day liquid fertiliser;
- 6 tons/day solid compost; and
- 40 – 80m³/hour biogas.

These products used by Sunshine Seedling Services in the following manner:

- The liquid fertiliser will be used at the existing Sunshine Seedling Services nursery;
- The solid, organic compost will be applied to existing sugarcane fields surrounding the Biogas and Fertiliser Plant and will be utilised in the existing Sunshine Seedling Services nursery; and
- The biogas will be utilised as a fuel source for heating the existing Sunshine Seedling Services nursery tunnels during the winter months; firing boilers in a purpose-built essential oil distillery to be constructed as part of the Biogas and Fertiliser Plant and for generating electricity in a closed combustion engine

which will assist in powering the Biogas and Fertiliser Plant. Excess biogas is flared as a standard industry practice.

Further detailed information is provided in Section 4.3.3 of this report.

4.3.2 CONSTRUCTION SPECIFICATIONS

The Biogas and Fertiliser Plant will be comprised of the following components:

- 1 x 1 000m² general storage yard for the receiving and stockpiling of raw material i.e. animal manure / plant matter;
- 2 x holding bunkers with a storage capacity of 40m³ each;
- 1 x 100 000 litre pre-holding tank, fixed with a cutter pump and interconnecting density adjustor pump;
- 1 x 100 000 litre material conditioning tank with associated rotating agitator;
- 4 x IBR digester tanks with a capacity of 120m³ each;
- 3 x 6m containers for operational controls and processing equipment;
- 1 x 20 000 litre holding tank;
- 1 x screw press to separate digestate into liquids (i.e. liquid fertiliser) and solids (i.e. compost);
- 1 x compost packaging and storage area;
- 2 x 240m³ subterranean storage bladders for liquid fertiliser and associated biogas;
- 1 x flare for excess biogas;
- 1 x 630m² storage and essential oil distillery shed; and
- Pipelines and delivery road.

The total footprint of the Biogas and Fertiliser Plant, inclusive of the general storage yard, delivery road and compost packing and storage area will amount to 0.9ha in size. However, during construction laydown areas etc. may result in the need to utilise a total area of 1ha or slightly more.

A construction layout plan and process description diagram are provided in Figures 4-2 and 4-3 respectively.

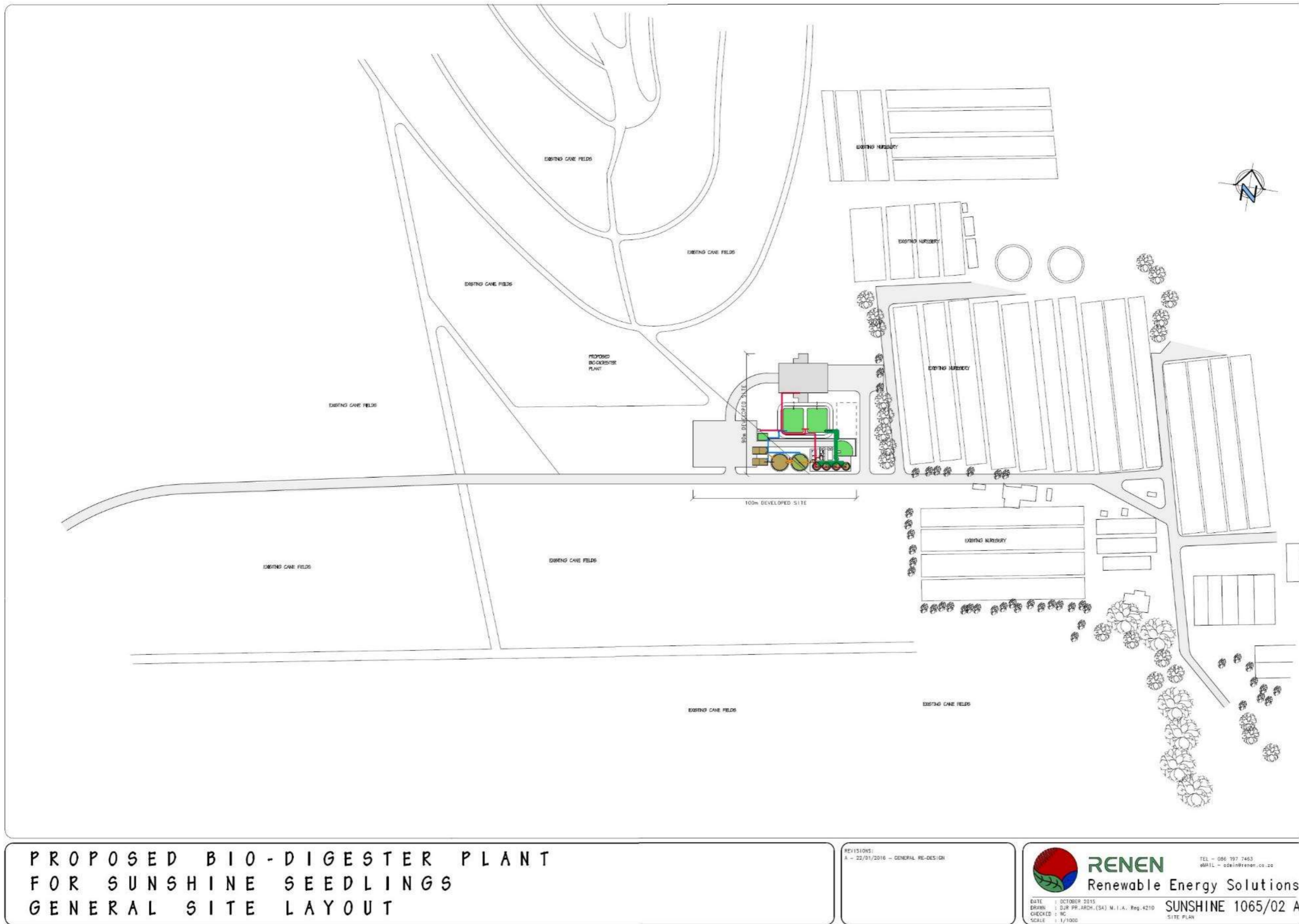
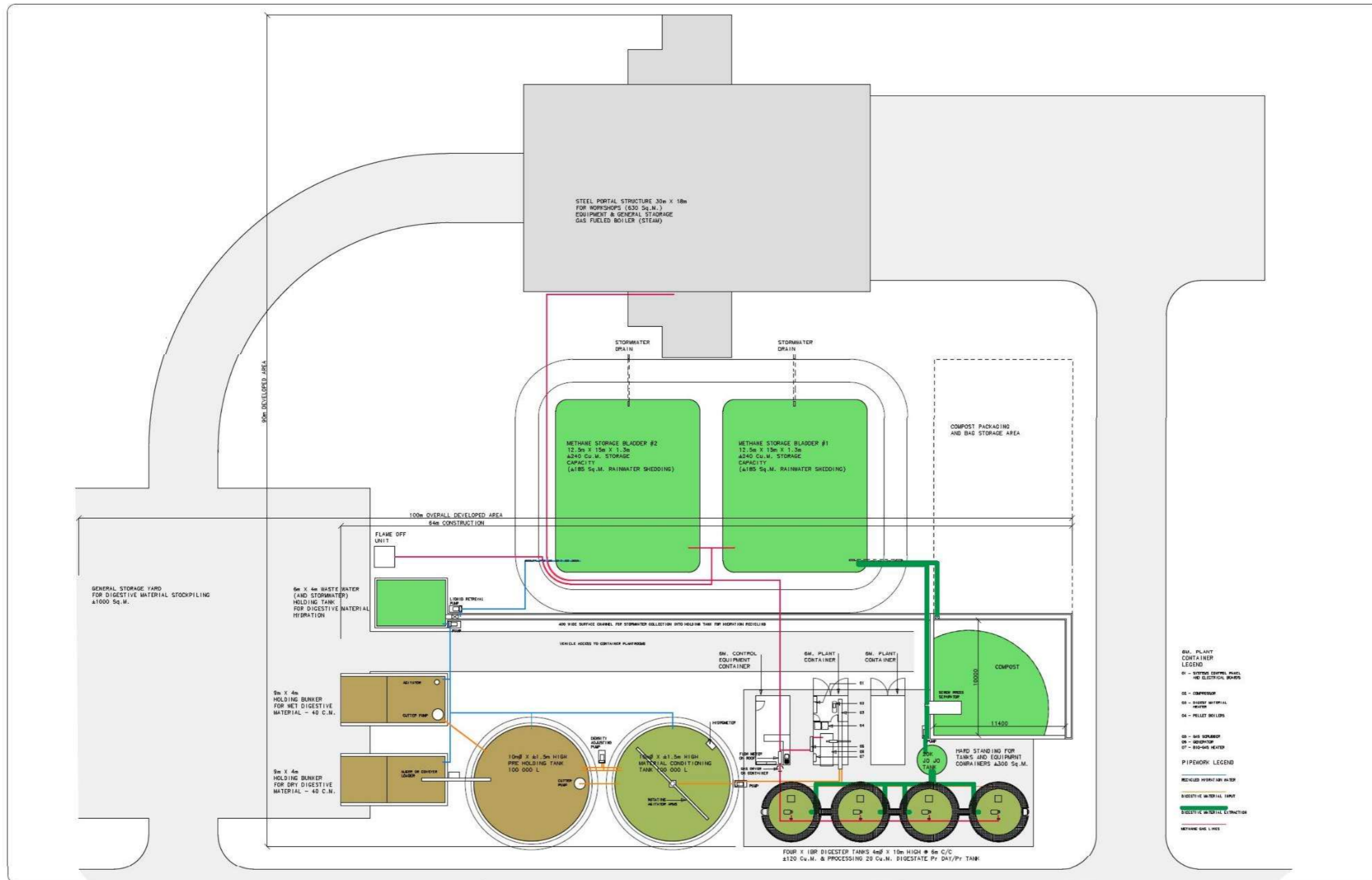


FIGURE 4-2: Construction layout



PROPOSED BIO-DIGESTER PLANT
FOR SUNSHINE SEEDLINGS
PROPOSED DETAILED SITE LAYOUT

REVISIONS:

RENEW
Renewable Energy Solutions

TEL - 086 197 7463
EMAIL - admin@renew.co.za

DATE : JANUARY 2016
DRAWN : DJR PR.ARCH.(SA) M. I.A. Reg. 4210
CHECKED : WC
SCALE : 1/150

SUNSHINE 1065/04
DETAILED SITE PLAN

FIGURE 4-3: Process description diagram

4.3.3 PROCESS DESCRIPTION: OPERATION

Bovine manure (i.e. a waste product) will be collected daily from a local feedlot, located approximately 6km northwest of the site via tipping truck. Dependent on the amount of manure available for collection, as well as the stockpiled amount in the designated general storage area on site, this may occasionally be conducted weekly. The raw manure will be scraped from the feedlot and transported to site for stockpiling. The received waste will be composed of approximately 30% dry solids and is therefore considered to be a relatively dry material.

The dry waste will be transferred into the dry holding bunker where a conveyor/auger will transfer it into a pre-holding tank. Water and previously generated liquid fertiliser will be added to the manure to increase the moisture content, prior to it being transferred into the conditioning tank where the moisture content is tested and corrected if necessary. This waste mixture is then heated utilising excess heat from the engine generator, (a specialised biogas fuelled mechanism - see Appendix 4), and a consistent flow of the pre-heated waste mixture is piped into the bottom of each IBR digester tank sequentially, at a rate of 13 litres per minute per tank.

Each IBR digester tank is designed to be a 10m vertical column. The vertical design increases the rate of exposure of organic solids to bacteria as the pre-heated waste mixture is passed up through the tank, thereby significantly increasing the processing rate. The vertical design also negates the need for a stirring mechanism which reduces maintenance costs. The vertical design further allows for a decreased construction footprint.

The consistent rate of the pre-heated waste mixture into the IBR tank ensures that a continuous rate of anaerobic digestion is maintained. In this regard, the waste mixture is systematically exposed to the various strains of bacteria in the tank and the processes of hydrolysis, acidogenesis, acetogenesis, methanogenesis occurs at various stages and heights in the IBR tank. The even pre-heated feed of the waste mixture minimises any potential shock to the anaerobic digestion bacteria and facilitates an even distribution in the IBR tank. In total, the processing time, or Hydraulic Retention Time (HRT), of the waste mixture is 5-6 days. The resultant products of the IBR tank process are biogas and digestate.

The digestate is pumped from the IBR tank into a 20 000 litre holding tank (JoJo type tank) from where it is passed through a screw-press, which separates the liquid from the solid fibre. The solid fibre will be composted aerobically and utilised on the existing sugarcane fields or in the Sunshine Seedling Services nursery. A portion of the liquid component is fed back into the process (pre-holding tank) to assist in increasing moisture levels of the receiving raw manure. The remaining liquid is piped into one of the two covered subterranean storage bladders. From here, it is piped to Sunshine Seedling Services for irrigation purposes in the existing nursery. Based on this design, no water is lost in the process, as all water utilized as an input, is amalgamated into the end product i.e. liquid fertiliser.

The process of anaerobic digestion in the IBR tanks results in the release of biogas. It is proposed to pipe the biogas from the top of the IBR tank to the covered subterranean storage bladders, where the liquid fertiliser is

stored. From the storage bladders, the biogas is proposed to be piped to the following components of the Biogas and Fertiliser Plant to:

- 1) Fuel the boiler located in the essential oil distillery plant;
- 2) Generate electricity via a gas fired, closed combustion engine contained in one of the processing control containers (see Appendix 4);
- 3) Act a heat source in the nursery tunnels at Sunshine Seedling Services; or
- 4) Flared on site as necessary, at a stack height of 3m. The flare will be spark ignited and utilise a Liquid Petroleum Gas (LPG) driven pilot flame for immediate ignition as required. The flare unit will also be surrounded by a 5m x 5m security fence.

4.3.4 ESSENTIAL OIL DISTILLERY PLANT

A purpose-built essential oil distillery plant forms part of the Biogas and Fertiliser Plant and is located within the 0.9ha development footprint of the site. It is to be located to the direct north of the subterranean storage bladders and will be housed within in a steel structure.

The essential oil distillery plant will add an additional product stream to Sunshine Seedling Services, via the production of essential oils. The essential oils will be extracted from the various plant species cultivated by Sunshine Seedling Services. Further, the biogas generated via the Biogas and Fertiliser Plant will be utilised in the distillery process by fuelling the gas fire boiler, which will release steam, necessary in the distilling process.

The construction and operation of the essential oil distillery plant does not trigger any Listed Activities under the EIA, NEM: WA or NEM: AQA. However, it does provide a suitable medium for the utilisation of the generated biogas, which is a sustainable, renewable fuel resource.

4.3.5 STORMWATER

A stormwater management plan (SWMP) has been compiled for the Biogas and Fertiliser Plant (see Appendix 5), separating the clean stormwater (CW) from dirty stormwater (DW), in line with GN704 of the National Water Act (Act 36 of 1998). Figure 4-4 provides a conceptual design of the proposed stormwater management on the site.

As per Figure 4-4, the majority of the development site will produce clean stormwater runoff. This is largely due to the fact that many of the areas likely to result in dirty stormwater runoff (i.e. digester tank area, methane storage area and the essential oil distillery) are either covered by roofs, or are sufficiently lined such that spillages are highly unlikely (i.e. the subterranean storage bladders are covered and underlined by a 250 micron HDPE liner).

The clean stormwater captured from roofs will be collected in Jojo tanks on-site or piped to the existing reservoirs located within Sunshine Seedling Services (i.e. rainwater harvesting). The remaining clean water will be attenuated and discharged to the existing sugarcane fields located to the north of the development.

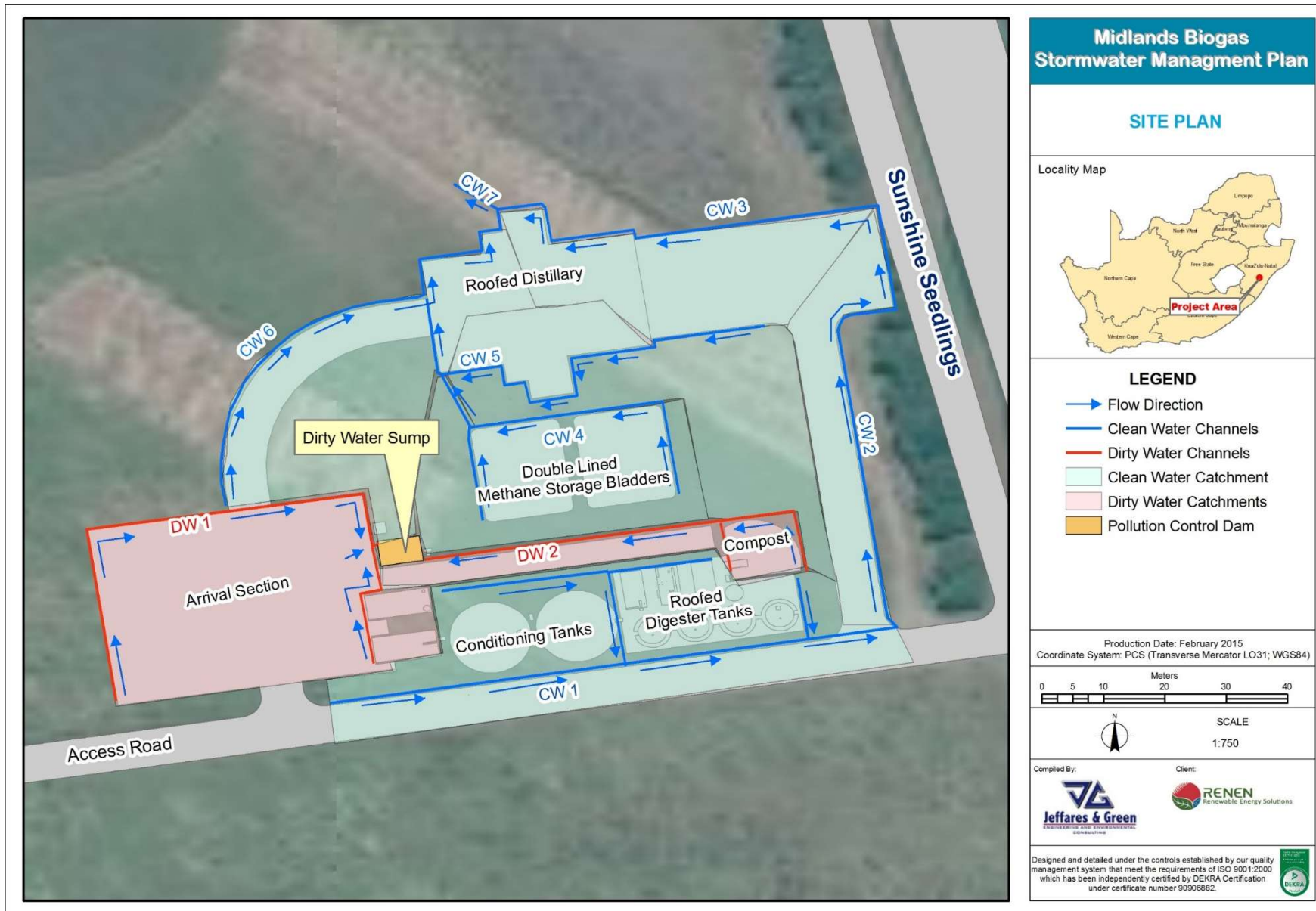


FIGURE 4-4: Stormwater management on site (Appendix 5: SWMP).

In terms of dirty stormwater, an analysis of the proposed bovine manure was conducted and found to be within acceptable guideline limits in terms of contamination potential (Appendix 5: SWMP). Midlands Biogas & Fertiliser have, however, committed to storing the stormwater runoff from areas considered to be potentially contaminated to prevent any possible contamination of water resources. In accordance with the statutory requirements of the National Water Act (Act No. 36 of 1998), dirty stormwater runoff from contaminated sources should be kept separate from clean stormwater runoff and stored in a system separate from that of the clean stormwater runoff system. In this regard, the dirty stormwater runoff generated from the general storage Arrival and Compost areas (as depicted in Figure 4-4) will report to the pollution control dam from which stormwater will be pumped into the subterranean storage bladders. Both the pollution control dam and the subterranean storage bladders are therefore considered to form part of the dirty water containment system.

The accumulated dirty stormwater contained within the subterranean storage bladders will feed water back into the production process, as required, via addition into the holding bunkers, pre-holding tank and material conditioning tanks. The addition of the water to the waste at the various stages will assist with establishing the correct viscosity prior to processing.

4.3.6 TRANSPORT AND SITE ACCESS

As noted previously, current practice on site is the collection and transportation of bovine manure from the existing animal feedlot for application on existing sugarcane fields. In this regard, the existing practice will continue with the collection and transportation of animal manure to the site. However, prior to application of the bovine manure to the sugarcane fields, it will undergo processing via the Biogas and Fertiliser Plant. In this regard, there is no net increase in the amount of vehicles which currently transport manure to and from site, therefore the current status quo will remain.

4.3.7 ODOUR NUISANCE

During processing, in terms of odour nuisance, carbon dioxide (CO₂) and carbon monoxide (CO) are the only gases likely to be emitted, as methane (CH₄) and the other volatile organic compounds (VOC's) will be contained within the IBR tanks and covered subterranean storage bladders. Further, the processing which occurs in the IBR tanks reduces the VOC content, (which is the main odour contingent), by 65%.

The subterranean storage bladders will be constructed of an impermeable HDPE liner (250 micron) to prevent the loss of biogas (and hence odour) and will be continuously maintained at a positive pressure to avoid any inflow of air. The bladders will be tethered to the ground by fixed ground anchors.

It is important to note that the produced biogas, which is composed of methane, VOCs, carbon dioxide and carbon monoxide holds a resource value in that it will be used by Sunshine Seedling Services in several activities as noted in Section 4.3.3. In this regard, all equipment will be maintained and serviced as required to ensure that all produced biogas is captured and stored appropriately to allow for effective use, as and when required. It is therefore in the Applicant's best interest to ensure that all biogas and associated mechanisms are functioning optimally, further reducing the possibility of odour nuisance impacts.

4.3.8 WASTE

An existing local bovine feedlot is situated approximately 6km northwest of the site. Given the proximity of this resource, it is proposed to utilise the accumulated and readily available manure (i.e. general waste) produced at this facility as the primary fuel resource in the Biogas and Fertiliser Plant. Intermittently, chicken litter and vegetation debris may be added to the bovine manure mixture. i.e. additional waste ingredients. However, under no circumstances will any animal carcass or fluid be utilised. i.e. bone, flesh, blood.

Once the waste has been processed via the IBR technology, it is no longer considered to be a waste and is instead classified as a product. In this regard, it was discussed and agreed to at the Environmental Pre-Application Meeting held with the Competent Authority, the EDTEA, that Category A, Activity 1 of the Waste Act, “*The storage of general waste in lagoons*”, would not be triggered as the material in the subterranean storage bladders would have been processed and was thus considered to be a product, as opposed to being a waste. Please refer to Appendix 3 for minutes of the EDTEA Pre-Application Meeting.

The Listed Activities triggered for the proposed development in terms of the Waste Act are noted in Section 4.1.

5 APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

Table 5-1 provides a list of all the applicable legislation, policies and/or guidelines of any sphere of government that are relevant to the application as contemplated in the EIA Regulations (2014).

TABLE 5-1: *Applicable legislation, policies and/or guidelines.*

TITLE OF LEGISLATION, POLICY OR GUIDELINE:	ADMINISTERING AUTHORITY:	DATE:
National Environmental Management Act (Act 107 of 1998) – for its potential to cause degradation of the environment (Section 28).	Department of Environmental Affairs	1998
Environmental Conservation Act (Act 73) – for potential environmental degradation.	Department of Environmental Affairs	1989
National Water Act (Act 36 of 1998) – for potential to cause pollution of water resources defined under the Act (Section 19).	Department of Water Affairs and Forestry	1998
Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) – for protection of agricultural resources and for control and removal of alien invasive plants.	National Department of Agriculture	1983
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) – for protection of biodiversity.	Department of Agriculture and Environmental Affairs & Ezemvelo KZN Wildlife	2004
The National Heritage Resources Act (Act No 25 of 1999 as amended) – for the identification and preservation of items of heritage importance.	Department of Arts and Culture (Amafa KwaZulu-Natal)	1999
Guideline 4: Public Participation in support of the EIA Regulations (2005).	Department of Environmental Affairs and Tourism	2006
Guideline 7: Detailed Guide to Implementation of the Environmental Impact Assessment Regulations (2006).	Department of Environmental Affairs and Tourism	2007
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – for the registration and useage of a Fertiliser.	Department of Agriculture, Forestry and Fisheries	1947

TITLE OF LEGISLATION, POLICY OR GUIDELINE:	ADMINISTERING AUTHORITY:	DATE:
National Energy Act (NEA), 2008 (Act No.34 of 2008) – for the use of a ‘biological waste energy’ as a Renewable Energy.	Department of Energy	2008
uMshwathi Municipal By-Laws.	Local Municipality	Updated accordingly
Occupational Health and Safety Act, (Act No. 85 of 1993) - Major Hazardous Installation Regulations.	Local Municipality	2001
National Veld and Forest Fire Act, No. 101 of 1998	Department of Forestry and Fisheries	1998

6 NEED AND DESIRABILITY

Renen Energy Solutions, which is a holding company of Midlands Biogas & Fertiliser, is a renewable energy solutions company, whose vision it is to offer sustainable energy solutions to the public, in order to reduce dependence on traditional energy sources.¹ In this regard, Renen Energy Solutions partnered with Sunshine Seedling Services to form the subsidiary company, Midlands Biogas & Fertiliser, with the aim of implementing an existing international technology in South Africa, which provides a sustainable alternative to generating fertiliser, as opposed to traditionally manufactured chemical fertilisers.

The ultimate aim of the partnership is to develop and utilise a working model of the existing, internationally recognised, IBR technology in South Africa, for distribution to other users in the country. In this regard, Sunshine Seedling Services are the landowners on which the Biogas and Fertiliser Plant is to be located, as well as the recipients of the final products, while Renen Energy Solutions are the providers of the technology.

Renen Energy Solutions approached Sunshine Seedling Services to partner with them on this venture in order to produce a real-world scenario of the IBR technology in operation. Based on previous projects implemented by Renen Energy Solutions, it has been discovered that the South African market exhibits apprehension and conservatism with regards to investing in technology which is not currently implemented, or locally visible. Renen Energy Solutions therefore require an actual real-world demonstration to be implemented in order to encourage investors. Fundamentally, the project is based on future replication. Should the project prove successful, Renen Energy Solutions envisage rolling out the technology in numerous KwaZulu-Natal farming practices such as dairy, chicken and piggery operations.

A schematic of the relationship between Renen Energy Solutions and Sunshine Seedling Services is provided in Figure 6-1.

¹ www.renen.co.za

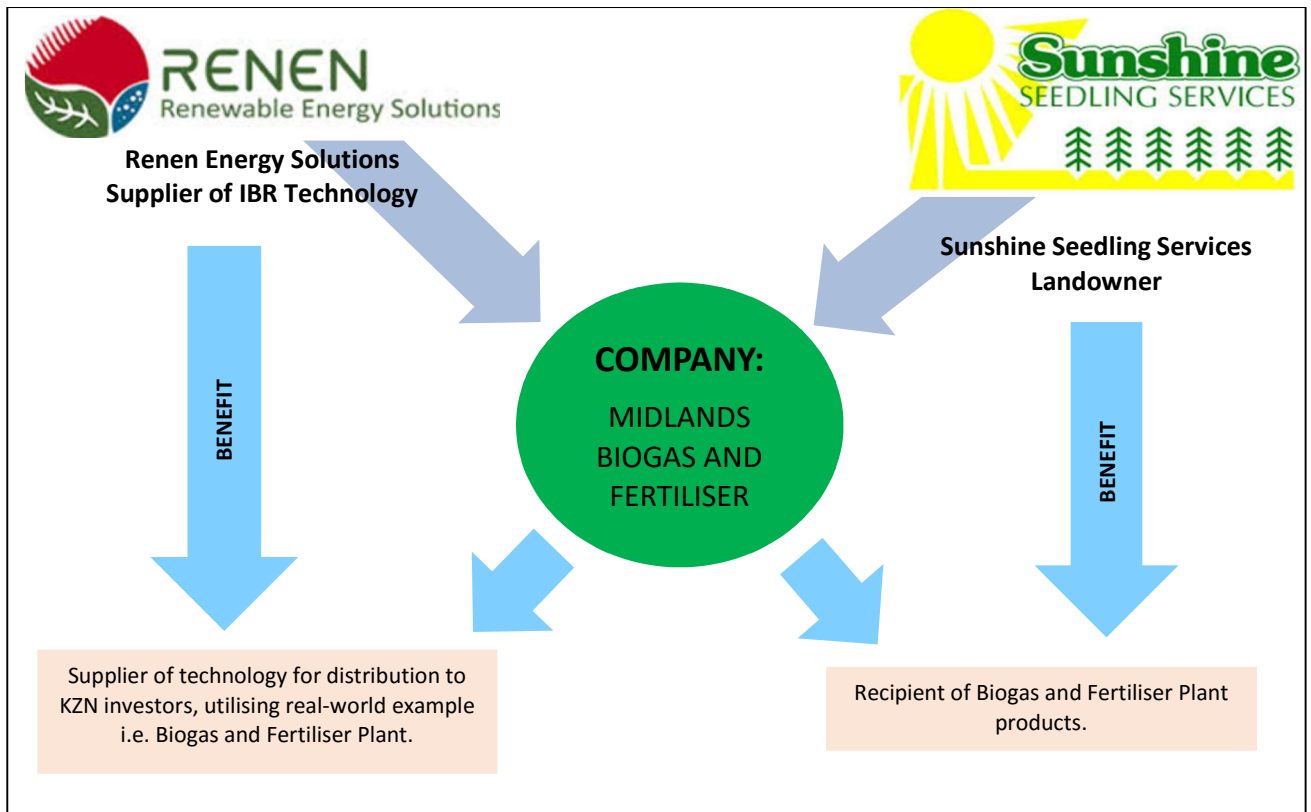


FIGURE 6-1: Schematic of Renen Renewable Energy Solutions and Sunshine Seedling Services relationship.

In terms of the need of the proposed, the IBR technology was developed to reduce potential pollution impacts on animal husbandry farms. Poor waste management practices can result in pollution and eutrophication of water resources, as well as the release of extensive greenhouse gas emissions. Further, especially in southern Africa, increasing production costs in the form of energy (electricity) and chemical fertilisers increase overall operational costs.

The IBR technology will provide a reliable and affordable alternative for energy, via heat and electricity and a natural fertiliser for crop and pasture production. In addition to energy and fertiliser, the IBR technology provides a waste management practice which results in the reduction of greenhouse gas emissions, while protecting natural resources.

From the perspective of Sunshine Seedling Services, they will benefit from the IBR technology housed within the proposed Biogas and Fertiliser Plant as it will provide them with a natural, nutrient rich liquid and solid fertiliser for use in their existing nursery. Further, the inputs to maintain the Biogas and Fertiliser Plant are minimal as a portion of the biogas produced will be converted into electricity to power operations, water will be circulated from the subterranean bladders to assist in correcting the consistency of the raw manure pre-processing and the essential oil distillery plant will utilise the generated biogas to fuel the required steam boilers. Therefore, the inputs for operation are low, but the benefit to Sunshine Seedling Services high in terms of economies and final products. In terms of the receiving environment, the project will utilise a sustainable

waste product (i.e. bovine manure) adding value to a waste resource and creating environmentally friendly, and valuable, products.

7 MOTIVATION FOR THE PREFERRED SITE, ACTIVITY AND TECHNOLOGY ALTERNATIVE

The proposed development triggers Listing Notice GNR 983, Activities 09, 12 and 19 of the EIA Regulations. As per GNR 982, Appendix 1(2)(b), alternatives for the proposed development are to be identified and considered. Chapter 1 of the EIA Regulations provides an interpretation of the word “alternatives”, which is to mean *“in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the –*

- a) *Property on which or location where the activity is proposed to be undertaken;*
- b) *Type of activity to be undertaken;*
- c) *Design or layout of the activity;*
- d) *Technology to be in the activity; or*
- e) *Operational aspects of the activity;*
- f) *And includes the option of not implementing the activity.”*

Based on the above, the following alternatives are presented for the proposed development of the Biogas and Fertiliser Plant.

7.1 PREFERRED SITE ALTERNATIVE

The preferred site alternative is the construction of the Biogas and Fertiliser Plant on Portion 45 of the Farm Riet Spruit No. 997. This property is owned and managed by Sunshine Seedling Services. It is proposed to locate the Plant on the eastern edge of the property, adjacent to Sunshine Seedling Services. This location is considered to be favourable as:

- An access road (utilised by Sunshine Seedling Services) is already in existence;
- Construction will be continuous with the existing Sunshine Seedling Services nursery, therefore preventing the fragmentation of agricultural land;
- The site is located approximately 1.8km from the main road (P25-1), and as such, will not be seen by the public. In this regard, there will be no visual intrusion to the public utilising the P25-1 and therefore the sense of place in the area (largely agricultural) will be perceived to be maintained by the public;
- Security and services can be easily extended to the Plant given the proximity of the Sunshine Seedlings Services property, thereby reducing construction expenditure and construction disturbance;
- The proximity of the Plant to Sunshine Seedling Services will facilitate the efficient transportation of the finished product (i.e. liquid fertiliser and compost), as well as harvested rainwater to the necessary locations within the nursery through piping; and
- The gradient of the site is very gently sloping requiring relatively minimal earth works in terms of cut and fill construction activities.

Due to the composition of biogas and the amount to be stored on site, equating to 480m³ total, a Quantitative Risk Assessment was undertaken to determine if the preferred site alternative was considered to be safe given the proximity to the Sunshine Seedling Services. In this regard, the Quantitative Risk Assessment assessed the possibility of the following risks occurring and the effect on the staff and public at Sunshine Seedlings should such an incident occur:

- Asphyxiation from **carbon dioxide**;
- Thermal radiation from **fires** should the stored biogas ignite; and
- Overpressure from **explosions**.

The Quantitative Risk Assessment Report is attached as Appendix 6 and indicates the following results:

- “A 1% fatality from large **carbon dioxide** releases would not extend beyond the site boundary and no off-site impacts are predicted”;
- “The 1% fatality due to jet **fires** from a release of biogas at the process installations in the worst weather conditions would not extend beyond the site boundary; impacts from jet fires would be limited to the immediate vicinity of the fire”; and
- The 1% fatality for vapour cloud **explosions** from large releases of biogas could extend beyond the site boundary into the undeveloped, agricultural area”.

Based on the above, locating the proposed Biogas and Fertiliser Plant on the site identified for development is considered to be the preferred alternative due to the proximity of the site to Sunshine Seedling Services, and the limited health and safety impacts on the public and staff of Sunshine Seedling Services. Further the receiving environment is considered to hold a low significance value given that it is planted to sugarcane.

Based on the above, no other site alternatives have been identified given that the preferred site alternative meets all the criteria required by the landowner (i.e. Sunshine Seedling Services) in terms of land ownership, land availability and proximity to the Sunshine Seedling Services nursery.

Plates 7-1 – 7-4 provide an overview of the site. Please note, at the time of the site visit the area was planted to sugarcane, therefore photographs of the site could not be taken from the centre co-ordinate. Figure 4-1 illustrates where Plates 7-1 – 7-4 were taken on site. Note, in terms of visual assessment, the centre co-ordinate would indicate sugarcane.



PLATE 7-1: Southern boundary of the site, facing west along the existing access road, towards to the P25-1.



PLATE 7-2: Western boundary of the site, facing north. Sugarcane fields surrounding.



PLATE 7-3: Sugarcane fields at the northern boundary of the site, facing south into the existing sugarcane field.



PLATE 7-4: Eastern boundary of the site, facing south. Sunshine Seedlings Services border the site to the east.

Figure 7-1 provides a map of where Plates 7-1 – 7-4 were taken on site.



FIGURE 7-1: Location of photographs 7.1 – 7.4 [Source: Google Earth, 2016].

7.2 PREFERRED TECHNOLOGY ALTERNATIVE

The preferred technology alternative is the IBR technology. This technology has been extensively researched and proves to be efficient in process and end product. The technology has been successfully implemented across the United States of America and in Canada as a waste treatment and energy production technology (Dustin, 2010).

The technology has the ability to process waste relatively fast, with a low hydraulic retention time (HRT) equivalent to 5-6 days. The vertical column design facilitates a high rate of exposure of organic solids to bacteria, which encourages anaerobic digestion and negates the need for high maintenance stirring mechanisms.

Renew Energy Solutions has conducted extensive research and due diligence assessments into the IBR technology. Based on its success internationally, Renew Energy Solutions are confident of its implementation and operation in South Africa, with the pilot project being implemented for Midlands Biogas & Fertiliser. Based on the research undertaken, no other technology alternative has been investigated, as the IBR technology is the only technology currently available to Midlands Biogas & Fertiliser that can meet the need and desirability in terms of design, operation, HRT and product.

7.3 PREFERRED LAYOUT ALTERNATIVE

The preferred layout alternative has been designed by engineers as the most suitable and efficient layout given the physical attributes of the site. Further, the Quantitative Risk Assessment (Appendix 6) notes that the preferred site layout will not have any adverse health and safety impacts on the public and staff in the

surrounding area (i.e. at Sunshine Seedling Services). Based on the above, no other layout alternative has been identified as the preferred site alternative meets all of the criteria needed to construct and operate the proposed Biogas and Fertiliser Plant, on the identified site (i.e. preferred site alternative).

7.4 NO-GO ALTERNATIVE

The no-go alternative is to not to construct the Biogas and Fertiliser Plant. Should this alternative be implemented, the landowner will continue to import and apply raw bovine manure from the local animal feedlot onto the existing sugarcane fields. Sunshine Seedling Services will continue to purchase fertilisers for application in the nursery and the nursery tunnels will continue to utilise electricity as a power source, thus continuing to draw power from the national grid. Further, Sunshine Seedlings Services will unlikely expand operations in terms of developing essential oils.

Based on the above, the development of the Biogas and Fertiliser Plant will produce sustainable and valuable products for Sunshine Seedling Services from existing farming practices (i.e. application of manure onto sugarcane fields). Therefore, the one dimensional practice of manure application is expanded to produce liquid and solid fertiliser, as well as biogas to fuel other operational processes, decreasing operational costs, increasing employment opportunities and diversifying operations within Sunshine Seedling Services.

In terms of Renen Energy Solutions, the no-go alternative will result in the IBR technology not being implemented in KwaZulu-Natal as no real-world operational example will be available for assessment by potential investors.

Lastly, the no-go alternative would result in the failure to locally demonstrate an internationally proven waste management, renewable energy generation, and organic fertiliser production plan that could potentially provide alternative revenue opportunities to a variety of agricultural enterprises throughout South Africa.

8 PUBLIC PARTICIPATION

To fulfil the necessary public participation required as part of the BA Process, the following methods of stakeholder engagement were conducted by the EAP, as outlined below.

8.1 NEWSPAPER ADVERTISEMENT

Newspaper advertisements were published at the outset of the project to inform the general public of the BA Process. Advertisements were published in English on 05 April in the Witness and on 06 April 2016 in the Maritzburg Fever newspapers. Copies of the advertisements are included in Appendix 7 of this report.

8.2 SITE NOTICE BOARDS

One (1) site notice board was placed on site and one (1) was placed at the intersection of the P25-1 and the existing access road to Sunshine Seedling Services on 06 April 2016. The notice boards were written in English and isiZulu. Figure 8-1 provides a copy of the site notice, while Figure 8-2 provides an illustration of the location of the notice boards on site.

The purpose of the notice boards was to inform neighbours, community members and passers-by of the BA and WML Application. The details of the EAP were also provided should any member of the public require additional information or wish to register as an IAP in the Application. Photographs 8-1 and 8-2 provide proof that the notice boards were placed on site.

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT APPLICATION AND WASTE MANAGEMENT LICENCE APPLICATION (BASIC ASSESSMENT REPORT) Reference No.: 4123	ISAZISO NGE SICELO SOCWANINGO LWEZEMVELO KANYE NESICELO SELAYISENSE YOKUPHATHWA KWENDLE (UMBIKO NGE SISEKELO SOCWANINGO) Reference No.: 4123
<p>PROPOSED DEVELOPMENT OF A MIDLANDS BIOGAS AND FERTILISER PLANT, UMSHWATHI LOCAL MUNICIPALITY, KWAZULU-NATAL.</p> <p>Notice is hereby given in terms of the National Environmental Management Act, (NEMA, Act 107 of 1998), published in Government Notice No. R982 (2014) and the National Environmental Waste Management Act (Act 59 of 2008), of the intent to carry out a Basic Assessment Process and Waste Management Licence Application for the abovementioned development. Activities listed under NEMA GNR 983 and 985, and NEM:WA Category A and C will be applied for with the Department of Economic Development, Tourism and Environmental Affairs (EDTEA).</p> <p>LOCATION: The proposed development is situated on Portion 45 of the Farm Plot Spint No. 997, Sunshine Seedling Services farm, Umshwathi Local Municipality, KwaZulu-Natal.</p> <p>SCOPE OF WORKS: The proposed development will entail the construction of a liquid fertiliser plant which will use animal manure as a primary input. The process will produce three products, namely the primary product of an organic composting medium (which will be bagged and sold to the public), liquid fertiliser (which will be used in the existing on-site nursery) and biogas. The biogas will be utilised to fuel on-site boilers and as a heat source in the nursery tunnels. The Applicant is a subsidiary company of Renen Energy Solutions and Sunshine Seedling Services.</p> <p>PROPONENT: Midlands Biogas and Fertiliser</p> <p>CONTACT: Imko Summers Jeffares & Green (Pty) Ltd PO Box 794, Hilton, 3245 Phone: 033 343 6789 Fax: 033 343 6701 E-mail: summers@jg.co.za</p> <p>In order to ensure that you are identified as an interested and/or affected party please submit your name, email address, and other contact information and interest in the matter, in writing, to the contact person given above.</p>	<p>UMSEBENZI OHLONGOZWAYO I MIDLANDS BIOGAS KANYE NEMISHINI KAMANYOLO, KUMASIPALA WASEMISHWATHI, ENDAWENI YAKWAZULU-NATAL.</p> <p>Isaziso sikhishwa ngokulandela umthetho kaZwelonke Wokuphathwa kweMvelo, (NEMA, Act 107 of 1998), eshicilelwe kwisaziso sikhulumeni unombolo R982 (2014) kanye noMthetho kwaZwelonke wezemvelo obhekela ukuphathwa kwendle (umthetho 59 ka 2008), ngenhloso yokwenza ucwaningo oluyisisekelo kanye nokufaka isicelo selayiseNSE yokuphathwa kwendle ngokuthuthukiswa okubalulekile ngenhla. Isicelo sokugunyaza imisebenzi eshicilelwe ngaphasi kuka NEM GNR 983 and 985, Kanye no NEM: WA Isigaba A kanye nesigaba C sizofakwa emnyangweni wokuThuthukiswa koMnotho, ukuVakasha kanye Nezemvelo (EDTEA).</p> <p>INDAWO: Intshukho ehlongozwayo ihlolakala ku-Portion 45 wePulazi uRietspruit No. 997, i-pulazi u-Sunshine Seedlings Services, kuMasipala waseUmshwathi, KwaZulu-Natal</p> <p>UMSEBENZI OHLONGOZWAYO: Intshukho ehlongozwayo izobandakanya ukwakhiwa kwenishini yomanyolo oluketshazi lapho kuzosetshenziswa umquba wezihlavo njengesiqalo. Indlela okuzokwenziwa ngayo kuzokhiqizwa imikhiqizo emihlanu, okungukuthi umkhiqizo wokuqala (uzofakwa emasekeni bese kudayiselwa umphakathi), umanyolo owuketshazi (wona uzosetshenziswa endaweni ekhona ngaphakathi lapho kutshatwa khona izithombo) kanye ne biogas. I biogas izosetshenziswa ukunuthisa obhayela abathalokala ngaphakathi asayithini futhi nanjengomthombo wokushisa kwimigudu yendawo lapho kutshatwa khona izithombo. Umfakisicelo inkampani ephelwe yi Renen Energy Solutions kanye ne Sunshine Seedlings Services.</p> <p>UMSEKELI: Midlands Biogas and Fertiliser</p> <p>IMININGWANO: Imko Summers Jeffares & Green (Pty) Ltd PO Box 794, Hilton, 3245 Phone: 033 343 6789 Fax: 033 343 6701 E-mail: summers@jg.co.za</p> <p>Ukuze uqinisekise ukuthi ubalwe njengonentshisekelo okanye othintekayo sizela uthumale igama, ikheli le-imeyili kanye namanye iminingwano nentshisekelo yakho ngalendaba, ngokubhalala, kuminingwano ebalulwe ngenhla.</p>

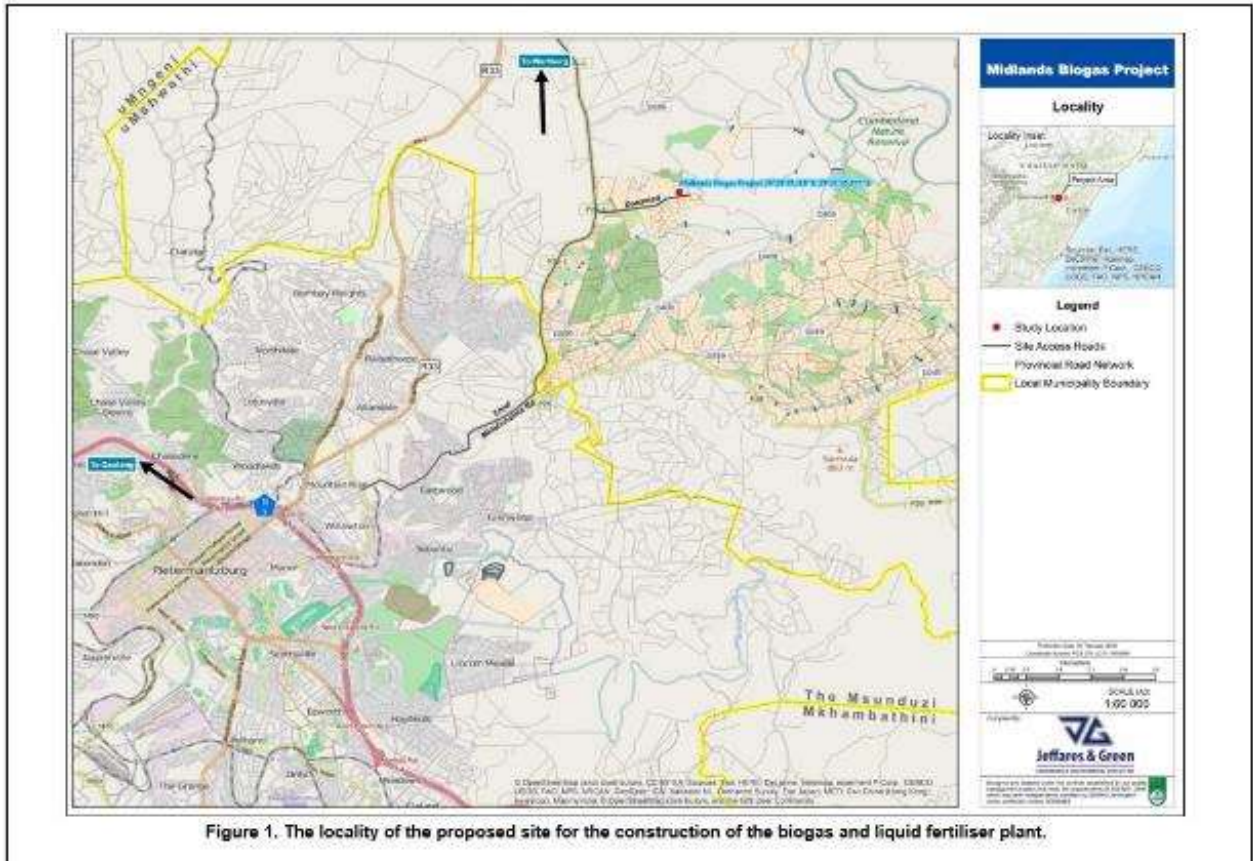


FIGURE 8-1: Copy of the poster placed on site, written in English and isiZulu along with the contact details of the EAP.



FIGURE 8-2: Location of Site Notices placed on site [Map Source: Google Earth, 2016].



PLATE 8-1: Site Notice at the entrance to Sunshine Seedling Services.



PLATE 8-2: Site Notice at the intersection of the P25-1 and the existing access road to Sunshine Seedling Services.

8.3 WRITTEN NOTIFICATION TO AUTHORITIES AND NEIGHBOURS

8.3.1 INTERESTED AND AFFECTED PARTIES (IAPS)

A register of IAPs was compiled as per Section 42 of the EIA Regulations, 2014. This included all relevant authorities, Government Departments, the Local Municipality, the District Municipality, relevant conservation bodies and non-governmental organisations (NGO's), as well as neighbouring landowners. This register was regularly updated to include those IAPs responding to the newspaper advertisements, site notice boards and Notification Letters. A copy of the IAP Register is included as Appendix 8 of this report.

8.3.2 NOTIFICATION LETTER

A Notification Letter was compiled and circulated to all identified IAPs by email and post. The purpose of the Notification Letter was to provide preliminary information regarding the project and its location. Furthermore, the Notification Letter invited preliminary comments from IAPs and requested those notified to provide details of other potential IAPs which they may be aware of. A copy of the Notification Letter is included as Appendix 9 of this report.

8.4 PUBLIC MEETING

A public meeting was not held due to limited interest in the proposed activity.

8.5 COMMENTS RECEIVED

Based on the circulation of the Notification Letter, the following comments noted in Table 8-1 have been received from Amafa Heritage and the Fertiliser Association of Southern Africa (FERTASA). Please refer to Appendix 8 for original comments.

TABLE 8-1: IAP comment

Date received	IAP / Stakeholder	Comment	Response
28/04/2016	<p>Amafa aKwaZulu-Natali</p> <p>Contact: Ms B. Pawandiwa</p> <p>Amafa ref: SAH16/9427</p>	<p>We acknowledge receipt of your invitation for comment with regards to the proposed development. The survey by Frans Prins identified no heritage sites or features. In view of the findings by the Heritage Practitioner, Amafa has no objection to the development. You are also required to adhere to the below-mentioned standard conditions:</p> <ol style="list-style-type: none"> 1. Amafa should be contacted if any heritage objects are identified during earthmoving activities and all development should cease until further notice. 2. No structures older than sixty years or parts thereof are allowed to be demolished altered or extended without a permit from Amafa. 3. No activities are allowed within 50m of a site, which contains rock art. 4. Sources of all natural materials (including topsoil, sands, natural gravels, crushed stone, asphalt, etc.) must be obtained in a sustainable manner and in compliance with the heritage legislation. <p>Failure to comply with the requirements of the National Heritage Resources Act and the KwaZulu-Natal Heritage Resources Act could lead to legal action being instituted against the applicant.</p>	<p>Noted. The conditions stipulated by Amafa have been included in the BAR and EMPr and will be communicated to the Contractor on commencement of construction, for implementation on site.</p>
26/05/2016	<p>FERTASA</p> <p>Contact: Adam Mostert (Chief Executive Officer)</p>	<p>FERTASA is a recognised and preferred body aimed at promoting the image of the fertiliser industry through:</p> <ul style="list-style-type: none"> • Promoting the integrity of each member and building preferential trust for their products and services. • Enhancing and protecting the interest of its members through effective engagement with government and organised agriculture. <p>This is because Fertasa members are committed to:</p> <ul style="list-style-type: none"> • A code of conduct; • An audited set of standards; • Relevant scientifically based recommendations; • Continual learning and improvement <p>It is in the interest of the fertiliser industry to ensure that any new fertiliser plant conforms to the industry standards and is in no way detrimental to the environment.</p>	<p>Comment noted. In this regard, FERTASA have been identified as an IAP in the Application and will be notified of the availability of the Draft and Final BA Reports for review and comment.</p>

8.6 CIRCULATION OF DRAFT BASIC ASSESSMENT REPORT FOR COMMENT

Copies of the Draft BA Report have been circulated to the following Key Stakeholders and IAPs for review and comment on 03 June 2016:

- Ezemvelo KZN Wildlife: Mr A. Blackmore;
- Department of Water and Sanitation: Ms N.Mdlalose;
- Department of Transport: Ms J. Reddy;
- UMshwathi Local Municipality: Mr S. Gubane;
- UMgungundlovu District Municipality: Ms M. Khomo;
- Amafa Heritage: SAHRIS;
- DAEA: Macro Planning Directorate: Ms N. Myeni;
- Department of Agriculture, Forestry and Fisheries: Mr W. Rozani;
- Department of Cooperative Governance and Traditional Affairs: Mr M. de Lange;
- National Energy Regulator: To be confirmed;
- Fertilizer Association of Southern Africa: Mr A. Mostert; and
- Eskom: Mr N. Zondo.

All registered IAPs were notified of the availability of the Draft BA Report and the deadline for comments, being on, or before, 04 July 2016.

Further, one copy of the report was placed in the uMshwathi (New Hanover) Public Library for public review on 03 June 2016 and a complete copy of the report uploaded onto the JG Afrika (Pty) Ltd website for public comment.

9 POTENTIAL IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

9.1 TOPOGRAPHY & SURROUNDING LANDUSE

9.1.1 DESCRIPTION

The site is currently zoned as agriculture and is planted to sugarcane. The existing gravel access road to Sunshine Seedling Services borders the site to the south, with sugarcane planted on the opposite side of the access road. The Sunshine Seedling Services nursery is located to the east of the site and sugarcane fields border the site to the north and west. Please refer to Figure 9-1.



FIGURE 9-1: Site and surrounding landuse (Source: Google Earth, 2016).

The gradient of the site increases marginally from the existing access road where it peaks in the middle of the site and then tapers off very gently towards the north. Please refer to Figure 9-2.



FIGURE 9-2: Gradient of the site, running from south to north (Source: Google Earth, 2016).

9.1.2 IMPLICATIONS

The site is located on Portion 45 of the Farm Riet Spruit No. 997 which is approximately 150.9ha in extent. The majority of this property is planted to sugarcane (approximately 120.8 ha). The proposed development, however, will require approximately 1ha of land during construction and 0.9ha for operation, resulting in a 0.7% loss in agricultural land on the property. The remaining 99.3% of currently cultivated land will continue to be farmed for sugarcane.

Although earthworks will be confined to the development footprint, potential exists for soil erosion to occur on cleared areas, with resultant sedimentation of drainage lines / watercourses². If any potentially harmful or hazardous substances are used during construction, these could contaminate groundwater should ponding occur, given the very gentle gradient of the site. Further, sediments could be mobilised and enter drainage lines / watercourses during high rainfall events.

The proposed development will result in an increase in hardened surfaces through the construction of roofs, the two subterranean methane storage bladders and the delivery access road, resulting in increased stormwater volumes. Improper drainage has the potential to create sheet wash and erosion during high intensity storm events.

9.1.3 MITIGATION AND RECOMMENDATIONS

- Vegetation on the site should only be removed immediately before construction commences to reduce the period of exposure to bare soil. Where vegetation has been removed, exposed soils must be re-vegetated as soon as possible with creeping / stoloniferous vegetation;
- Berms above and below cleared areas are to be installed to capture surface run-off and promote infiltration;
- Rainwater harvesting should be conducted to capture all clean stormwater. This should be piped to Sunshine Seedlings Services for storage in their existing reservoirs, for utilisation in the nursery. The harvested rainwater could also be used for firefighting reserves should this be necessary. All dirty stormwater must be captured in the pollution control dam and fed back into the subterranean storage bladders, which will feed water into the process as required via the holding bunkers, pre-holding tank and material conditioning tank (SWMP: Appendix 5);
- The remaining clean stormwater will be attenuated and discharged to the sugarcane fields located to the north of the development (SWMP: Appendix 5); and
- Use of hazardous substances should be avoided during the Construction Phase. Where the use of biodegradable substances is not possible, extreme caution must be taken in the handling, storage and application of substances and training of personnel in the correct use thereof.

9.2 CLIMATE

9.2.1 DESCRIPTION

The area is characterised by a rainy summer season and experiences some rain in winter. Rain events can either be soft and soaking or dramatic thunderstorm events. The area has a mean annual rainfall of 895 millimetres (mm). Frost is infrequent, occurring mainly where cold air becomes trapped in valleys. The mean monthly maximum and minimum temperature for New Hanover in January (Summer) is 38.2°C and -0.2°C in June (Winter) (Mucina & Rutherford, 2006).

² The closest drainage line to the site is located approximately 350m to the northwest of the site (Surveyor General database, 2009).

9.2.2 IMPLICATIONS

Potential exists for high intensity rainstorm events to cause severe erosion at the construction site. Potential frosts and little to no rain during winter will impede any re-vegetation and rehabilitation efforts. High temperatures during summer may pose a potential threat in terms of cane fires, as do dry winters. Stockpiled topsoil has the potential to become windblown, causing dust.

9.2.3 MITIGATION AND RECOMMENDATIONS

- Measures should be taken to cover exposed areas during high intensity rainfall events;
- Stockpiled topsoil should be dampened or covered during times of high wind to prevent dust;
- Rehabilitation and landscaping should take place in the wetter summer months to increase the newly planted vegetation's chance of establishing. Plant species which are indigenous or endemic to the area should be used; and
- Firebreaks must be maintained on the property and site boundaries to prevent the spread of fires as per the National Veld and Forest Fire Act, No. 101 of 1998.

9.3 VEGETATION

9.3.1 DESCRIPTION

According to Mucina and Rutherford (2006), the vegetation cover in the area is classified as Ngongoni Veld. This vegetation type is classified by dense, tall grassland, overwhelmingly dominated by unpalatable, wiry Ngongoni grass (*Aristida junciformis*). The monodominance of Ngongoni grass usually results in a low species diversity. Wooded areas (thornveld) are found in valleys at lower altitudes, where this vegetation unit grades into KwaZulu-Natal Hinterland Thornveld and Bhishe Thornveld (Mucina & Rutherford, 2006).

Ngongoni Veld can be found extensively throughout KwaZulu-Natal, extending into the Eastern Cape. As a guideline, the vegetation type can be found stretching from Melmoth in the north of KwaZulu-Natal to near Libode in the former Transkei, including the areas of Eshowe, New Hanover, Camperdown, Eston, Richmond, Dumis, Harding, Lusikisiki and Libode. The Ngongoni Veld type is generally found between the altitudes of 400-900m.

In terms of conservation status, Ngongoni Veld is classified as vulnerable and holds a conservation target of 25%. Only less than 1% of the unit is statutorily conserved in the Ophathe and Vernon Crookes Nature Reserves. Some 39% has been transformed for cultivation, plantations and urban development (Mucina & Rutherford, 2006).

It is important to note that the site is no longer representative of the Ngongoni Veld type as the area is currently planted to sugarcane.

9.3.2 IMPLICATIONS

The conservation value of the site is considered to be limited given that it is currently cultivated to sugarcane. Hence the presence of the Ngongoni Veld type does not exist on the site.

Earthworks associated with the construction activities on-site have the potential to encourage the establishment of invasive alien plants. If left unattended, these are likely to spread and displace any indigenous vegetation. Further, frequent and extensive soil disturbance due to the earthworks during the construction phase could facilitate colonisation by Category 1 species and other alien species.

9.3.3 MITIGATION AND RECOMMENDATIONS

- Clearing of vegetation prior to construction must be confined to the construction site only and should only be undertaken immediately prior to construction commencing. Topsoil should be removed and suitably stored for use during the rehabilitation process;
- No indigenous or medicinal / 'muthi' plants may be collected or harvested at any stage of construction or operation, either from the property or from neighbouring properties;
- It is recommended that all new services (electricity cable, water, etc.) be consolidated alongside the existing access road to reduce the disturbance associated with earthworks on the property; and
- The disturbance associated with construction activities will facilitate the establishment and spread of alien invasive plants, which if left to spread, will lead to the degradation of surrounding areas. Alien plants must therefore be removed on an on-going basis.

9.4 GEOLOGY AND SOILS

9.4.1 DESCRIPTION

According to the 1:250 000 Geological Map Series, 2930, Durban, the study area is underlain by shale, siltstone and subordinate sandstone of the Karoo Super Group. Please refer to Figure 9-3.

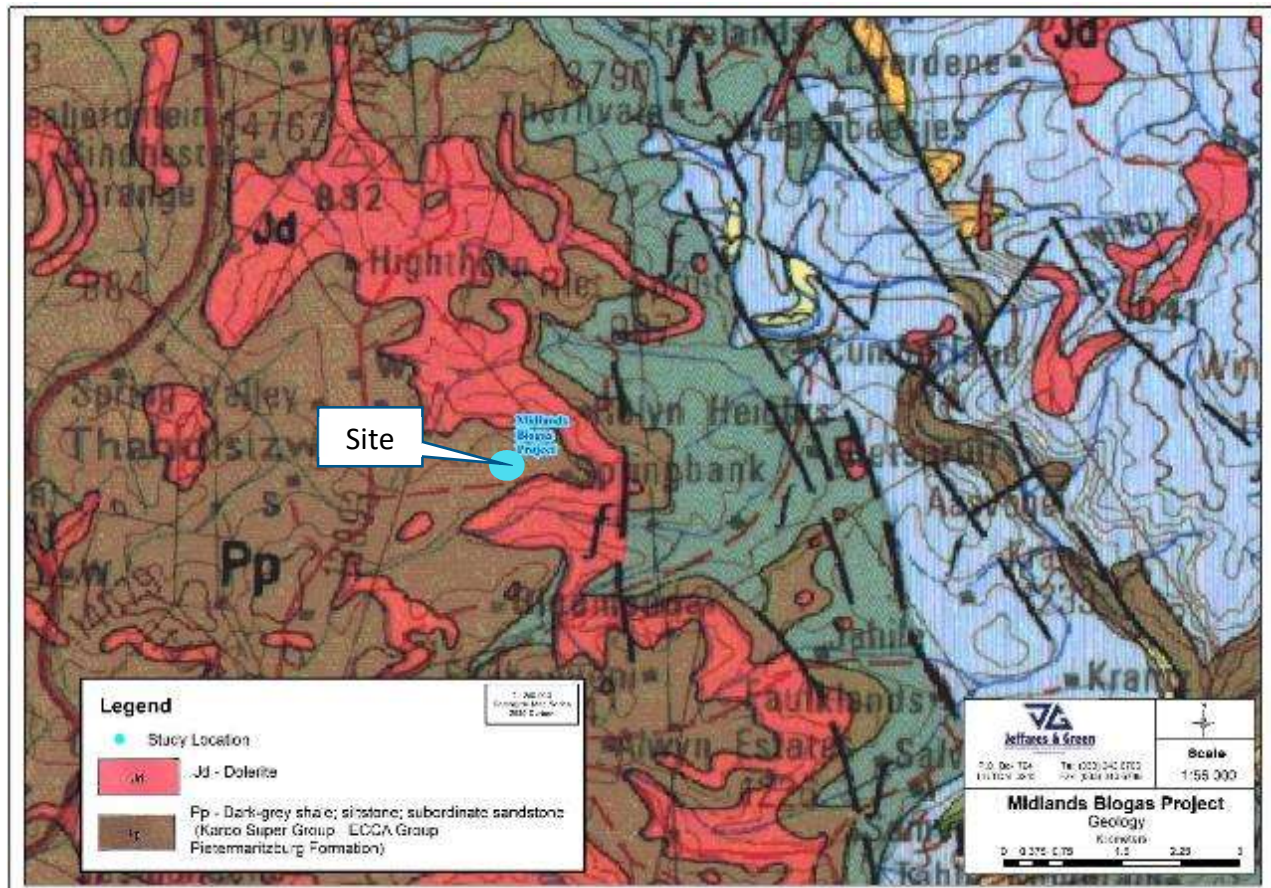


FIGURE 9-3: Geology of the site.

A soil survey has not been undertaken, but given the historical and current cultivation of sugarcane on the site, the soils are considered to be of good agricultural potential.

9.4.2 IMPLICATIONS

Construction in areas of instability, the use of inappropriate materials and irresponsible design and construction methodologies could result in the cracking and collapse of infrastructure.

The site will be prone to erosion once vegetation clearing has taken place. This could lead to surface water run-off with high sediment loads entering surrounding drainage lines. During dry, windy conditions, exposed soil areas will be prone to wind erosion.

9.4.3 MITIGATION AND RECOMMENDATIONS

- Re-vegetation must take place immediately once construction is complete to minimise soil loss due to erosion;
- To prevent site instability, all surface water must be channelled or piped downslope of the property;
- Runoff from roofs should be piped from gutters to the existing reservoirs at Sunshine Seedling services;
- Surface drainage of the building platforms should direct water away from fill edges to prevent erosion of the fill embankment slopes. Sub-surface drainage will need to be assessed during construction;
- It is recommended that all earthworks be carried out in accordance with SABS 1200; and

- It is recommended that a competent engineering geologist/geotechnical engineer be appointed to periodically inspect the earthworks and foundation excavations during the development of the site.

9.5 HYDROLOGY

9.5.1 DESCRIPTION

The study area is situated in the Mgeni Water Management Area (WMA), Area 11, in the quaternary catchment U20G. The major rivers in the area include the Mooi and Mgeni Rivers and associated tributaries. As noted previously, the Mean Annual Precipitation (MAP) of the area is 895mm, while the Mean Annual Evaporation (MAE) for the site is 1 200 mm. This indicates a negative environmental water balance.

The access road located immediately south of the project site forms a catchment boundary. Due to the location of this watershed, there is no stormwater runoff that enters the project site from upstream catchment areas. Generally, stormwater runoff within the project site drains from south to north. Further, given the topographical location in the landscape, the presence of groundwater on-site is considered to be low, given that the site is located on a plateau.

Currently the site is planted to sugarcane which provides a natural water dissipating mechanism, thereby aiding in erosion prevention and stormwater control.

The geohydrology in the area can be broadly described as predominantly argillaceous rocks comprising shale, mudstone and siltstone. The principal groundwater occurrence is from an intergranular and fractured aquifer type, with median borehole yields in the range 0.5 to 2.0l/s. The aquifer is characterised as a low to medium yielding Minor aquifer in terms of the South African Aquifer Classification System (Appendix 10: Geohydrological Assessment).

9.5.2 IMPLICATIONS

Should the proposed development be approved, the increase in hardened surface areas, such as roofs, the two subterranean methane storage bladders and the access roads, will result in increased stormwater flow volume and flow velocity. This could result in increased erosion and sedimentation on-site and in the nearby drainage lines / watercourses, if not adequately mitigated.

During the construction phase, hazardous substances (such as paints and varnishes) are likely to be used. Should any hazardous substance enter a water resource, it would contaminate it, resulting in serious implications for aquatic fauna and flora and downstream users.

During the operational phase of the Biogas and Fertiliser Plant, potential exists for dirty stormwater to pollute drainage lines and ultimately water resources. However, with the implementation of a SWMP, this impact can be severely decreased. Further, contamination analysis of the waste product (i.e. bovine manure), reveals that the manure is found to be within acceptable guideline limits in terms of contamination potential.

9.5.3 MITIGATION AND RECOMMENDATIONS

- During construction, use must be made of earth berms to prevent sheet flow of stormwater into the nearby drainage lines. Erosion control structures must be installed for all stormwater outlets, including runoff from roads and buildings. Where there are steep slopes or sensitive areas, rows of geofabric should be stacked vertically at pertinent points. That will allow water to pass through but will retain the silt behind the geofabric, essentially creating a silt fence;
- During the Construction Phase, all storage, mixing and decanting of hazardous substances such as paints and varnishes must be done on an impermeable, bunded surface. An impermeable surface could be created by (i) placing a layer of clay beneath plastic sheeting or (ii) placing soil on top of plastic sheeting. When the impermeable surface is no longer required, the plastic sheet along with the contaminated soil must be disposed of off-site at a registered landfill;
- Only suitably qualified labourers should handle hazardous chemicals. Spills should be reported immediately to the supervisor and in turn to the appropriate Authorities (e.g. Department of Water Affairs). Spill kits, such as Drizit or Zorbit, must be kept on-site during construction and should be readily available for use in the event of a spill;
- Adequate sanitation facilities such as chemical toilets will need to be provided for the labourers during the Construction Phase. This waste will need to be disposed of at a permitted off-site treatment facility. One toilet per 20 labourers is recommended;
- During operation, rainwater harvesting will be conducted to capture all clean stormwater. This will be piped to Sunshine Seedlings Services for storage in their existing reservoirs, for utilisation in the nursery. The harvested rainwater will also be used for firefighting reserves should this be necessary. All dirty stormwater will be captured in the pollution control dam and fed back into the subterranean storage bladders, which will feed water into the process as required via the holding bunkers, pre-holding tank and material conditioning tank;
- The remaining clean stormwater will be attenuated and discharged to the sugarcane fields located to the north of the development;
- All installed stormwater channels are to be covered by a steel grid to allow for maintenance when required;
- Where possible, leak detection monitoring methods such as Stock Inventory Reconciliation analysis, automatic tank gauging and integrity testing should be implemented during operation; and
- All aspects of soil erosion prevention and stormwater management in the EMPr (Appendix 11) must be strictly implemented and regularly monitored.

9.6 SURFACE WIND AND AIR QUALITY

9.6.1 DESCRIPTION

The site is located in a rural agricultural area and as such air quality is expected to be of a high standard. The area can experience strong winds and this can contribute to wind-blown dust and increased fire hazards. In the summer months, winds blow predominantly from the east and south-east, while during the winter months, winds increase from the north-east and south-west, while still maintaining a presence from the east and south-east.

9.6.2 IMPLICATIONS

Potential exists for dust to be created on the site during the construction phase, particularly from the cleared construction site and exposed stockpiles of topsoil. The impact of wind-blown dust from the site during the construction phase also has the potential to impact negatively on neighbours (i.e. Sunshine Seedling Services) and neighbouring farmers. Dust will also be generated from construction vehicles.

Vehicle emissions will be generated during both the construction and operational phases associated with the transportation of raw manure to the site. This impact, however, will be intermittent and will not be long term and is thus considered to hold a low significance.

Wind in this area may also aid in the spread of fires, especially during the dry winter season. This would have serious implications for surrounding properties, especially given the presence of sugarcane in the area.

9.6.3 MITIGATION AND RECOMMENDATIONS

- All vehicles should comply with speed limits on the access roads. Vehicles should be properly maintained and regularly serviced to ensure that exhaust emissions are controlled;
- It is recommended that construction on the site is phased so that only small areas are exposed at any time, thereby reducing the amount of dust on-site;
- Construction areas should only be cleared of vegetation immediately prior to the commencement of construction, to reduce the period which soils are exposed. Following construction, these areas should be rehabilitated and re-vegetated as soon as possible;
- The construction site should be periodically dampened to reduce the impact of dust. Soil stockpiles should be covered or grassed, if they are likely to be present on-site for periods longer than two months;
- It is recommended that concrete mixing areas (batching plants) be enclosed with shade cloth to reduce the potential for concrete dust to become wind-blown;
- Fire breaks are to be regularly maintained as per the National Veld and Forest Fire Act, No. 101 of 1998; and
- Current practice involves the spreading of raw bovine manure on the surrounding sugarcane fields. The IBR technology will remove a large amount of the associated odour (i.e. methane and VOCs) and capture it in the extracted biogas. As the biogas will be stored in the subterranean bladders and transported through pipelines for utilisation, limited odour nuisance should be experienced. Thereafter the air quality in the area should be not negatively impacted on.

9.7 FAUNA

9.7.1 DESCRIPTION

Any development has the potential to negatively impact upon the local fauna, given the intrusion of an unnatural object in a natural environment, or artificial environment.

The Ezemvelo KZN Wildlife Minset database (2010) was consulted and no species of conservation significance were highlighted as being present in the area. Given the above, it must be noted that as the site is located on an existing and operational sugarcane farm, the probability of animals of conservation significance being present is low, given its transformed state.

9.7.2 IMPLICATIONS

The most significant potential negative impacts on fauna and avifauna will be the disturbance caused during the construction phase, e.g. earthworks, noise and increased human activity and the loss of sugarcane habitat. This impact is, however, considered to be negligible, as the remainder of the site (i.e. already cultivated land, equivalent to 99.3% or 120.8ha) is currently part of a greater working sugarcane farm which includes existing disturbances from farm labourers and tractors etc. During the construction of the Biogas and Fertiliser Plant, animals present in the area are likely to move away from the site, however, they are likely to make use of the surrounding sugarcane fields as alternative habitat.

9.7.3 MITIGATION AND RECOMMENDATIONS

- The trapping and killing of wild animals and disturbance to their habitats are prohibited during all phases of construction and operation. This will require strict control and penalties must be enforced in this regard. Any incidences of such will need to be reported to the Compliance Monitoring and Enforcement Department of the EDTEA. It is also recommended that specific incidences be reported to Ezemvelo KZN Wildlife; and
- Construction activities must be confined to the development footprint only. The site will need to be demarcated and fenced and the contractors and all labourers must remain within this area at all times. The contractors will be governed by the EMPr (see Appendix 11) to ensure that labourers do not interfere with the natural wildlife and their habitats.

9.8 FIRE MANAGEMENT

9.8.1 DESCRIPTION

As the site is in an area which experiences moderate rainfall, occasional droughts, strong winds and dry winter months, the threat of fire is of significance. Given that the site will be surrounded by sugarcane fields to the north, west and south, the threat of fire is even more significant.

The immediate area surrounding the site will be fenced and surrounded by a gravel access road. This will act as a fire break to prevent the spread of fire into or from the Biogas and Fertiliser Plant. Furthermore, fire hydrants / extinguishers will be strategically positioned within the confines of the Midlands Biogas Plant as per Health and Safety requirements (Occupational Health and Safety Act, (Act No. 85 of 1993). Rainwater harvesting infrastructure will offer further assistance in terms of firefighting resources.

9.8.2 IMPLICATIONS

Accidental fires could cause severe damage to the buildings on-site, as well as to neighbouring properties. The prevention of fire is therefore of critical importance as a fire could have serious environmental and financial implications for the Applicant and adjacent properties.

9.8.3 MITIGATION AND RECOMMENDATIONS

- All personnel must be aware of where on-site firefighting mechanisms are located and how they are to be utilised;
- Fire drills are recommended;
- Measures to maintain any open grassed areas must be implemented. This could include the use of mowing and / or burning;
- No fires must be permitted on-site during the construction phase for workers to cook food. Instead alternative cooking equipment should be supplied (e.g. gas stoves) and these should only be used in a designated area; and
- As required by law, (National Veld and Forest Fire Act, No. 101 of 1998), firebreaks must be monitored on the property and site boundaries to prevent the spread of fires.

10 POTENTIAL IMPACTS ON THE SOCIAL AND ECONOMIC ENVIRONMENTS

10.1 LOCAL ECONOMY AND EMPLOYMENT OPPORTUNITIES

10.1.1 DESCRIPTION

The uMshwathi Municipality's Integrated Development Plan (IDP) notes that poverty levels in the municipality are very high. This is due to a high unemployment rate which is attributed to low education levels and a stagnant economy. In terms of the Statistics SA 2011 Census, the unemployment rate is 75.1%.

Available employment opportunities within the municipality are largely dependent on the agricultural and manufacturing sectors. The IDP (2015/2016) notes that the uMshwathi Municipality has been identified as a potential agri-hub, which includes agri-processing activities. This has been identified as a means to create sustainable jobs and SMME development within the municipality. Sugarcane and timber plantations employ the majority of the working population, while chicken houses are playing an increasing role ((uMshwathi IDP, 2015/2016).

However, stakeholders in the uMshwathi economy have expressed concerns regarding the concentration of economic activities around the mono-crops of sugarcane and timber. This concentration makes the economy very vulnerable to market fluctuations. As such, agro-industry opportunities are encouraged to diversify the economy (uMshwathi IDP, 2015/2016).

10.1.2 IMPLICATIONS

The clearing and land preparation of the site will provide employment opportunities, as too will the construction of the Biogas and Fertiliser Plant. These processes would provide temporary employment opportunities, skills development and knowledge transfer to the local population, although existing Sunshine Seedling or farm staff may be utilised to initially clear and prepare the site.

Specialised employment opportunities will present themselves in the construction of the Biogas and Fertiliser Plant in terms of engineering, surveying and administrative processes.

In terms of employment opportunities at the Biogas and Fertiliser Plant specifically, it is envisaged that eight unskilled employment opportunities will be created through the construction phase; one skilled employment opportunity will be created during the operational phase and eight unskilled employment opportunities will be created during the operational phase. These opportunities exceed the current employment that would service the 1ha of sugarcane that is farmed on the Preferred Site Alternative.

10.1.3 MITIGATION AND RECOMMENDATIONS

- The Biogas and Fertiliser Plant is considered to be an agro-industry enterprise, thereby aligning with the uMshwathi Municipality's vision to diversify the economy;
- It is strongly recommended that local businesses and suppliers are used to source materials and services, where required, for the construction of the Biogas and Fertiliser Plant so as to contribute to the local economy;
- Should additional employment opportunities arise during the construction or operational phases, these should be offered to local community first before seeking personnel outside of the municipal boundaries; and
- Skills creation and knowledge transfer is strongly encouraged.

10.2 PLANNING INITIATIVES

10.2.1 INTEGRATED DEVELOPMENT PLAN (IDP)

In terms of the Municipal Systems Act (Act 32 of 2000), every municipality in South Africa is obliged to develop an Integrated Development Plan (IDP) to realize the constitutional mandate of local government. The IDP is a strategic management tool, which aims to guide and align all planning, budgeting and operational decisions of the municipality and other spheres of governments. It is a legally-binding document and replaces all other plans that guide development at local government level.

An IDP's core components consist of the following:

- The Municipal Council's long term development and internal transformation needs;
- An assessment of the level of development and needs to determine community access to basic services;
- The Council's development of priorities and objectives for its term of office, including its Local Economic Development (LED) aims;
- The Council's development and operational strategies accordingly aligned with national and/or provincial sector plans and legislated planning requirements;
- An identification of specific projects which will satisfy service delivery needs and general economic development;
- The Spatial Development Framework (SDF), which includes the provision of basic guidelines for a Land Use Management System (LUMS) for the Municipality;
- The applicable disaster management plans;
- A financial plan, including budget projections covering, at least, the next three years; and
- Key performance indicators and performance targets.

The Municipal Council must review and amend its IDP on an annual basis in accordance with an assessment of its performance measurements and in line with changing circumstances. In formulating and reviewing its IDP, the Municipal Council must also follow a pre-determined programme which must allow for community and stakeholder consultation and effective participation.

UMSHWATHI MUNICIPALITY

The uMshwathi Municipality is located in the uMgungundlovu District, KwaZulu-Natal Midlands, north-east of Pietermaritzburg. Common boundaries are shared with the Msunduzi, uMngeni, Mpofana, uMvoti, Ndwedwe, eThekweni and Mkhambathini Local Municipalities. According to the 2011 Stats-SA Community Survey, the total population is 106 374, however, this has declined by 5.9% since the 2007 Stats-SA Community Survey. A high rate of migration out of the municipality exists, particularly of men who seek work in the neighbouring Msunduzi and more specifically, the eThekweni Municipalities.

Thirteen wards exist in the uMshwathi Municipality with predominantly agricultural landscapes (timber and sugarcane) and rural-residential settlements. The four main urban settings of the Municipality are New Hanover, Wartburg, Dalton and Cool Air. The R33 (Old Greytown Road) serves as the primary development corridor between the N3 and Pietermaritzburg, thus offering a range of opportunities for investment along this route (uMshwathi IDP, 2015/2016).

SPATIAL DEVELOPMENT FRAMEWORK (SDF)

As per the Mshwathi Municipality's IDP (2015/2016), the Municipality has appointed an external service provider to develop the SDF. Due to this reason, the Municipality is in the process of reviewing its SDF and as it stands, the SDF objectives of the uMshwathi Municipality have been abstracted from the 2011/2012 IDP as the 2016 SDF is incomplete. The SDF objectives of 2011/2012 are as follows:

- To improve accessibility in rural areas and improve linkages between urban and rural components;
- To stimulate local economic development with specific emphasis on tourism, agriculture, manufacturing and commerce;
- To attract a greater market share of tourism markets;
- To protect, consolidate and develop the existing agricultural sector;
- To actively pursue the provision of housing to all communities within the Municipality, within the context of overall community development;
- To positively manage informal settlements;
- To achieve a balance between the developmental needs of all local communities, the demands of the tourism and manufacturing industry and sound environmental management principles;
- To place all Council's developmental actions and decisions on a sound environmental footing;
- To raise environmental awareness amongst all the communities in the municipal area; and
- To establish an integrated land use management system which will be more user-friendly, environmentally sensitive and responsive to community needs.

Based on the above objectives, it is clear that environmental management is a priority focus area of the municipality. Given that the majority of the municipality comprises high-potential agricultural farming land

(sugarcane and timber plantations/ grazing areas for livestock), a strong emphasis is placed on land use management in terms of conserving and protecting ecosystem and vegetation communities that require specific environmental management, such as wetlands, grasslands and indigenous forests.

Tourism also plays a vital role in environmental management as the Albert Falls Dam and Nature Reserve falls within the municipality, adding value to the municipality through recreation and tourism activities.

10.2.2 IMPLICATIONS

The proposed development of the Biogas and Fertiliser Plant satisfies many aspects of the IDP as listed below:

- It will continue to add to the agri-industrial potential of the municipality;
- It will assist in improving the manufacturing potential of the municipality;
- The proposed site for development will not impact on any sensitive environmental sites;
- It will continue to contribute towards employment and hence economic growth; and
- It will provide skills creation opportunities to local residents in the municipality.

In terms of the principles of sustainability, the proposed development is likely to be sustainable in the following areas:

- In terms of **environmental sustainability**, the proposed development site does not have any significant environmental issues as it is cultivated with little or no conservation / biodiversity value.
- In terms of **institutional sustainability**, the development is situated outside of the serviced municipal area and will be developed privately with no cost to the municipality or ratepayers. Further, the manner in which the Plant utilises its products to sustain itself (i.e. generation of biogas) further adds to its sustainable practice.
- In terms of **economic sustainability**, the development will continue to serve an existing market, i.e. Sunshine Seedling Services and will also serve a new market through the operation of the essential oil distillery plant.
- In terms of **social sustainability**, the development will generate employment opportunities during the construction and operational phases.
- In terms of **infrastructural sustainability**, the development will utilise existing road infrastructure and will be self-sufficient in terms of electricity, water and biogas supply requirements during operation.

10.2.3 MITIGATION AND RECOMMENDATIONS

- The proposed development is compliant with planning principles of the area, which seek to stimulate local economic development with specific emphasis on tourism, agriculture, manufacturing and commerce;
- Local businesses and suppliers should be used to source materials and services required for the construction to contribute to the local economy;
- Any jobs that are created during the construction and operational phases should be offered to local people first, should they meet the required employment criteria; and
- The proposed development is compliant with the many long-term planning principles of the area.

10.3 SURROUNDING LANDUSE & AESTHETICS

10.3.1 DESCRIPTION

The site is zoned as agriculture and is bordered by sugarcane fields to the west, north and south. Sunshine Seedling Services borders the site to the east.

10.3.2 IMPLICATIONS

The predominate land use in the area is agriculture, however, the disruption to the area in terms of aesthetics and change in sense of place is considered to be minimal given that the proposed development will be located adjacent to Sunshine Seedling Services and out of the line of sight of the general public.

10.3.3 MITIGATION AND RECOMMENDATIONS

- Colours such as brown, beige, cream and grey should be used wherever possible, as this will reduce the visual impact of the proposed development;
- The use of vegetative screening and landscaping to reduce visual impacts is recommended;
- If floodlights are to be used at night, they are to be directed downwards onto the development and not outwards towards neighbouring landowners; and
- The building designs will need to conform to the relevant building specifications of the uMshwathi Local Municipality, as well as the National Building Regulations.

10.4 CULTURAL, HISTORICAL AND ARCHAEOLOGICAL RESOURCES

10.4.1 DESCRIPTION

Amafa KwaZulu-Natal (Amafa), the authority responsible for KwaZulu-Natal's heritage, was contacted regarding the proposed development. The EAP completed the necessary online application via SAHRIS (<http://www.sahra.org.za/sahris/sahris>). Further, Active Heritage cc, were appointed to conduct a Heritage Impact Assessment of the site, in terms of the National Heritage Resources Act (No. 25 of 1999) and the KwaZulu-Natal Heritage Act, 1997 (Act No. 4 of 2008). Active Heritage found no items of heritage or cultural significance on site.

10.4.2 IMPLICATIONS

Correspondence from Amafa, dated 28 April 2016, notes that in terms of the KwaZulu-Natal Heritage Act, (Act No. 4 of 2008) and the National Heritage Resources Act No. 25 of 1999 (Section 38(8)), the Heritage Survey conducted by Mr F. Prins of Active Heritage (see Appendix 8) is noted and the findings accepted. In this regard, Amafa has no objections to the development.

10.4.3 MITIGATION AND RECOMMENDATIONS

Although it is unlikely that any cultural, historical or archaeological resources exist on the site, there is still a possibility that such resources could be buried on-site and therefore these could be uncovered and/or disturbed during earthworks associated with the construction phase. Therefore, in order to satisfy the requirements of Amafa, the following conditions must be adhered to:

- Amafa should be contacted if any heritage objects are identified during earthmoving activities and all development should cease until further notice;

- No structures older than sixty years or parts thereof are allowed to be demolished, altered or extended without a permit from Amafa;
- No activities are allowed within 50m of a site which contains rock art;
- Sources of all natural materials (including topsoil, sands, natural gravels, crushed stone, asphalt, etc.) must be obtained in a sustainable manner and in compliance with the heritage legislation.

These conditions have been incorporated into the Draft EMPr, attached as Appendix 11.

10.5 TRAFFIC, ROADS & ACCESS

10.5.1 DESCRIPTION

The site is located off of the P25-1, along the already existing gravel access road which leads to Sunshine Seedling Services. This existing access gravel road will be utilised for access to and from the Midlands Biogas and Fertiliser Plant.

10.5.2 IMPLICATIONS

Current practice on site is the collection and transportation of bovine manure from the existing animal feedlot for application on existing sugarcane fields. In this regard, the existing practice will continue with the collection and transportation of animal manure to the site. However, prior to application of the bovine manure to the sugarcane fields (as a solid fertiliser), or application in the nursery (as a liquid fertiliser), it will undergo processing via the Biogas and Fertiliser Plant. In this regard, there is no nett increase in the amount of vehicles which currently transport manure to and from site, therefore the current status quo will remain.

10.5.3 MITIGATION AND RECOMMENDATIONS

- During the construction phase, construction warning signage is to be provided where appropriate to warn of the presence of slow-moving construction vehicles; and
- The condition of the existing gravel access road must be monitored and graded as required.

10.6 CONSTRUCTION ACTIVITIES, NOISE & DUST

10.6.1 DESCRIPTION

Construction activities on-site, and access to and from the site, will involve earthworks, heavy machinery and construction vehicles into the local area. These operations will generate noise and dust.

Furthermore, there will be an increase in the number of people in the area due to the presence of construction labourers on the site, as well as other potential job seekers.

10.6.2 IMPLICATIONS

The production of noise and dust from construction activities will negatively impact upon neighbouring landowners as it has the potential to disrupt the rural lifestyle in the area.

Potential exists for construction labourers to trespass onto neighbouring properties during the construction phase.

10.6.3 MITIGATION AND RECOMMENDATIONS

- It is recommended that activities of construction vehicles, building contractors and labourers be limited to working hours between 7.30am - 5pm. Furthermore, construction on Sundays and Public Holidays should not be permitted;
- Machinery and equipment must be maintained and regularly serviced to ensure that unnecessary noise is prevented;
- Workers on-site must not create unnecessary noise such as hooting or shouting;
- All construction labourers must remain within the boundaries of the construction site at all times. To ensure this, it is recommended that the entire site boundary be secured at the start of the construction phase to prevent labourers trespassing onto neighbouring properties;
- As many local people in the area are unemployed, labourers for the construction phase must be sourced from nearby settlements to ensure that unemployed people are given priority for employment on the site, if practical;
- The implementation of the EMPr during the construction phase will help to mitigate against nuisance noise and emissions;
- Stockpiles and vehicles carrying building sand should be covered with tarpaulins to minimise dust;
- Stockpiles should be vegetated if they are not likely to be used within two months. The construction site and other dusty areas should be regularly dampened to reduce dust; and
- All construction activities must be monitored regularly by an independent Environmental Control Officer (ECO) according to the EMPr (Appendix 11).

10.7 SECURITY

10.7.1 DESCRIPTION

During the construction phase, construction labourers will be transported to the site every day and will not live on the site. Access to the development site during both the construction and operational phases will need to be monitored by a security system.

10.7.2 IMPLICATIONS

Management of construction labourers is often problematic. Potential exists for labourers to trespass onto adjoining properties, become involved in criminal activity and poach wildlife.

Crime in the area could increase during the construction phase as result of criminals posing as construction workers, or people seeking employment on the site.

10.7.3 MITIGATION AND RECOMMENDATIONS

- Security will need to be strictly implemented to control access to the proposed development site during the construction phase. The contractors will be responsible for ensuring that construction labourers are confined to the construction site and no trespassing onto neighbouring properties occurs. Any transgressions should be reported to the South African Police Services (SAPS) in New Hanover;
- The site boundaries must be secured before construction commences and there must be a workers register at the gate; and

- Workers must be employed from an off-site location (e.g. offices of the building contractor or settlements in the area) to prevent people loitering in the area in search of employment or criminals posing as job-seekers.

11 SPECIALIST STUDIES

11.1 HERITAGE IMPACT ASSESSMENT

Active Heritage cc was appointed to undertake a Heritage Impact Assessment (HIA) for the proposed construction of the Biogas and Fertiliser Plant. The field survey was conducted in April 2016.

The resultant HIA Report is attached as Appendix 12. The relevant details of the Specialist are noted in Table 11-1.

TABLE 11-1: Details of Heritage Specialist

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix 12
Mr F. Prins	M.A. Archaeology	Heritage Impact Assessment	Cultural Heritage Impact Assessment of the construction of the proposed Midlands Biogas Project, Pietermaritzburg.

11.1.1 CONCLUSIONS AND RECOMMENDATIONS

The HIA survey did not locate any fatal flaws. As per the findings of the HIA Report (Appendix 12): *“The proposed development of the Midlands Biogas Project may proceed in terms of heritage values, as no archaeological or heritage sites or features occur on the footprint. However, it should be pointed out that the KwaZulu-Natal Heritage Act requires that all operations exposing archaeological and historical residues should cease immediately pending an evaluation by the heritage authorities.”*

It is important for the contractor to bear in mind that human settlements may yield graves. Should any graves be intercepted, the procedure as noted by Amafa KZN is to be followed, as noted in the EMPr (Appendix 11).

11.2 QUANTITATIVE RISK ASSESSMENT

Riscom (Pty) Ltd was appointed to undertake a Quantitative Risk Assessment for the proposed operation of the Midlands Biogas Facility.

The resultant Quantitative Risk Assessment Report is attached as Appendix 6. The relevant details of the Specialist are noted in Table 11-2.

TABLE 11-2: Details of Quantitative Risk Assessment Specialist

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix 6
Mr M. Oberholzer	B.Sc Chemical Engineering	Risk and Major Hazardous Installation Assessments	Quantitative Risk Assessment for the Midlands Biogas and Fertiliser Plant, uMshwathi Local Municipality, KwaZulu-Natal.

The aim of the investigation was to quantify the risks to employees, neighbours and the public with regard to the proposed construction of the proposed Biogas and Fertiliser Plant. The Quantitative Risk Assessment is limited to the proposed biogas facility only.

The following terms of reference were utilised:

- The development of accidental spill and fire scenarios for the storage facility;
- Utilising generic failure rate data (tanks, pumps, valves, flanges, pipework, gantry, couplings, etc.), the determination of the probability of each accident scenario;
- For each incident developed, the determination of the consequences (thermal radiation, domino effect, toxic cloud formation, etc.);
- The calculation of maximum individual risk (MIR) values taking into account all accidents, meteorological conditions and lethality.

The main hazards identified included exposure to:

- Asphyxiant vapours;
- Thermal radiation from fire; and
- Overpressure from explosions.

11.2.1 CONCLUSIONS AND RECOMMENDATIONS

The investigation concluded that under the current design conditions, the proposed Biogas and Fertiliser Plant would not be considered as a Major Hazard Installation (MHI). Furthermore, Riscom (Pty) Ltd did not find any fatal flaws that would prevent the project proceeding to the detailed engineering phase of the project.

As per their recommendations, Riscom (Pty) Ltd note that they support the project based on the following conditions being implemented:

- 1) Compliance with all statutory requirements, i.e. pressure vessel designs;
- 2) Compliance with applicable SANS codes, i.e. SANS 10087, SANS 10089, SANS 10108, etc.;
- 3) Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs;
- 4) Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place;
- 5) Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment:
 - Including compliance to statutory laws, applicable codes and standards and world's best practice;
 - Including the listing of statutory and non-statutory inspections, giving frequency of inspections;
 - Including the auditing of the built facility against the safety document;

- 6) Signature of all associated designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs;
- 7) Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (should it be deemed necessary by local authorities);
- 8) Any change to the project (including product changes) that exceed the limits stipulated in the EIA Basic Assessment report will automatically trigger the need for an EIA; and
- 9) Completion of a MHI Risk Assessment in accordance to the MHI Regulations, should it be deemed necessary.

11.3 STORMWATER MANAGEMENT PLAN

Terratest (Pty) Ltd developed the SWMP for the proposed development of the Biogas and Fertiliser Plant (Appendix 5). The relevant details of the Specialist are noted in Table 11-3.

TABLE 11-3: Details of Stormwater Specialist

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix 5
Mr P. Hull	M.Sc (Hydrology) Pr. Sci. Nat.	Stormwater management	Proposed Development of a Liquid Fertilizer Plant at Sunshine Seedlings, uMshwathi Local Municipality, KwaZulu-Natal.

11.3.1 CONCLUSIONS AND RECOMMENDATIONS

Results of the SWMP are provided in Section 4.3.5.

11.4 GEOHYDROLOGICAL REPORT

Terratest (Pty) Ltd developed a Geohydrological Assessment for the proposed development of the Biogas and Fertiliser Plant (Appendix 10). Table 11-4 provides details of the Specialist.

TABLE 11-4: Details of Geohydrologist

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix 10
Mr R. Schapers	B.Sc (Hons) Geohydrology Pr. Sci. Nat.	Geohydrology, contamination and remediation	Geohydrological Assessment for the Midlands Biogas and Fertilizer Site near Pietermaritzburg (4209R01)

11.4.1 CONCLUSIONS AND RECOMMENDATIONS

Construction phase impacts are limited and stormwater management and management of construction areas are standard mitigation options to mitigate surface water runoff and increased turbidity loads. Temporary storage areas and sanitation facilities should be routinely maintained to prevent spills. Refuelling should be carried in designated fuelling areas which have a compacted low permeability base course layer or hardstand.

Operational phase impacts are associated with surface ingress from stockpile areas and storage areas, and prolonged leaks and major loss of containment from infrastructure. Mitigation techniques to both surface water and groundwater include compacting low permeable base course layers in stockpile areas, bunded areas for all chemical stores, and routine monitoring and inspections of infrastructure including pipes and tanks. Where

possible, leak detection monitoring methods such as Stock Inventory Reconciliation analysis (SIR), automatic tank gauging and integrity testing should be included in the operational and maintenance plan. Timeous repairs to leaks and bursts may limit the extent and scale of the possible impacts.

Based on the above, the following mitigation techniques are recommended to reduce/minimise risk of impact:

- Surface water runoff management is required at all construction areas. Stormwater management is required during the operational phase;
- Suitable sanitation facilities must be provided at all construction areas and at the operational plant, and must be appropriately managed;
- Earthwork plant/machinery spills must be remediated immediately by appropriate removal of all impacted soils;
- Refuelling of plant and machinery must be carried out in a controlled environment as per the Environmental Management Programme;
- Pipe/plant leaks and in particular bursts during operation phase need to be attended to urgently. The use of isolation valves may be considered;
- Leak detection monitoring and inspection to be included in the operational plan;
- Compacting of sub grade to be carried out in stockpile area to reduce permeability and leachate to groundwater;
- Any chemical store areas that are identified should be placed undercover on hardstand or bunded; and
- Impacts on resource quantities needs to be identified for the construction phase.

12 IMPACT ASSESSMENT AND MITIGATION MEASURES

12.1 IMPACT ASSESSMENT METHODOLOGY

The EIA Regulations (2014) prescribes requirements to be adhered to and objectives to be reached when undertaking Impact Assessments. The relevant sections of the EIA Regulations (2014) are:

- Regulation 982, Appendix 1, Section 2 and Section 3 – Basic Assessment Impact Requirements; and
- Regulation 982, Appendix 2 and Appendix 3 – Environmental Impact Assessment Requirements.

In terms of these Regulations, when undertaking an Impact Assessment, the following is considered when undertaking an Impact Assessment:

- A description and assessment of the significance of any environmental impact including:
 - Cumulative impacts that may occur as a result of the undertaking of the activity during the project life cycle;
 - Nature of the impact;
 - Extent and duration of the impact;
 - The probability of the impact occurring;
 - The degree to which the impact can be reversed;
 - The degree to which the impact may cause irreplaceable loss of resources; and

- The degree to which the impact can be mitigated.

The overall significance of an impact / effect is ascertained by attributing numerical ratings to each identified impact. The numerical scores obtained for each identified impact is multiplied by the probability of the impact occurring before and after mitigation. High values suggest that a predicted impact / effect is more significant, whilst low values suggest that a predicted impact / effect is less significant. The interpretation of the overall significance of impacts is presented in Table 12-1.

TABLE 12-1: Interpretation of the significance scoring of a negative impact / effect.

Scoring value	Significance
>35	High - The impact is total / consuming / eliminating - In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. Mitigation may not be possible / practical. <u>Consider a potential fatal flaw in the project.</u>
25 - 35	High - The impact is profound - In the case of adverse impacts, there are few opportunities for mitigation that could offset the impact, or mitigation has a limited effect on the impact. Social, cultural and economic activities of communities are disrupted to such an extent that their operation is severely impeded. Mitigation may not be possible / practical. <u>Consider a potential fatal flaw in the project.</u>
20 – 25	Medium - The impact is considerable / substantial - The impact is of great importance. Failure to mitigate with the objective of reducing the impact to acceptable levels could render the entire project option or entire project proposal unacceptable. <u>Mitigation is therefore essential.</u>
7 – 20	Medium - The impact is material / important to investigate - The impact is of importance and is therefore considered to have a substantial impact. <u>Mitigation is required to reduce the negative impacts and such impacts need to be evaluated carefully.</u>
4 – 7	Low - The impact is marginal / slight / minor - The impact is of little importance, but may require limited mitigation; or it may be rendered acceptable in light of proposed mitigation.
0 – 4	Low - The impact is unimportant / inconsequential / indiscernible – no mitigation required, or it may be rendered acceptable in light of proposed mitigation.

The significance rating of each identified impact / effect was further reviewed by the Environmental Assessment Practitioner (EAP) by applying professional judgement.

For the purpose of this assessment, the impact significance for each identified impact was evaluated according to the following key criteria outlined in the sub-sections below.

NATURE OF IMPACT

The environmental impacts of a project are those resultant changes in environmental parameters, in space and time, compared with what would have happened had the project not been undertaken. It is an appraisal of the type of effect the activity would have on the affected environmental parameter. Its description includes what is being affected and how.

SPATIAL EXTENT

This addresses the physical and spatial scale of the impact. A series of standard terms and ratings used in this assessment relating to the spatial extent of an impact / effect are outlined in Table 12-2.

TABLE 12-2: Rating scale for the assessment of the spatial extent of a predicted effect / impact

RATING	SPATIAL DESCRIPTOR
7	International - The impacted area extends beyond national boundaries.
6	National - The impacted area extends beyond provincial boundaries.
5	Ecosystem - The impact could significantly affect functioning ecosystems linked to the site.
4	Regional - The impact could affect the greater area including the neighbouring areas, transport routes and surrounding towns etc.
3	Landscape - The impact could affect all areas generally visible, including ecosystems linked to the site.
2	Local - The impacted area extends slightly further than the actual physical disturbance footprint and could affect the whole, or a measurable portion of adjacent areas.
1	Site Related - The impacted area extends only as far as the activity e.g. the footprint. The loss is inconsequential in terms of the spatial context of the relevant environmental or social aspect.

SEVERITY / INTENSITY / MAGNITUDE

This provides a qualitative assessment of the severity of a predicted impact / effect. A series of standard terms and ratings used in this assessment that relate to the magnitude of an impact / effect are outlined in Table 12-3.

TABLE 12-3: Rating scale for the assessment of the severity / magnitude of a predicted effect / impact³.

RATING	MAGNITUDE DESCRIPTOR
7	Total / consuming / eliminating - Function or process of the affected environment is altered to the extent that it is permanently changed.
6	Profound / considerable / substantial - Function or process of the affected environment is altered to the extent where it is permanently modified to a sub-optimal state.
5	Material / important - The affected environment is altered, but function and process continue, albeit in a modified way.
4	Discernible / noticeable - Function or process of the affected environment is altered to the extent where it is temporarily altered, be it in a positive or negative manner.
3	Marginal / slight / minor - The affected environment is altered, but natural function and process continue.
2	Unimportant / inconsequential / indiscernible - The impact temporarily alters the affected environment in such a way that the natural processes or functions are negligibly affected.
1	No effect / not applicable

DURATION

This describes the predicted lifetime / temporal scale of the predicted impact. A series of standard terms and ratings used in this assessment are included in Table 12-4.

TABLE 12-4: Rating scale for the assessment of the temporal scale of a predicted effect / impact.

RATING	TEMPORAL DESCRIPTOR
7	Long term – Permanent or more than 15 years post decommissioning. The impact remains beyond decommissioning and cannot be negated.
3	Medium term – Lifespan of the project. Reversible between 5 to 15 years post decommissioning.

³ **Source:** adapted from Glasson J, Therivel R & Chadwick A. Introduction to Environmental Impact Assessment, 2nd Edition. 1999. pp 258. Spoon Press, United Kingdom.

1	Short term – Quickly reversible. Less than the project lifespan. The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than any of the project phases or within 0 -5 years.
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IRREPLACEABLE LOSS OF RESOURCES

Environmental resources cannot always be replaced; once destroyed, some may be lost forever. It may be possible to replace, compensate for or reconstruct a lost resource in some cases, but substitutions are rarely ideal. The loss of a resource may become more serious later, and the assessment takes this into account. A series of standard terms and ratings used in this assessment are included in Table 12-5.

TABLE 12-5: Rating scale for the assessment of loss of resources due to a predicted effect / impact.

RATING	RESOURCE LOSS DESCRIPTOR
7	Permanent – The loss of a non-renewable / threatened resource that cannot be renewed / recovered with, or through, natural process in a time span of over 15 years, <u>or by artificial means.</u>
5	Long term – The loss of a non-renewable / threatened resource that cannot be renewed / recovered with, or through, natural process in a time span of over 15 years, <u>but can be mitigated by other means.</u>
4	Loss of an ‘at risk’ resource - one that is not deemed critical for biodiversity targets, planning goals, community welfare, agricultural production, or other criteria, but cumulative effects may render such loss as significant.
3	Medium term – The resource can be recovered within the lifespan of the project. The resource can be renewed / recovered with mitigation or will be mitigated through natural process in a span between 5 and 15 years.
2	Loss of an ‘expendable’ resource - one that is not deemed critical for biodiversity targets, planning goals, community welfare, agricultural production, or other criteria.
1	Short-term – Quickly recoverable. Less than the project lifespan. The resource can be renewed / recovered with mitigation or will be mitigated through natural process in a span shorter than any of the project phases, or in a time span of 0 to 5 years.

REVERSIBILITY / POTENTIAL FOR REHABILITATION

The distinction between reversible and irreversible impacts is a very important one and the irreversible impacts not susceptible to mitigation can constitute significant impacts in an EIA (Glasson et al, 1999). The potential for rehabilitation is the major determinant factor when considering the temporal scale of most predicted impacts. A series of standard terms and ratings used in this assessment are included in Table 12-6.

TABLE 12-6: Rating scale for the assessment of reversibility of a predicted effect / impact.

RATING	REVERSIBILITY DESCRIPTOR
7	Long term – The impact / effect will never be returned to its benchmark state.
3	Medium term – The impact / effect will be returned to its benchmark state through mitigation or natural processes in a span shorter than the lifetime of the project, or in a time span between 5 and 15 years.
1	Short term – The impact / effect will be returned to its benchmark state through mitigation or natural processes in a span shorter than any of the phases of the project, or in a time span of 0 to 5 years.

PROBABILITY

The assessment of the probability / likelihood of an impact / effect has been undertaken in accordance with ratings and descriptors provided in Table 12-7.

TABLE 12-7: Rating scale for the assessment of the probability of a predicted effect / impact⁴.

RATING	PROBABILITY DESCRIPTOR
1.0	Absolute certainty / will occur
0.9	Near certainty / very high probability
0.7 – 0.8	High probability / to be expected
0.4 - 0.6	Medium probability / strongly anticipated
0.3	Low probability / anticipated
0.2	Possibility
0.0 - 0.1	Remote possibility / unlikely

12.2 MITIGATION

The potential to mitigate the negative impact is determined and rated for each identified impact. Similarly, the mitigation objective that results in a measurable reduction or enhancement of the impact, is determined and rated. The significance of environmental impact and mitigation measures is assessed. The significance of the impact “without mitigation” is therefore the prime determinant of the nature and degree of mitigation required.

13 IDENTIFIED IMPACTS

The preferred site alternative is the 0.9ha area of land immediately adjacent to Sunshine Seedling Services on Portion 45 of the Farm Riet Spruit No. 997. The site is considered favourable given its gentle gradient and high level of transformation. Further, the location of the site adjacent to Sunshine Seedling Services will prevent the fragmentation of agricultural land. The Risk Assessment conducted by Risom (Pty) Ltd (Appendix 6) noted that the preferred site alternative held acceptable limits in terms of health and safety impacts. The preferred site alternative meets the need and desirability of the Application. No other site alternative has been investigated.

The preferred technology alternative is the use of internationally recognised and utilised IBR technology. The IBR technology is the basis on which the Biogas and Fertiliser Plant is based and has been researched by Renen Energy Solutions. The IBR technology is the only currently available technology that can meet the need and desirability of the Applicant in terms of design, operation, HRT and product.

The preferred layout alternative has been designed by engineers as the most suitable and efficient layout given the physical attributes of the site. Further, the Risk Assessment notes that the preferred site layout held acceptable limits in terms of health and safety impacts with regards to the public and staff in the surrounding area (i.e. at Sunshine Seedling Services). Based on the above, no other layout alternative has been identified as the preferred site alternative meets the criteria required to construct and operate the proposed Biogas and Fertiliser Plant, on the identified site. The environmental management principles required to operate the Biogas and Fertiliser Plant as per the preferred layout alternative are also considered to be sound, given the channelling of dirty stormwater into the subterranean storage bladders for reuse in the process. Further, best practice principles in terms of harvesting rainwater (i.e. clean stormwater from roofs) are to be adopted.

⁴ **Source:** adapted from Glasson J, Therivel R & Chadwick A. Introduction to Environmental Impact Assessment, 2nd Edition. 1999. pp 258. Spoon Press, United Kingdom.

The no-go alternative is to not to construct the Biogas and Fertiliser Plant. Should this alternative be implemented, the landowner will continue to import and apply raw bovine manure from the local animal feedlot onto the existing sugarcane fields. Sunshine Seedling Services will continue to purchase fertilisers for application in the nursery and the nursery tunnels will continue to utilise electricity as a power source, thus continuing to draw power from the national grid. Further, Sunshine Seedlings Services will unlikely expand operations in terms of developing essential oils.

In terms of Renen Energy Solutions, the no-go alternative will result in the IBR technology not being implemented, therefore no real-world operational example in will be available for assessment by potential investors in KwaZulu-Natal and South Africa at large. As such, the business investment will not come to fruition, and may hamper the growth of similar, sustainable and symbiotic agriculture projects in South Africa.

The impacts identified for the proposed development of the Biogas and Fertiliser Plant and the associated mitigation measures are provided in Table 13-1.

TABLE 13-1: Impacts identified and associated mitigation measures.

IMPACT	DESCRIPTION	MITIGATION
Soil impacts	<p>Construction related impacts</p> <ul style="list-style-type: none"> • Potential disturbances include compaction, physical removal and potential pollution; • The exposed soil surfaces have the potential to erode easily if left uncovered which could lead to the loss of vegetation and additional loss of soil and soil quality; • Potential loss of stockpiled topsoil and other materials if not protected properly; • Physical disturbance of the soil and removal of flora may result in soil erosion/loss; and • Erosion and potential soil loss from cut and fill activities. 	<ul style="list-style-type: none"> • Vegetation on the site should only be removed immediately before construction commences to reduce the period of exposure to bare soil. Where vegetation has been removed, exposed soils must be re-vegetated as soon as possible with creeping / stoloniferous vegetation; • Vegetation should only be cleared where required and the extent of the disturbed area must be minimised. • Berms are to be installed above and below cleared areas to capture surface run-off and promote infiltration; • Measures should be taken to cover exposed areas during high intensity rainfall events; • Stockpiled topsoil should be dampened or covered during times of high wind to prevent dust; and • All areas impacted by earth-moving activities should be re-shaped post-construction to ensure natural flow of runoff and to prevent ponding. All exposed earth should be rehabilitated promptly with suitable vegetation to stabilize the soil.
	<p>Operational related impacts</p> <ul style="list-style-type: none"> • Stormwater run-off from hardened surfaces may create and/or accelerate soil erosion on site; • Insufficient stormwater control measures may result in localised soil erosion; and • The additional hardened surfaces created during construction will increase stormwater runoff velocities, which has the potential to cause erosion. • Enriched surface run-off can have an impact of soil fecundity through organic and nutrient loading to soils. 	<ul style="list-style-type: none"> • A SWMP will assist in preventing erosion; • Rehabilitation and landscaping should take place in the wetter summer months to increase the newly planted vegetation's chance of establishing; • Firebreaks must be maintained on the property boundaries to prevent the spread of fires.

IMPACT	DESCRIPTION	MITIGATION
Vegetation and fauna impacts	<p>Constructed related impacts</p> <ul style="list-style-type: none"> • Construction disturbance of the site may lead to encroachment of alien plant species on-site; • Increase in road strikes of birds and wildlife, especially slow-moving organisms such as frogs from construction vehicles; • Loss of an agricultural resource (i.e. sugarcane); • Loss in sugarcane habitat utilised by fauna; 	<ul style="list-style-type: none"> • Site personnel must undergo Environmental Training and be educated on keeping any vegetation disturbance to a minimum; • The construction site must be demarcated and fenced in order to confirm construction activities to the site area; • Poaching or harvesting of indigenous flora / fauna is strictly forbidden; • Alien plant encroachment must be monitored and measures implemented to prevent such; • Fauna dependent on the site will utilise the remaining 99.3% of the property • No animals required for hunting e.g. dogs, under the supervision of construction workers, are permitted on site. All construction personnel on the property should be informed of this ruling; • Any construction personnel found to be poaching in the area should be subjected to a disciplinary hearing; • No indigenous or medicinal / 'muthi' plants may be collected or harvested at any stage of construction or operation, either from the property or from neighbouring properties.
	<p>Operational related impacts</p> <ul style="list-style-type: none"> • Loss of an agricultural resource (i.e. sugarcane); Loss in sugarcane habitat utilised by fauna; • Alien plants may invade the site if not monitored and removed on an on-going basis enhanced by enriched run-off; • Increase in nuisance conditions i.e. flies, rats, dung beetles from accumulated waste material in stockpiled area. 	<ul style="list-style-type: none"> • The loss of agricultural land i.e. 1ha, will not have a negative impact on the agricultural industry. Further the development is considered to be agri-industrial enterprise, meeting the development criteria of the Mshwathi Municipality's IDP; • The site is currently planted to sugarcane, the loss of which will have a limited ecological impact; • Fauna dependent on the site will utilise the remaining 99.3% of the property for habitat requirements; • Implementation of a vegetation management plan to prevent the establishment and propagation of alien species; and • A pest control plan must be implemented to control flies, rats etc. Biological control methods must be utilised to prevent secondary poisoning.

IMPACT	DESCRIPTION	MITIGATION
Air quality and odour impacts	<p>Constructed related impacts</p> <ul style="list-style-type: none"> • Potential dust generation from soil stripping, vehicle traffic on the access roads and motor vehicle fumes will have an impact on air quality; • Potential increase in noise from the operation of machinery and equipment, as well as the construction vehicle traffic; and • Dust will be created from construction activities. 	<ul style="list-style-type: none"> • All construction machinery and equipment must be regularly serviced and maintained to keep noise, dust and possible leaks to a minimum, as per the requirements of the EMPr (Appendix 11); • Road and site dampening should be undertaken to prevent excess dust during construction; • All vehicles must comply with speed limits on the access roads; • It is recommended that construction on the site is phased so that only small areas are exposed at any time, thereby reducing the amount of dust on-site; and • It is recommended that concrete mixing areas (batching plants) be enclosed with shade cloth to reduce the potential for concrete dust to become wind-blown.
	<p>Operational related impacts</p> <ul style="list-style-type: none"> • Odour impacts from hydrogen sulphide, methane and VoCs; and • Odour impacts from raw manure stockpiled on site. 	<ul style="list-style-type: none"> • The IBR technology is implemented in a closed loop system, thus preventing the escape of methane and VoCs (i.e. biogas); • Active raw material management must aim to reduce retention time prior to processing. Should the plant be inoperable, raw material acceptance should be limited and must not exceed the capacity of the receiving area. • Biogas is to be stored in subterranean methane storage bladders, composed of an impermeable membrane. Thus odour will not be able to escape; • The IBR technology will remove a large amount of the associated odour and capture it in the extracted biogas. As the biogas will be stored in the subterranean bladders and transported through pipelines for utilisation, limited odour nuisance should be experienced; and • Limited opportunity for mitigation is available for raw manure odour control. However, the site is located within a rural, agricultural context with limited receptors. Being located within an agricultural setting, any odour nuisance from the raw manure should be considered acceptable. However, a grievance procedure should be implemented if staff at Sunshine Seedling Services find any odour related to the development offensive.

IMPACT	DESCRIPTION	MITIGATION
Traffic impacts	<p>Construction related impacts</p> <ul style="list-style-type: none"> • Increase in construction vehicles in the area; • Possible lane closures, traffic delays and congestion during the construction phase; • Slow-moving construction vehicles on the surrounding roads may cause accidents; and • If not properly maintained, increased road use to existing surrounding road infrastructure, for access purposes by construction personnel, may cause damage to the existing infrastructure. 	<ul style="list-style-type: none"> • Appropriate temporary traffic control and warning signage must be erected and implemented on all affected roads in the vicinity; • Construction workers' / construction vehicles must take heed of normal road safety regulations, thus all personnel must obey and respect the law of the road. A courteous and respectful driving manner should be enforced and maintained so as not to cause harm to any individual; • During the construction phase, construction warning signage is to be provided where appropriate to warn of the presence of slow-moving construction vehicles; and • Any damage to surrounding roads should be repaired as soon as possible to prevent further deterioration to the road network.
	<p>Operational related impacts</p> <ul style="list-style-type: none"> • Current status quo to continue – No Impact. 	<ul style="list-style-type: none"> • The condition of the existing gravel access road must be monitored and graded as required.
Waste impacts	<p>Construction related impacts</p> <ul style="list-style-type: none"> • There is potential for the site and surrounding areas to become polluted if construction activities are not properly managed (e.g. oil / bitumen spills, litter from personnel on-site, sewage from ablutions etc.); and • Waste generation could be created by the following: <ul style="list-style-type: none"> – Solid waste - plastics, metal, wood, concrete, stone, asphalt; – Chemical waste- petrochemicals, resins and paints; and – Sewage as may be generated by employees. 	<ul style="list-style-type: none"> • All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials is supported; • All solid wastes should be disposed of at a registered landfill site and records maintained to confirm safe disposal; • Adequate scavenger-proof refuse disposal containers should be supplied to control solid waste on-site; • Chemical waste should be stored in appropriate containers and disposed of at a licensed disposal facility; • Portable sanitation facilities should be erected for construction personnel. Use of these facilities should be enforced (these facilities should be kept clean so that they are a desired alternative to the surrounding vegetation). These facilities should also be monitored and serviced regularly so as to prevent contamination of the water resources; • The construction site should be inspected for litter on a daily basis. Extra care should be taken on windy days;

IMPACT	DESCRIPTION	MITIGATION
		<ul style="list-style-type: none"> • Soil that is contaminated with, e.g. cement, petrochemicals or paint, should be disposed of at a registered waste disposal; • It must be ensured that all hazardous contaminants are stored in designated areas that are sign-posted, lined with an appropriate barrier and bunded to 110% of the volumes of liquid being stored to prevent the bio-physical contamination of the environment (ground and surface water and soil contamination); and • Any significant spills on-site must be reported to the relevant Authority (e.g. Department of Water and Sanitation / Municipality etc.) and must be remediated as per the EMPr.
	<p>Operational related impacts</p> <ul style="list-style-type: none"> • Improper storage of raw material i.e. animal manure, vegetation debris etc. may have impacts to soil, surface water quality and groundwater quality through seepage and run-off; • The Applicant will have a renewable energy source / resource that isn't derived from fossil fuels, thus increasing the environmental value of the raw product as a resource and decreasing Sunshine Seedling Services' carbon footprint; • A decrease in Sunshine Seedling Services' operating costs as: <ul style="list-style-type: none"> – The liquid fertiliser will be utilised in the existing nursery; – The solid compost will be utilised in the existing nursery or on existing sugarcane fields; – The biogas will be utilised as fuel in the purpose-built Essential Oil Distillery, utilised to generate electricity via a closed combustion engine; and as a heat source in the existing nursery tunnels during the winter months. • Decrease in the use of fossil fuels, as well as synthetic and chemical fertilisers. • Waste products generated by the servicing of plant and filtration devices may generate hazardous wastes 	<ul style="list-style-type: none"> • All raw material is to be stored in the designated hard surfaced general storage area; • Berms should be created on the boundaries of the general storage area to prevent footprint creep; and • Berms will also assist in containing the raw material during high intensity storm events. • All servicing to be carried out by appropriately qualified technicians, who have been made aware of the responsibilities of waste management in the EMPr; and • Any waste materials not pre-classified by the Waste Classification and Management regulations must be classified and handled in accordance with the aforementioned regulations.

IMPACT	DESCRIPTION	MITIGATION
Socio-Economic impacts	<p>Construction related impacts</p> <ul style="list-style-type: none"> • Creation of job opportunities for skilled personnel (e.g. engineers, specialists etc.) and non-skilled personnel (e.g. labourers); • Skills development of the local community through employment opportunities; • Social anxiety may arise should the surrounding community not be adequately notified of the proposed activity; and • Possible economic benefits to suppliers of building materials in the municipality as goods and services may be purchased from these entities during the construction phase. 	<ul style="list-style-type: none"> • Inform the surrounding communities and general public of the proposed activity as soon as possible. This will serve to ease potential social anxiety. Such notification can be conducted through the Public Participation Process; • Local businesses and suppliers should be used to source materials and services required for the construction to contribute to the local economy • Any jobs that are created during the Construction and Operational Phases should be offered to local people first; and • Local people should be employed where possible.
	<p>Operational related impacts</p> <ul style="list-style-type: none"> • Creation of job opportunities for skilled personnel (e.g. engineers, specialists etc.) and non-skilled personnel (e.g. labourers); • Decrease in monetary spend for Sunshine Seedling Services on synthetic and chemical fertilisers; • Diversification in market due to the establishment of the Essential Oil Distillery; • Decrease in a reliance on Eskom as a small amount of electricity will be generated via the biogas and closed combustion engine. 	<ul style="list-style-type: none"> • Not required.
Safety and security	<p>Construction related impacts</p> <ul style="list-style-type: none"> • There is potential for construction labour to trespass onto neighbouring properties; and • Construction personnel / construction vehicles – movement of construction personnel and vehicles may pose a potential health and safety risk to road users and local residents. 	<ul style="list-style-type: none"> • Any construction personnel found to be trespassing must be subjected to a disciplinary hearing; • Construction workers' / construction vehicles should take heed of normal road safety regulations, thus all personnel must obey and respect the law of the road. A courteous and respectful driving manner should be enforced and maintained so as not to cause harm to any individual; and • A designated speed limit should be set by the developer to limit possible road strikes.

IMPACT	DESCRIPTION	MITIGATION
	<p>Operational related impacts</p> <ul style="list-style-type: none"> Health and safety impacts to staff of the Midlands Biogas and Fertiliser Plant and Sunshine Seedling Services, as well as the general public through: <ul style="list-style-type: none"> Asphyxiant vapours; Thermal radiation from fires; Explosions from overpressure. 	<ul style="list-style-type: none"> A Risk Assessment was conducted by Riscom (Pty) Ltd, (see Appendix 6), the outcome of which notes that the development would not pose a major risk, provided the recommendations thereof are implemented.
Water Resources	<p>Construction related impacts</p> <ul style="list-style-type: none"> Contamination of ground and surface water and soil; The additional hardened surfaces created during construction will increase the amount of stormwater runoff, which has the potential to cause erosion; and Increased consumptive use of water in a scarce water catchment. 	<ul style="list-style-type: none"> Appropriate stormwater / surface water management measures must be put in place before construction commences and maintained throughout the lifetime of the development; An appropriate number of toilets (1 toilet for every 20 workers) must be provided for labourers during the Construction Phase. These must be maintained in a satisfactory condition and a minimum of 100m away from any water resources and outside of the 1:100 year floodline;
		<ul style="list-style-type: none"> Any contaminated water associated with construction activities must be contained in separate areas or receptacles such as Jo-Jo tanks or water-proof drums, and must not be allowed to enter into the natural drainage systems; The Construction Camp should be positioned on previously disturbed areas (if possible) and outside of the 1:100 yr floodline; Soil erosion prevention measures must be implemented such as gabions, sand bags etc. whilst energy dissipaters must be constructed at any surface water outflow points. The site should be monitored by the Contractor weekly for any signs of off-site siltation. All areas impacted by earth-moving activities must be re-shaped post-construction to ensure natural flow of runoff and to prevent ponding; Earthwork plant/machinery spills must be remediated immediately by appropriate removal of all impacted soils; Refuelling of plant and machinery must be carried out in a controlled environment as per the Environmental Management Plan; Any chemical store areas that are identified should be placed undercover on hardstand or bunded; Appropriate silt control mechanisms must be installed around all soil excavations to prevent silt from entering surrounding drainage lines; and Surface water runoff management is required at all construction areas.

IMPACT	DESCRIPTION	MITIGATION
	<p data-bbox="327 217 645 240">Operational related impacts</p> <ul data-bbox="327 256 1155 379" style="list-style-type: none"> <li data-bbox="327 256 1155 347">• Water quality impacts to surface water and groundwater through the storage of high nutrient laden materials, leakage from plant piping and catastrophic incidents. <li data-bbox="327 355 1061 379">• Increased consumptive use of water in a scarce water catchment. 	<ul data-bbox="1184 264 2038 713" style="list-style-type: none"> <li data-bbox="1184 264 1576 288">• A SWMP must be implemented; <li data-bbox="1184 296 2038 360">• Machinery spills must be remediated immediately by appropriate removal of all impacted soils; <li data-bbox="1184 368 2038 432">• Pipe/plant leaks and in particular bursts during operation phase need to be attended to urgently. The use of isolation valves may be considered; <li data-bbox="1184 440 2038 504">• Leak detection monitoring and inspection to be included in the operational plan; <li data-bbox="1184 512 2038 576">• Compacting of sub grade to be carried out in stockpile area to reduce permeability and leachate to groundwater; <li data-bbox="1184 584 2038 647">• Clean rainwater to be harvested from roofs will feed back to Sunshine Seedling Services for use; while dirty stormwater will be fed back into the process for re-use; and <li data-bbox="1184 655 2038 713">• Any chemical store areas that are identified should be placed undercover on hardstand or bunded.

14 IMPACT ASSESSMENT

Table 17 presents the impact assessment findings in relation to the proposed construction activities.

TABLE 14-1: Assessment of Construction Impacts

	Nature of project impact	Spatial extent		Severity / intensity / magnitude		Duration		Resource loss	Reversibility		Probability		Significance without mitigation	Significance with mitigation
		Without	With	Without	With	Without	With		Without	With	Without	With		
CONSTRUCTION IMPACTS	Soil impacts	1	1	7	5	7	1	3	3	1	1	1	21	11
	Flora and fauna impacts	1	1	7	7	7	7	1	1	1	1	1	17	17
	Air quality and noise pollution impacts	2	2	2	1	1	1	1	1	1	0.3	0.3	2.1	1.8
	Traffic impacts	4	4	3	2	1	1	1	1	1	0.3	0.3	3	2.7
	Waste impacts	2	2	5	3	3	1	1	3	1	0.4	0.4	5.6	3.2
	Socio-economic impacts	2	4	2	3	1	1	1	1	1	0.3	0.3	2.1	3
	Safety and security impacts	2	2	2	2	1	1	1	1	1	0.1	0.1	0.7	0.7
	Noise impacts	2	2	4	3	1	1	1	1	1	0.1	0.1	0.9	0.8
	Water impacts	2	2	3	2	1	1	5	1	1	0.4	0.3	4.8	3.3
OVERALL IMPACT SIGNIFICANCE													6.4	4.8
													LOW	LOW

TABLE 14-2: Assessment of Operational Impacts

	Nature of project impact	Spatial extent		Severity / intensity / magnitude		Duration		Resource loss	Reversibility		Probability		Significance without mitigation	Significance with mitigation
		Without	With	Without	With	Without	With		Without	With	Without	With		
OPERATION IMPACTS	Soil impacts	2	2	5	4	1	1	3	1	1	0.4	0.3	4.8	3.3
	Flora and fauna impacts	4	3	5	4	1	1	3	1	1	0.7	0.4	9.8	4.8
	Air quality and noise pollution impacts	2	2	5	4	3	3	1	1	1	0.8	0.6	9.6	6.6
	Traffic impacts	4	4	2	2	3	3	1	1	1	0.7	0.4	7.7	4.4
	Waste impacts	4	4	4	4	3	3	3	3	3	0.8	0.8	13.6	13.6
	Socio-economic impacts	4	4	7	7	3	3	3	3	3	0.8	0.8	16	16
	Safety and security impacts	1	1	2	2	1	2	1	1	1	0.1	0.1	0.6	0.7
	Noise impacts	1	1	3	2	3	3	1	1	1	0.1	0.1	0.9	0.8
	Water impacts	4	3	6	6	7	1	5	3	3	0.6	0.2	15	3.6
	Risk impacts	2	1	3	2	3	1	3	1	1	0.3	0.1	3.6	0.8
OVERALL IMPACT SIGNIFICANCE												8.2	5.5	
												MEDIUM	LOW	

14.1 SIGNIFICANCE

Based on the outcome of the significance scoring noted in Table 14-2, construction impacts, the overall significance impact without mitigation, is considered to be LOW, with a score of 6.4. With mitigation, the overall significance impact is considered to be LOW, with a score of 4.8.

The operational impacts noted in Table 14-3 note that the overall significance of operating the Biogas and Fertiliser Plant without mitigation measures is considered to be MEDIUM, with a score of 8.2. With mitigation, the overall significance impact is considered to be LOW, with a score of 5.5.

The greatest impact of significance during construction is considered to be soil related impacts, while fauna and flora impacts are rated as the second highest possible impact. However, with the correct mitigation measures employed as noted in Table 14-2 and as per the EMPr (Appendix 11), these impacts can be significantly reduced.

The greatest impact of positive significance during operation is considered to be the socio-economic impacts. The greatest impact of negative significance during operation is considered to be water related impacts, followed by waste related impacts. These, however, can be mitigated by implementing the documented recommendations as noted in the SWMP and Geohydrological Assessment Reports (Appendix 5 and 10). Based on the results of the significance scoring, the Preferred Site Alternative, Technology Alternative and Layout Alternative should all be adopted as harm to the receiving environment is considered to be unlikely given the implementation of the proposed mitigation measures.

15 ENVIRONMENTAL IMPACT STATEMENT

Assuming all phases of the project adhere to the conditions stated in the EMPr (Appendix 11) it is believed that the impacts associated with the proposed construction and operation will have no significant, adverse environmental impact on the surrounding environment. The preferred site alternative did not identify any environmentally sensitive features which need to be considered during construction and operation.

Positive impacts associated with construction and operation include:

- Employment opportunities and skills development;
 - Development and use of a refined natural fertiliser;
 - Use of a sustainable waste product which is in accordance to the principals espoused in the National Waste Management Policy and NEM:WA;
 - The production and utilisation of renewable energy from waste in terms the objects of the National Energy Act, 2008;
 - Operation of a processing plant with limited reliance on municipal services i.e. water and electricity;
 - Diversification of products at Sunshine Seedling Services (i.e. development of essential oil distillery plant); and
 - Municipal economic growth and development.
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It is perceived that these impacts will be long-term and will have sustainable benefits to the social, economic and bio-physical environments.

In terms of negative impacts associated with construction and operation of the Biogas and Fertiliser Plant, there is potential for groundwater contamination during the operational phase. Provided the mitigation measures recommended by the Geohydrological Specialist (see Appendix 10 for report) are implemented, this risk is considered to be low.

In terms of construction, general construction related activities pose a risk to the surrounding environment. However, given the relatively flat nature of the site, the monocrop dominance (i.e. sugarcane), and the location of the site next to an existing agri-industrial facility (i.e. Sunshine Seedling Services), the significance of the negative impacts are considered to be low provided that the mitigation measures provided in Section 13 and the EMPr (Appendix 11) are implemented and monitored by an independent ECO.

In summary, the proposed development of the Biogas and Fertiliser Plant will utilise a sustainable waste product in the form of bovine manure in a process which will create an environmentally friendly and organic liquid and solid fertiliser, for use by the landowner (i.e. Sunshine Seedling Services). Further, a by-product of the process will result in biogas, to be used by the landowner as a heating fuel source in the Sunshine Seedling Services nursery tunnels during the winter months; firing boilers in a purpose-built essential oil distillery and for generating electricity in a closed combustion engine which will assist in powering the Biogas and Fertiliser Plant. Any excess biogas generated will be flared.

Further, the best practice principle of rainwater harvesting will be implemented for clean water, and all dirty stormwater will feed into the two subterranean bladders, for re-use back into the process, as per the SWMP (Appendix 5).

The development is considered to be sustainable and utilises a waste product to produce several value-added resources. If Environmental Authorisation and a WML are issued, the Biogas and Fertiliser Plant will be utilised as a 'real-world' example to agricultural investors in KwaZulu-Natal for future development elsewhere in the province and potentially country-wide.

16 RECOMMENDATIONS OF THE EAP

The proposed development will not result in impacts on the natural or social environment that are highly detrimental, nor result in undue risks to the natural environment. The nature and types of negative impacts do not outweigh the potential benefits of this project, provided that the short term localised impacts of the construction phase are adequately mitigated and the long-term impacts of the operational phase are managed appropriately. In this regard, an EMPr has been compiled and is attached to this report (see Appendix 11). It is recommended that external EMPr monitoring takes place by an independent Environmental Control Officer

(ECO) during the construction and operational phase to ensure that the requirements of the EMPr are being correctly implemented, thus ensuring the protection of the surrounding environs.

It is the recommendation of the EAP that the following management and mitigation measures be incorporated into any project approvals which may be issued:

1. All recommendations noted in the **Heritage Impact Assessment** (Appendix 12) must be adopted and followed by the contractor. These include:
 - Should any works expose any archaeological or historical residues, works must immediately stop and an evaluation of the find is it be undertaken by Amafa;
 - No structures older than sixty years or parts thereof are allowed to be demolished, altered or extended without a permit from Amafa;
 - No activities are allowed within 50m of a site which contains rock art;
 - Amafa should be contacted if any graves are identified during construction and the following procedure is to be followed:
 - Stop construction;
 - Report finding to local police station; and
 - Report to Amafa to investigate.
 - No walling may be damaged without permission from the archaeologist and/or Amafa KZN.

 2. All recommendations noted in the **Geohydrological Assessment** (Appendix 10) are to be implemented. These include:
 - Surface water runoff management is required at all construction areas. Stormwater management is required during the operational phase. The SWMP (Appendix 5) is to be implemented;
 - Suitable sanitation facilities must be provided at all construction areas and at the operational plant and must be appropriately managed;
 - Earthwork plant/machinery spills must be remediated immediately by appropriate removal of all impacted soils;
 - Refuelling of plant and machinery must be carried out in a controlled environment as per the EMPr;
 - Pipe/plant leaks and in particular bursts during operation phase need to be attended to urgently. The use of isolation valves may be considered;
 - Leak detection monitoring and inspection to be included in the operational plan;
 - Compacting of sub grade to be carried out in stockpile area to reduce permeability and leachate to groundwater;
 - Any chemical store areas that are identified should be placed undercover on hardstand or bunded; and
 - Impacts on resource quantities needs to be identified for the construction phase.
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3. All recommendations noted in the **Quantitative Risk Assessment** (Appendix 6) are to be implemented. These include:
- Compliance with all statutory requirements, i.e. pressure vessel designs;
 - Compliance with applicable SANS codes, i.e. SANS 10087, SANS 10089, SANS 10108, etc.;
 - Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs;
 - Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place;
 - Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment:
 - Including compliance to statutory laws, applicable codes and standards and world's best practice;
 - Including the listing of statutory and non-statutory inspections, giving frequency of inspections;
 - Including the auditing of the built facility against the safety document;
 - Signature of all associated designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs;
 - Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (should it be deemed necessary by local authorities);
 - Any change to the project (including product changes) that exceed the limits stipulated in the EIA Basic Assessment report will automatically trigger the need for an EIA; and
 - Completion of a MHI Risk Assessment in accordance to the MHI Regulations, should it be deemed necessary.

Further, in terms of Environmental Monitoring, the following is recommended:

- An independent, external ECO must audit the construction site during the construction phase of the Biogas and Fertiliser Plant on a bio-monthly basis, unless otherwise specified by the EDTEA;
- A monthly construction Environmental Audit Report is to be drafted and submitted to the EDTEA: Compliance and Monitoring department for the duration of the construction period;
- During operation, an independent, external ECO must audit the Biogas and Fertiliser Plant bi-annually for the first two (2) years of operation, unless otherwise specified by the EDTEA; and
- An Operational Environmental Audit Report is to be submitted bi-annually to the EDTEA: Compliance and Monitoring department for the first two (2) years of operation.

All of the above recommendations have been incorporated into the EMPr (Appendix 11).

As per the requirements of the EIA Regulations 2014, GNR 982: Appendix 1, the EAP is to provide any Conditions of Authorisation which were conditional to the findings of the assessment. As the assessment has indicated that the proposed development will have a low impact to the receiving environment, no Conditions of Authorisation are presented, barring that all recommendations stipulated in the Specialist Studies be adhered to. Based on the above, it is the reasoned opinion of the EAP that the Application be granted a positive decision on Environmental Authorisation and a WML.

17 CONSTRUCTION TIMEFRAMES

Construction will be completed within 3-5 months. Further, it is requested that the Environmental Authorisation and WML, if issued by the Competent Authority, be valid for a period of five (5) years from the date of signature.

18 SUBMISSION AND CONSIDERATION OF DOCUMENTATION BY THE COMPETENT AUTHORITY

It is to be noted that in terms of the EIA Regulations (2014), GNR 982 43(2), all State Departments that administer a law relating to a matter affecting the environment, specific to the Application, must submit comments within 30 days to the EAP. Should no comment be received within the 30 day commenting period, it will be assumed that the relevant State Department has no comment to provide.

All comments received in response to the BA Report will be attached to, summarised and responded to in a final version of the BA Report, which will be submitted to the Competent Authority, (i.e. EDTEA) for consideration in terms of issuing an Environmental Authorisation and WML.

19 UNDERTAKING

JG Afrika (Pty) Ltd hereby confirms that the information provided in this report is correct at the time of compilation and was compiled with input provided by Midlands Biogas & Fertiliser.

JG Afrika (Pty) Ltd further confirms that all comments received from Stakeholders and IAPs to-date have been included in this report. Further, a record has been created and will continue to be updated with comments received in respect of this Environmental Authorisation and WML Application. All received comments will be consolidated and incorporated into all subsequent reports, either submitted for comment to IAPs, or to the EDTEA for consideration and decision-making.

For JG Afrika (Pty) Ltd:

L. Dralle
Environmental Scientist

G. von Mayer
Senior Environmental Scientist

20 REFERENCES

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Appendix 1: CURRICULUM VITAE OF EAPS

Appendix 2: EDTEA EA & WML APPLICATION FORM

Appendix 3: EDTEA PRE-APPLICATION MEETING

Appendix 4: ENGINE GENERATOR SPECIFICATIONS

Appendix 5: SWMP

Appendix 6: QUANTITATIVE RISK ASSESSMENT

Appendix 7: ADVERTS

Appendix 8: IAP REGISTER & ORIGINAL COMMENTS

Appendix 9: IAP NOTIFICATION

Appendix 10: GEOHYDROLOGICAL ASSESSMENT

Appendix 11: ENVIRONMENTAL MANAGEMENT PROGRAMME

Appendix 12: HERITAGE IMPACT ASSESSMENT