FRESHWATER ECOLOGICAL IMPACT ASSESSMENT

PROPOSED ROBERTSON ABATTOIR COMPOST FACILITY AND FEEDLOT ON PORTION 6 OF FARM MIDDELBURG NO 10, ROBERTSON

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1. INTRODUCTION AND BACKGROUND

Eco Impact Legal Consulting (Pty) Ltd (Eco Impact) is appointed by South African Farm Assured Meat Group cc (SAFAM) to assess the impacts of the proposed construction of a compost facility and feedlot.

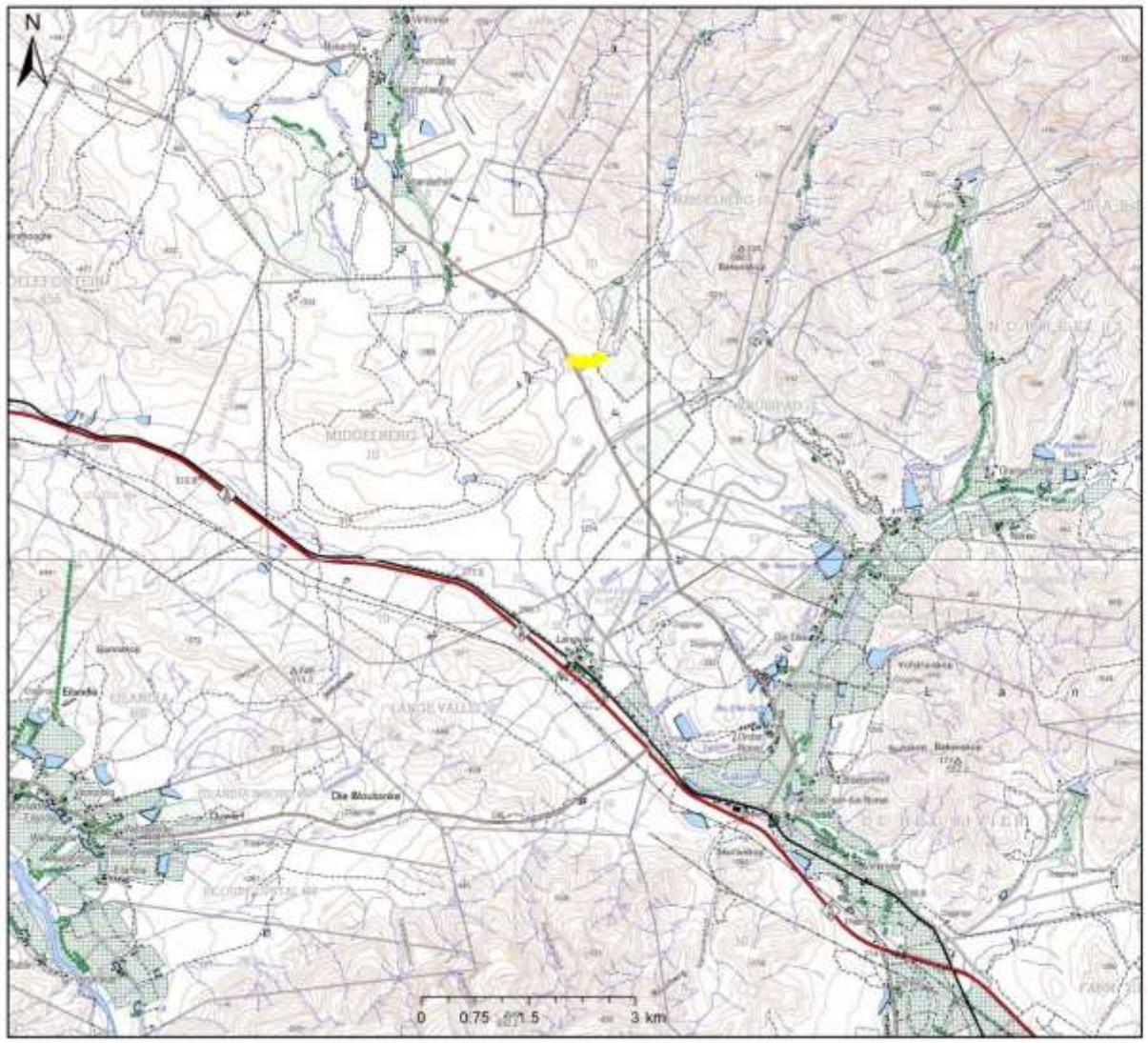
SAFAM proposes the development of the following:

- A compost facility to recycle and treat abattoir by-products and organic waste to produce compost on approximately 7.5ha on the Middelburg Farm, Robertson.

- Construction of storm water cut-off channels and collection dam to contain and store all storm water generated on site for reuse and recycling onto the compost rows as part of the treatment and compost making process.

- The proposal also includes the development of a feedlot to keep animals for commercial production on approximately 9ha of the Middelburg Farm. The planned stock levels under the canopy are 6000 to 6500 lambs at any one time depending upon site and age.

The whole site is currently zoned as Agriculture 1. The site was previously ploughed and planted with pastures and used for grazing purposes. From time to time livestock are kept on the property until they reach prime condition and slaughter weight. As such the site is completely transformed with no natural area remaining. Vast patches of bare soil are evident in site photographs and aerial images.



Locality Map

Scale: 1:72 224
Date created: February 13, 2018

Western Cape Government
Agriculture

Map 1: The 1 in 50 000 topographical map for the study area. Study area indicated by yellow line

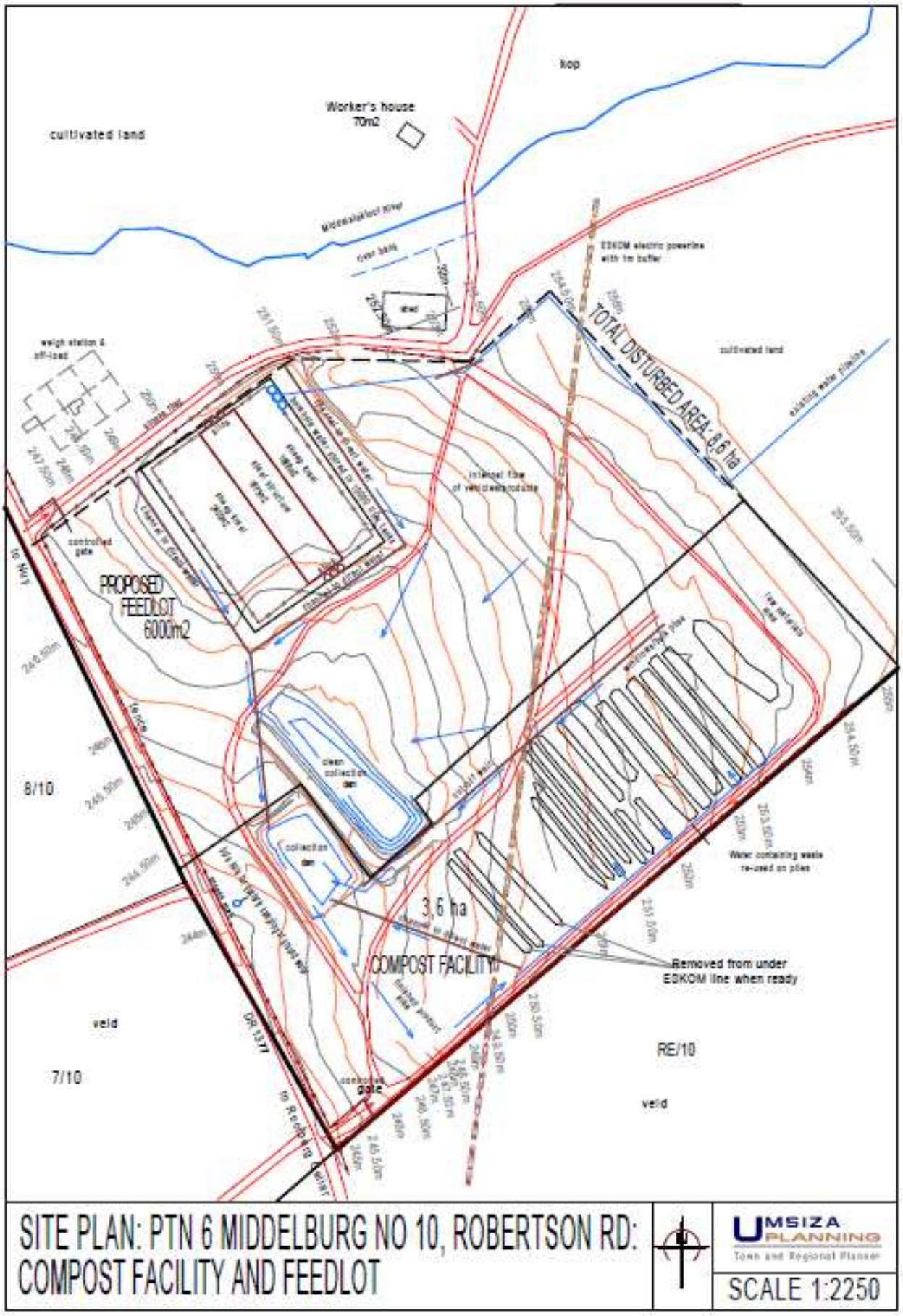


Figure 1: Site Development Plan

2. TERMS OF REFERENCE

The feedlot infrastructure that is proposed within 100m of the non-perennial water course triggers the need for this Freshwater Ecological Assessment and Water Use Authorization application.

The Terms of Reference include:

- Review available information and documentation relating to the proposed development;
- A site visit and assessment of the site;
- Determine the Present Ecological State (PES) & Ecological Importance and Sensitivity (EIS) Determine the impacts in terms of the characteristics of the aquatic ecosystems affected and associated with the proposed development;
- Describe and assess the significance of the proposed development on the aquatic ecosystems;
- Recommend mitigation measures to minimize the potential negative impacts on freshwater ecosystems;
- Determining the applicability of a General Authorisation (GA) according to the Department of Water and Sanitation (DWS) Risk Matrix,
- Preparing this report.

3. KNOWLEDGE GAPS

The main limitation of the findings presented in the current report is that they are based largely on a site visit that was undertaken when the potentially affected non-perennial river on and adjacent to the proposed site was not flowing.

Another, related limitation of the study is that the determination of the ecological importance and sensitivity of the potentially affected river systems was based largely on desktop-based information and visual observations made during the site visit, without the collection of site-based data pertaining to the biota associated with these aquatic ecosystems, particularly the presence of rare, endangered or otherwise important (e.g. highly endemic) faunal species (such as invertebrates and frogs).

Despite these limitations, the author of the current report is of the opinion that enough information was available to assess the PES and EIS of the potentially affected freshwater ecosystems with a sufficient degree of confidence for the purposes of this investigation.

4. STUDY AREA

The site is located within the H40H quaternary catchment. The primary aquatic feature on the site is a non-perennial river located adjacent to the development site, on the northern boundary. The non-perennial river is a tributary of the Vink River and feeds into the Vink River located approximately 300m west of the proposed development. Both of which are classified as Critical Biodiversity Areas (CBA's).

The study area falls into the Breede Gouritz Catchment Management Area (BGCMA), more specifically within the Upper Breede sub-Water Management Area (sub- WMA). The main river of the region is the Breede River, of which the Vink-Noree River system is a tributary. The study area falls within the Southern Folded Mountains[1], near the transition to the Western Folded Mountains Ecoregion (to west) and the Southern Coastal Belt Ecoregion (to south). More specifically, the study area forms part of the lowlands of the Langeberg

[1] Kleynhans CJ, Thirion C and Moolman J (2005). A Level I River Ecoregion classification System for South Africa, Lesotho and Swaziland. *Report No. N/0000/00/REQ0104*. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria.

Mountains, situated relatively close to the Langeberg-West Mountain Catchment conservation area. The physiographical characteristics of the Southern Folded Mountains Ecoregion, in terms of terrain morphology, are typically characterised by a diverse topography of closed hills and mountains with a moderate to high relief (slopes with a gradient of >3.69 - 5% are predominant within the Ecoregion).

The study area for the proposed feedlot and compost area is thus somewhat atypical of the Ecoregion within which it falls, being located in a relatively non-mountainous part of the landscape. The rainfall seasonality and the vegetation types that occur within the Southern Folded Mountains Ecoregion are highly variable. The climate of the study area can be referred to as a local steppe climate and classified as "BSk" (cold semi-arid climate) with little rainfall throughout the year, according to Köppen- Geiger system[2]. The subject property is located within Quaternary Catchment H40H, which is estimated to have a relatively low Mean Annual Precipitation (MAP) of 461 mm, a Mean Annual Evaporation (MAE) of 1605 mm and a Mean Annual Runoff (MAR) of 15.7 million m^3. [3]

Table 1: Key water resource information for the study area.

DESCRIPTOR	NAME/ DETAILS	NOTES
Water Management Area (WMA)	Breede Gouritz Catchment Management Area (BGCMA)	
Sub Catchment Area	Upper Breede sub-Water Management Area (sub- WMA)	
Quaternary Catchment	H40H	
Present Ecological State	D (Moderate)	
Ecological Importance and Sensitivity	Biotic – Low Habitat – Moderate Overall EIS – Low to moderate	
Water resource potentially impacted	Non-perennial tributary on site and the Vink River	Possible pollution of river system from feedlot and compost facility.
Latitude	33°43'45.56"S	
Longitude	19°44'32.67"E	
Site visit	Mr Nicolaas Hanekom	08 February 2018

5. EXPERTISE OF THE SPECIALIST

Nicolaas Hanekom is a registered Professional Natural Scientist with the South African Council for Natural Scientific Professions ("SACNASP") who holds a Masters Technologiae, Nature Conservation ("Vegetation, Ecology and Biodiversity Assessment") degree from the Cape Peninsula University of Technology. Nicolaas is certified in terms of section 20(3)(a) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003), as a Professional Natural Scientist (Ecological Science) Registration Number: 4008274/11. He has 26 years of ecology experience, working for Free State Nature Conservation and Western Cape departments of environmental affairs (CapeNature) and since 2011 was the author of many ecological (terrestrial and freshwater) specialist assessments and reports.

6. AIMS AND OBJECTIVES

The purpose of the National Water Act, 1998 (Act No. 36 of 1998), (NWA) is to provide a

[2] Schulze RE (ed) (2006). South African Atlas of Climatology and Agrohydrology. *WRC Report No. 1489/1/06*. Water Research Commission, Pretoria.
[3] Water Research Commission [WRC] (2008). Water Resources of South Africa, 2005 (WR2005). WRC Project No. K5/1491. Water Research Commission, Pretoria.

framework for the equitable allocation and sustainable management of water resources. Both surface and groundwater sources are redefined by the Act as national resources which cannot be owned by any individual, and rights to which are not automatically coupled to land rights, but for which prospective users must apply for authorisation and register as users.

The NWA also provides for measures to prevent, control and remedy the pollution of surface and groundwater sources. The Act aims to regulate the use of water and activities (as defined in Part 4, Section 21 of the NWA), which may impact on water resources through the categorisation of 'listed water uses' encompassing water abstraction and flow attenuation within catchments as well as the potential contamination of water resources, where the Department of Water and Sanitation (DWS) is the administering body in this regard.

Defined water use activities require the approval of DWS or the authorized Water Catchment Management Agency in the form of a General Authorisation or Water Use Licence authorisation. There are restrictions on the extent and scale of listed activities for which General Authorisations apply. Section 22(3) of the National Water Act allows for a responsible authority to dispense with the requirement for a Water Use Licence if it is satisfied that the purpose of the Act will be met by the grant of a licence, permit or authorisation under any other law.

According to the preamble to Part 6 of the NWA, "*This Part established a procedure to enable a responsible authority, after public consultation, to permit the use of water by publishing general authorisations in the Gazette…" "The use of water under a general authorisation does not require a licence until the general authorisation is revoked, in which case licensing will be necessary…*"

The General Authorisations for Section 21 (c) and (i) water uses (impeding or diverting flow or changing the bed, banks or characteristics of a watercourse) as defined under the NWA have recently been revised (Government Notice R509 of 2016). The proposed works within or adjacent to the wetland areas and river channels are likely to change the characteristics of the associated freshwater ecosystems and may therefore require authorization. Determining if a water use licence is required for these water uses is now associated with the risk of degrading the ecological status of a watercourse. A low risk of impact could be authorised in terms of a General Authorisations (GA).

The objective of this report is to assess the impacts and risks of the proposed activity on the freshwater ecological features identified in order for the department to take an informed decision when considering and authorizing the water use.

7. METHODOLOGY

7.1. Wetland and Freshwater Ecological Identification and Mapping

Input into this report was informed by a combination of desktop assessments of existing freshwater ecosystem information for the study area and catchment, as well as by a more detailed assessment of the freshwater features at the site.

The site was visited on 08 February 2018. During the field visit, the characterisation and integrity assessments of the ecological features were undertaken. Mapping of the features was undertaken using Google Maps with GPS tracker. The features were mapped while doing the field survey. The SANBI Biodiversity GIS website was also consulted to identify any constraints in terms of fine-scale biodiversity conservation mapping as well as possible freshwater features mapped in the Freshwater Ecosystem Priority Areas maps. This information/data was used to inform the resource protection related recommendations.

7.2. Wetland and Freshwater Ecological Features Delineation

The wetland delineation process uses four wetland indicators to provide an estimate of the extent of a wetland. They are: landscape position (must be flat or depressed), vegetation (must be hydrophilic), soil form (must compliment an existing wetland type) and soil wetness (water table must be within 50cm of profile).

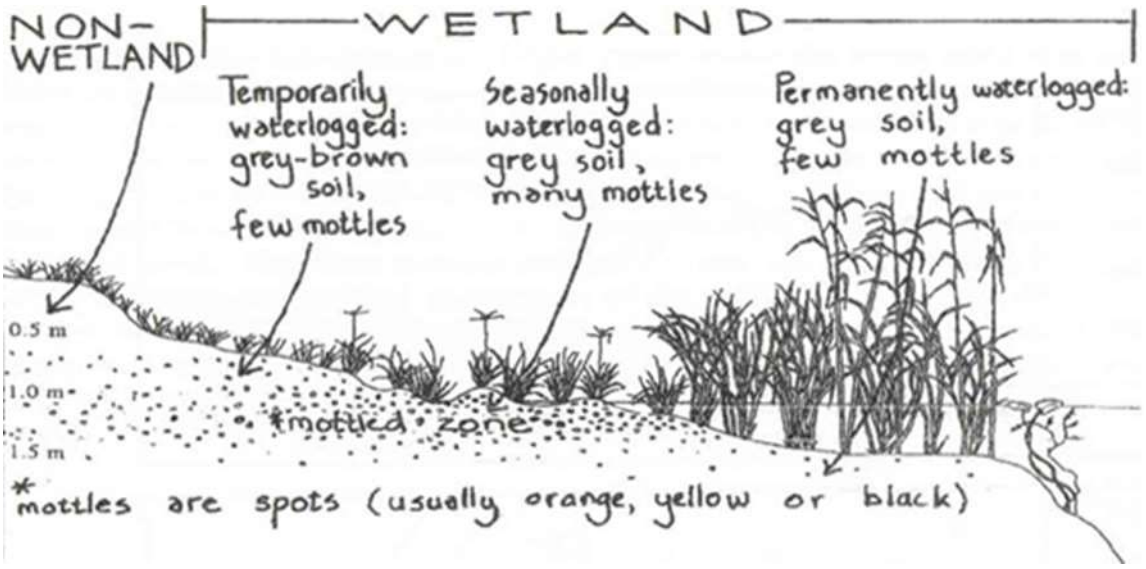


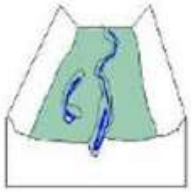
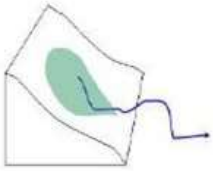
Figure 2: Wetland illustration

The guideline document, "A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas", as published by DWAF (2005) was followed for the delineation of the wetland areas[4]. According to the delineation procedure, the wetlands were delineated by considering the following wetland indicators: terrain unit indicator; soil form indicator; soil wetness indicator; and vegetation indicator.

Table 2: Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa

Hydro-geomorphic types	Description	Source of water maintaining wetland [1]	
		Surface	Sub-surface
Floodplain 	Valley bottom areas with a well-defined stream channel gently sloped and characterized by floodplain features and the alluvial transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel and from adjacent slopes.	***	*

[4] Department of Water Affairs and Forestry. (2005b). *A practical field procedure for identification and delineation of wetland and riparian areas.* DWAF, Pretoria.

Valley bottom with a channel 	Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel and from adjacent slopes.	***	*/ ***
Valley bottom without a channel 	Valley bottom areas with no clearly defined stream channel usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and from adjacent slopes.	***	*/ ***
Hillslope seepage linked to stream channel 	Slopes on hillsides, characterized by the colluvial movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.	*	***
Isolated hillslope seepage 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes Pans) 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

[1] Precipitation is an important water source and evapotranspiration is important.
Water source: * Contribution usually small
*** Contribution usually large
*/ *** Contribution may be small or important depending on the local circumstances

7.3. Wetland and Freshwater Ecological Features Functional Assessment

The functional wetland assessment technique, WET-EcoServices, developed by Kotze

(2007)[5] was used to provide an indication of the ecological benefits and services provided by delineated wetland habitat. This technique consists of assessing a combination of desktop and infield criteria in order to identify the importance and level of functioning of the wetland units within the landscape.

Wetlands as defined by the National Water Act (Act 36 of 1998) "*are a portion of land that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil*." Wetland delineation relates to the determination and marking of the boundary of a wetland to the outer edge of the temporary zone of wetness.

The wetland assessment consisted of the following wetland assessment components: Wetland delineation; wetland classification; wetland integrity; wetland ecological importance and sensitivity; and ecosystem services supplied by the wetland.

7.4. Determining the Ecological Integrity of the Wetlands and Freshwater Ecological Features

The evaluation of Habitat (ecological) integrity provides a measure of the degree to which a river or stream has been modified from its natural state. The methodology (DWAF, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system (Table 3). These disturbances include both abiotic and biotic factors, which are regarded as the primary causes of degradation of a river or stream. The severity of each impact is ranked using a scale from 0 (no impact) to 25 (critical impact). The Habitat Integrity Assessment is based on assessment of the impacts of two components of the river, the riparian zone and the instream habitat. The total scores for the instream and riparian zone components are then used to place the habitat integrity of both in a specific habitat category.

Table 3: Intermediate Habitat Integrity categories (from Kleynhans, 1996)

Category	Description	Score (% of total)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with almost complete loss of natural habitat and biota. In worst instances basic ecosystem functions have been destroyed and changes are irreversible.	0-19

[5] Kotze, D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.S., and Collins, N.B., 2007. Wet-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands. WRC Report No TT 339/09, Water Research Commission, Pretoria.

7.5. Determining the Present Ecological State of Wetlands and Freshwater Ecological Features

The Present Ecological Status (PES) Method (DWAF 2005) was used to establish the integrity of the wetland and was based on the modified Habitat Integrity approach developed by Kleynhans (DWAF, 1999; Dickens *et al*, 2003[6]). Table 4 shows the criteria and results from the assessment of the habitat integrity of the wetland. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland.

Table 4: Habitat integrity assessment criteria for palustrine wetlands (Dickens *et al*, 2003)

Criteria/Attributes	Relevance
Hydrologic	
Flow Modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floralistic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent Inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water Quality	
Water Quality Modification	From point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment Load Modification	Reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rate of erosion, accretion or infilling of wetlands.
Hydraulic/Geomorphic	
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat directly.
Biota	
Terrestrial Encroachment	Desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
Indigenous Veg Removal	Destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive Plant Encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien Fauna	Presence of alien fauna affecting faunal community structure.
Over utilisation	Overgrazing, over fishing, etc.

[6] DICKENS C, KOTZE DC, MASHIGO S, MACKAY H and GRAHAM, M (2003) Guidelines for Integrating the Protection, Conservation and Management of Wetlands into Catchment Management Planning. Water Research Commission, Pretoria, Report TT 220/03.

Table 5: Relation between scores given and ecological categories Scoring

Guidelines Per Attribute*	Interpretation of Mean* of Scores for all Attributes: Rating of Present Ecological Status Category (PESC)
Natural, unmodified - score=5.	Within general acceptable range CATEGORY A >4; Unmodified, or approximates natural condition.
Largely natural - score=4.	CATEGORY B >3 and <4; Largely natural with few modifications, but with some loss of natural habitats.
Moderately modified- score=3.	CATEGORY C >2 and <3; moderately modified, but with some loss of natural habitats.
Largely modified - score=2.	CATEGORY D <2; largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.
	OUTSIDE GENERALLY ACCEPTABLE RANGE
Seriously modified - rating=1.	CATEGORY E >0 and <2; seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
Critically modified - rating=0.	CLASS F 0; critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

7.6. Determining the Ecological Importance and Sensitivity of Wetlands and Freshwater Ecological Features

The ecological importance and sensitivity assessment was conducted according to the guidelines as developed by DWAF (1999). The EIS Assessment considers a number of biotic and habitat determinants surmised to indicate either importance or sensitivity.

Table 6: Definition of the four-point scale used to assess biotic and habitat determinants presumed to indicate either importance or sensitivity

Four point scale	Definition
1	One species/taxon judged as rare or endangered at a local scale.
2	More than one species/taxon judged to be rare or endangered on a local scale.
3	One or more species/taxon judged to be rare or endangered on a Provincial/regional scale.
4	One or more species/taxon judged as rare or endangered on a National scale (i.e. SA Red Data Books)

Table 7: Ecological importance and sensitivity categories (DWAF, 1999)

EISC	General description	Range of median
Very high	Quaternaries/delineations that are considered to be unique on a national and international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use.	>3-4

High	Quaternaries/delineations that are considered to be unique on a national scale based on their biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be sensitive to flow modifications but in some cases may have substantial capacity for use.	>2-≤3
Moderate	Quaternaries/delineations that are considered to be unique on a provincial or local scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are not usually very sensitive to flow modifications and often have substantial capacity for use.	>1-≤2
Low/marginal	Quaternaries/delineations which are not unique on any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

7.7. Ecological Classification and Description

The wetlands were subsequently classified according to their hydro-geomorphic determinants based on a classification system devised by Kotze *et al* (2004) and SANBI (2009). Notes were made on the levels of degradation in the wetlands based on field experience and a general understanding of the types of systems present.

8. RESULTS

8.1. Wetland and Freshwater Ecological Features Delineation

During the site visit, the freshwater ecosystems that were identified were classified into relevant types according to the classification system for inland aquatic ecosystems in South Africa (Ollis *et al.* 2013)[7]. The approximate extent of wetlands was delineated following standard field-based procedures for the identification and delineation of wetlands (after DWAF 2005). The definition of "wetland" adopted for this investigation was that of the National Water Act (Act No. 36 of 1998), whereby a wetland is defined as "*land which is transitional between terrestrial and aquatic systems, where the water table is usually at, or near the surface, or the land is periodically covered with shallow water and which land in normal circumstances supports, or would support, vegetation adapted to life in saturated soil*."

Following this definition and the standard wetland delineation protocols, no wetlands were identified on or adjacent to the proposed feedlot and compost sites. However, a non-perennial river is situated on the northern edge of the proposed impacted area.

8.2. Wetland and Freshwater Ecological Features Unit Identification

A non-perennial river is situated on the northern edge of the proposed site. This river is a tributary of the Vink River. The closest point from the development to the river bank is approximately 44m and the widest 109m. During the site visit, visual observations were made of the potentially affected river systems. Particular note was made of existing impacts to the integrity of the instream and riparian habitat provided by these systems.

[7] Ollis DJ, Snaddon CD, Job NM and Mbona N (2013). Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. *SANBI Biodiversity Series 22*. South African National Biodiversity Institute, Pretoria.

8.3. Wetland and Freshwater Ecological Features Unit Setting

Rivers in this longitudinal zone are typically characterised by a moderately steep, cobble-bed or mixed bedrock-cobble bed channel, with a narrow floodplain of sand, gravel or cobble often present adjacent to the river channel. It is presumed that these drainage lines have a naturally ephemeral (episodic) flow regime, only flowing for a short time after relatively major rainfall events.

The study area falls within the Southern Folded Mountains Ecoregion (after Kleynhans *et al*. 2005), near the transition to the Western Folded Mountains Ecoregion (to west) and the Southern Coastal Belt Ecoregion (to south). More specifically, the study area forms part of the lowlands of the Langeberg Mountains, situated relatively close to the Langeberg-West Mountain Catchment conservation area. The physiographical characteristics of the Southern Folded Mountains Ecoregion, in terms of terrain morphology, are typically characterised by a diverse topography of closed hills and mountains with a moderate to high relief (slopes with a gradient of >5% are predominant within the Ecoregion).

Photo 1: View of the upper reaches and catchment area of the non-perennial river.

The study area for the proposed development is thus somewhat atypical of the Ecoregion within which it falls, being located in a relatively non-mountainous part of the landscape. The rainfall seasonality and the vegetation types that occur within the Southern Folded Mountains Ecoregion are highly variable.

8.4. Wetland Soils

The soils associated with the river are classified as alluvial bottomlands, cobble-bed or mixed bedrock-cobble bed channel, with a narrow floodplain of sand, gravel or cobble often present adjacent to the river channel.

Photo 2: View of the soil profile of the non-perennial river next to the proposed feedlot and compost area.

Photo 3: View of the soil profile of the non-perennial river next to the proposed feedlot and compost area.

8.5. Description of Wetland Type and Freshwater Ecological Features

A non-perennial river which is a tributary of the Vink River was identified in the impacted area. This non-perennial river originates in the Langeberg Mountains at an elevation of approximately 700m above mean sea level east of the site and flows in a westerly direction for approximately 5.5km before it reaches the site and meets up with the Vink River approximately 300m west of the site. Two earthen instream storage dams were constructed in the river and 7 roads cross the river before it meets the impacted area.

Photo 4: View of one of the roads crossing the non-perennial river next to the proposed feedlot and compost area.

8.6. General Functional Description of Wetland Types and Freshwater Ecological Features

In order to assess the condition and ecological importance and sensitivity of the study area, it is necessary to understand how the river might have appeared under un-impacted conditions. This is achieved through classifying the river according to its ecological characteristics, in order that it can be compared to ecologically similar rivers. River typing or classification involves the hierarchical grouping of rivers into ecologically similar units so that inter- and intra-river variation in factors that influence water chemistry, channel type, substratum composition and hydrology are best accounted for. Any comparative assessment of river condition should only be done between rivers that share similar physical and biological characteristics under natural conditions.

The potentially affected river reach is characterised by a fairly incised single channel, approximately 10 to 20m wide, which has a bed comprising mostly cobbles and sand.

Photo 5: View of the non-perennial river next to the proposed feedlot and compost area.

Photo 6: View of the non-perennial river next to the proposed feedlot and compost area.

Photo 7: View of the non-perennial river next to the proposed feedlot and compost area.

Photo 8: View of the non-perennial river next to the proposed feedlot and compost area.

Vachellia karoo is common and the dominant species in the river channel and valleys followed by *Searsia longispina*.

On the northern bank of the river, adjacent to the main channel of the potentially affected reach of the river, there is a floodplain area approximately 30m in width. This floodplain area is dominated by *Galenia africana*. From the relatively dense growth of shrubs within the floodplain, it is evident that the floodplain does not get inundated nearly as frequently as it would have under natural conditions. The *Galenia africana* is also an indicator species of heavy impact and disturbance most likely as a result of animal grazing and trampling.

Photo 9: View of the floodplain on the northern bank of the non-perennial river next to the proposed feedlot and compost area.

On the southern bank of the affected river reach, the river is characterised by a steep bank and an elevated area that creates a berm which will result in the water that is flowing in the river being confined to the channel and if it floods the water will overflow towards the north into the flood plain. All storm and rain water from the impacted areas flows away from the river as a result of this elevated area. No indigenous vegetation exists between the river bank and the feedlot and compost area.

Photo 10: View of the area between the river bank and the feedlot and compost area on the southern bank of the non-perennial river.

Photo 11: View of the area between the river bank and the feedlot and compost area on the southern bank of the non-perennial river.

8.7. Wetland and Freshwater Ecological Features Ecological Functional Assessment

To ascertain the conservation importance of freshwater ecosystems in the area, GIS-based desktop mapping was used to place the study site in the context of existing conservation planning products that cover the region. According to the NFEPA project[8] and its map products[9], there are no Freshwater Ecosystem Priority Areas (FEPAs) or Fish Sanctuary

[8] Driver A, Nel JL, Snaddon K, Murray K, Roux DJ, Hill L, Swartz ER, Manuel J and Funke N (2011). Implementation manual for Freshwater Ecosystem Priority Areas. *WRC Report No. 1801/1/11*. Water Research Commission, Pretoria.

[9] Nel JL, Driver A, Strydom WF, Maherry A, Petersen C, Hill L, Roux DJ, Nienaber S, Van Deventer H, Swartz E and Smith-Adao LB (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources. *WRC Report No. TT 500/11*. Water Research Commission, Pretoria.

Areas (FSAs) in the study area but a Floodplain Wetland is shown to be present along the length of the non-perennial river bordering the feedlot and compost site and the Vink River.

According to the Western Cape Biodiversity Spatial Plan 2017 the area identified for the feedlot and compost site has been identified as a Terrestrial Critical Biodiversity Area (CBA). This is however not consistent with the existing state of the site, which has been completely transformed as a result of past and existing activities**.**

The non-perennial river was identified as an aquatic CBA (Category 2: CBA: Wetland).

CBA definition: Areas in a natural condition that is required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.

CBA Objective: Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.

8.8. The Present Ecological Status (PES) Assessment of the Remaining Wetland and Freshwater Ecological Features Areas

The evaluation of Habitat Integrity (HI) provides a measure of the degree to which a river has been modified from its natural state. The methodology (DWAF, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system. These disturbances include both abiotic and biotic factors, which are regarded as the primary causes of degradation of a river. The severity of each impact is ranked from 0 (no impact) to 25 (critical impact). The Habitat Integrity Assessment is based on assessment of the impacts of two components of the river, the riparian zone and the instream habitat (Table 8). Assessments are made separately for both components, but data for the riparian zone are interpreted primarily in terms of the potential impact on the instream component.

The estimated impact of each criterion is calculated as follows:

Rating for the criterion/maximum value (25) x weight (percent)

The results of the PES assessment that was completed for the potentially affected reach of the river are presented in **Table 8**. This rapid assessment was conducted following the Habitat Integrity assessment method for river ecosystems described above. The overall results were that the relevant reach of the river is in a poor ecological condition, with a PES Category of D ("largely modified") for both the instream and riparian components of the river systems.

Table 8: Index of Habitat Integrity Assessment results and criteria assessed in the affected watercourse

Instream Criteria	Score	Riparian Zone Criteria	Score
Water Abstraction	15	Water Abstraction	12
Flow Modification	20	Inundation	5
Bed Modification	12	Flow modification	16
Channel Modification	20	Water Quality	8
Water Quality	10	Indigenous vegetation removal	10
Inundation	5	Exotic vegetation encroachment	10
Exotic Macrophytes	5	Bank Erosion	10
Exotic Fauna	0	Channel Modification	10

Solid waste disposal	0		
Integrity Class	PES– 58% **(D)**	Integrity Class	PES– 51% **(D)**

The main impacts on the present ecological condition of the river are channel and flow modifications, together with water abstraction for agricultural use throughout the catchment. In its natural state, the relevant reach of the river would have consisted of a complex channel form, with multiple braided channels that would have shifted around in response to flooding events (Reinecke *et al*. 2014)[10]. Through agricultural development and water abstraction from the river, the river now has a single-channel form and its flow regime has become non-perennial. This has changed the sediment transport and deposition patterns within the river, affecting the substrate characteristics of the bed and decreasing the ability of the channel to convey floodwaters.

8.9. The Ecological Importance and Sensitivity (EIS) Assessment of the Remaining Wetland and Freshwater Ecological Features Areas

In terms of its EIS, the potentially affected reach of the river was rated to be of low/marginal EIS for biotic criteria, but with a low level of confidence due to the absence of biotic data, and of moderate EIS for habitat criteria. The overall EIS rating for the potentially affected reach of the river was that this system is of low-to-moderate ecological importance and sensitivity. Despite the low-to-moderate EIS of the river, it is important to bear in mind that this river forms an important ecological corridor and is a major tributary of the Vink River, which is ecologically important to the Breede River. In addition, the floodplain along the river has been recognised as an Aquatic CBA in the WCBPF and the C.A.P.E. Fine Scale Planning initiative for the Upper Breede Valley. This elevates the conservation importance of the river corridor and implies that it should be protected from any further degradation.

Table 9: Results of the EIS assessment for the affected watercourse

Biotic Determinants	**Score**
Rare and endangered biota	0
Unique biota	0
Intolerant biota	1
Species/taxon richness	1
Aquatic Habitat Determinants	
Diversity of aquatic habitat types of features	1.5
Refuge value and habitat type	2
Sensitivity of habitat to flow changes	2
Sensitivity of flow related water quality changes	1.5
Migration route/corridor for instream and riparian biota	3
National parks, wilderness areas, Nature Reserves, Natural Heritage sites, PNEs	3
EIS Category	**Low-Moderate EIS**

9. IMPACT ASSESSMENT DISCUSSIONS

The assessment of the potential impacts on freshwater ecosystems that could result from the proposed activities has been summarised and a discussion of the potential cumulative impacts is included. No stand-alone assessment of the "no-go option" has been included.

[10] Reinecke K, Rountree M and Crowther J (2014). Noree/Vink River Maintenance Management Plan. Prepared by Southern Waters Ecological Research and Consulting cc in association with Fluvius Environmental Consultants and CCA Environmental, June 2014.

Instead, in line with DEA&DP's (2013) Guideline for Alternatives, the current *status quo* of the sites associated with the "no-go option" has been used as the baseline against which potential impacts were assessed. If the "no-go option" was to be followed and no activities were to be carried out on the proposed sites, it is assumed that the rivers assessed would remain in their present ecological state.

The non-perennial river on the northern boundary and the Vink River located approximately 300m west of the proposed development could possibly be impacted by the proposed feedlot and compost facility.

On the southern bank of the affected river reach, the river is characterised by a steep bank and an elevated area that creates a berm which will result in the water that is flowing in the river being confined to the channel and if it floods the water will overflow towards the north into the flood plain away from the compost and feedlot area. All storm and rain water from the impacted areas flow away from the river as a result of this elevated area. No indigenous vegetation exists between the river bank and the feedlot and compost site. The natural storm water flow is however towards the west and Vink River.

IMPACTS TO THE RIVER

The assessment of the potential impacts on freshwater ecosystems that could result from the proposed activities has been summarised below.

Pollution of the river system due to the possible risk of contaminated storm water from the feedlot and compost facilities entering the river systems generally result in significant impacts and degradation of the freshwater ecological system and functioning.

The encroachment of infrastructure or development activities into a freshwater ecosystem generally results in the permanent loss of the portion of the freshwater ecosystem that is encroached into. This inevitably leads to a number of other, knock-on impacts on the freshwater ecosystem, as a result of the lack of an adequate buffer area between the proposed development area and the remaining portion of the ecosystem.

Placing infrastructure or undertaking development activities close to freshwater ecosystems, without necessarily encroaching directly into the freshwater ecosystems themselves, typically also results in a number of negative impacts on the freshwater ecosystems. As such, it is common practice to recommend "no-go" buffer areas adjacent to the edge of a freshwater ecosystem within which very limited or no development activity should be permitted, to ensure the protection of the freshwater ecosystems. It is important to note that buffer areas, on their own, do not necessarily ensure the protection of a freshwater ecosystem and that they should be used in conjunction with other mitigation measures.

For the current project, as explained previously, the approximate width of the buffer areas required for the protection of the river systems were initially determined using the river component of the "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries in South Africa" (Macfarlane *et al*. 2014)[11], also known as the "WRC Buffer Tool". Using the WRC Buffer tool, the treats of the proposed activity to the freshwater ecological systems is increased nutrient inputs, increased input of toxic organic and heavy metal contaminants, and pathogen inputs.

Buffer zones play an important role in:
Nutrient removal: Riparian vegetation and vegetation in terrestrial buffer zones may

[11] Macfarlane DM, Bredin IP, Adams JB, Zungu MM, Bate GC and Dickens CWS (2014). Preliminary guideline for the determination of buffer zones for rivers, wetlands and estuaries. Final Consolidated Report. *WRC Report No TT 610/14.* Water Research Commission, Pretoria.

significantly reduce the amount of nutrients (N & P), entering a water body reducing the potential for excessive outbreaks of microalgae that can have an adverse effect on both freshwater and estuarine environments.

Removal of pathogens: By slowing water contaminated with faeces, buffer zones encourage deposition of pathogens, which soon die when exposed to the elements.

Despite the range of functions potentially provided by buffer zones**, buffer zones are far from a "silver bullet" that addresses all water resource related problems** (Macfarlane *et al*. 2014). Indeed, buffers can do little to address some impacts such as hydrological changes caused by stream flow reduction activities or changes in flow brought about by abstractions or upstream impoundments. Buffer zones are also not the appropriate tool for militating against point-source discharges (e.g. sewage outflows), which can be more effectively managed by targeting these areas through specific source-directed controls. Contamination or use of groundwater is also not well addressed by buffer zones and requires complementary approaches such as controlling activities in sensitive groundwater zones.

The role that buffers can play must therefore be well understood when applying these guidelines. Despite clear limitations, buffer zones are well suited to perform functions such as sediment trapping and nutrient retention which can significantly reduce the impact of activities taking place adjacent to water resources. **Buffer zones are therefore proposed as a standard mitigation measure to reduce impacts of land uses / activities planned adjacent to water resources.**

These must however be considered in conjunction with other mitigation measures which may be required to address specific impacts for which buffer zones are not well suited to address. The modified fixed-width approach was regarded as most appropriate for the South African context. In this approach, a matrix of factors is typically used to categorize wetlands and / land uses with category specific standard buffer widths being applied to the resource. These widths may however be modified based on relevant on-site factors where more detailed information is available. As a minimum, this requires the maintenance of the water resource, including any riparian habitat.

Delineation and protection of water resources, as defined in South African legislation, including riparian habitat is therefore regarded as mandatory to ensure no direct impacts to these areas. The method developed is therefore designed to ensure that such areas are identified and mapped and included within any recommended setback area. The need for additional management measures, including potential additional management buffers to safeguard intact riparian habitat is also addressed.

The desktop buffer that was generated by the WRC Buffer Tool for the protection of drainage lines within the proposed impacted area itself was a modelled buffer width of 55m for the construction phase and 205m for the operational phase. This buffer width was then refined by applying the site based components of the WRC Buffer Tool, through which a site-specific recommended buffer width of 26m for the construction phase and 100m for the operational phase. The 100m buffer area is to manage the risk of nutrient inputs as a result of the bordering feedlot into the freshwater ecosystem. However, there is an elevated area between the feedlot infrastructure and the non-perennial river and the topography and slope of storm water flow is away from the non-perennial river towards the compost facility.

Figure 3: View indicating the elevation profile away from the non-perennial river.

Nutrients from the feedlot will therefore not enter the river and this buffer can be reduced significantly as a result of that. The WRC Tool however does not make provision for a topographical elevation and flow criteria away from the river as part of the calculation.

The buffer between the feedlot and the non-perennial river is 44m. The current desktop buffer of 30m set in the biodiversity planning is therefore a sufficient and appropriate buffer area. Additional mitigation measures to be implemented will further reduce the risk of the possible impacts on the river systems during operations.

The following mitigation measures should be implemented, in addition to the recommended buffer areas, to reduce the risks to the river systems from the proposed operations:

- "Dirty" runoff water that has been in contact with the feedlot and compost area should be kept separate from the "clean" (natural storm water) runoff by means of diversion berms, channels and collection ponds. The clean natural runoff water should be routed around the feedlot and compost facility.
- No stockpiles (manure or any other animal products) should be placed within the recommended “no-go” and buffer area.

Cumulatively, the impacts of the activities undertaken is of a low significance and largely just requires some rehabilitation of the disturbed areas and longer term monitoring and control of the growth of alien invasive plants.

10. CONCLUSIONS AND RECOMMENDATIONS

Following this definition and the standard wetland delineation protocols, no wetlands were identified on or adjacent to the proposed feedlot and compost sites. However, a non-perennial river is situated on the northern edge of the proposed impacted area.

The study area for the proposed development is thus somewhat atypical of the Ecoregion within which it falls, being located in a relatively non-mountainous part of the landscape. The rainfall seasonality and the vegetation types that occur within the Southern Folded Mountains Ecoregion are highly variable. The potentially affected river reach is characterised by a fairly incised single channel, approximately 10 to 20m wide, which has a bed comprising mostly cobbles and sand. *Vachellia karoo* is common and the dominant species

in the river channel and valleys.

On the northern bank of the river, adjacent to the main channel of the potentially affected reach of the river, there is a floodplain area of approximately 30m in width. This floodplain area is dominated by *Galenia africana*. From the relatively dense growth of shrubs within the floodplain, it is evident that the floodplain does not get inundated nearly as frequently as it would have under natural conditions. The *Galenia africana* is also an indicator species of heavy impact and disturbance most likely as a result of animal grazing and trampling.

On the southern bank of the affected river reach, the river is characterised by a steep bank and an elevated area that creates a berm which will result in the water that is flowing in the river being confined to the channel and if it floods the water will overflow towards the north into the flood plain. All storm and rain water from the impacted areas flow away from the river as a result of this elevated area. No indigenous vegetation exists between the river bank and the feedlot and compost facility.

The overall results were that the relevant reach of the river is in a poor ecological condition, with a PES Category of D ("largely modified") for both the instream and riparian components of the river systems.

In terms of its EIS, the potentially affected reach of the river was rated to be of low/marginal EIS for biotic criteria, but with a low level of confidence due to the absence of biotic data, and of moderate EIS for habitat criteria. The overall EIS rating for the potentially affected reach of the river was that this system is of low-to-moderate ecological importance and sensitivity. Despite the low-to-moderate EIS of the river, it is important to bear in mind that this river forms an important ecological corridor and is a major tributary of the Vink River, which is ecologically important to the Breede River. In addition, the floodplain along the river has been recognised as an Aquatic CBA in the WCBPF and the C.A.P.E. Fine Scale Planning initiative for the Upper Breede Valley. This elevates the conservation importance of the river corridor and implies that it should be protected from any further degradation.

Pollution of the river system due to the possible risk of contaminated storm water from the feedlot and compost facilities entering the river systems generally result in significant impacts and degradation of the freshwater ecological system and functioning.

In the light of the results generated through the application of the WRC Buffer Tool (Macfarlane *et al*. 2014) to the drainage line within the proposed impacted area, the retention of a buffer area of at least 32m in width along the sides of the drainage line is considered to be adequate if the above-mentioned mitigation measures for reducing risk as a result of the operational phase are implemented.

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APPENDIX A: ABBREVIATED CURRICULUM VITAE AND DECLARATION OF INDEPENDENCE OF FRESHWATER SPECIALIST

BACKGROUND AND QUALIFICATIONS OF SPECIALIST CONSULTANT

Full Name: Nicolaas Hanekom
Year of Birth: 1967
Nationality: South African
Profession: Environmental Scientist and Environmental Assessment Practitioner
Years in Profession: Since 1989

This Freshwater Impact Assessment was conducted by Nicolaas Hanekom who has 26 years' experience working as an ecologist in the field of nature conservation. He has extensive field experience, knowledge of freshwater ecology, knows the region in which he is working and exercises sound and unbiased scientific and professional judgment. He has received training on the basics of freshwater ecosystems impact assessment during his career in nature conservation. He is a qualified Environmental Assessment Practitioner who holds a M. Tech, Nature Conservation from the Cape Peninsula University of Technology and a registered Professional Natural Scientist (Ecologist) with the South African Council for Natural Scientific Professions ("SACNASP").

Summary of Experience:

- Assistance Reserve Manage at Gariep Dam Nature Reserve (1993-1998)
- Reserve Manager, Conservation Services Manager for Western Cape Nature Conservation Board (1998-2001)
- Part time external Lecturer at Cape Peninsula University of Technology (2003-2005)
- Director: Environmental Management at Cape Lowlands Environmental Services (2006-2010)
- Environmental Impact Assessment Practitioner at Eco Impact (Pty) Ltd (2010 to date)
- Safety Health & Environmental System consulting

Mr Hanekom meets the legal requirements to act as a specialist on this project in terms of Regulation 13 of the Environmental Impact Assessment Regulations, 2014 that took effect on 8 December 2014, which regulates the general requirements for Environmental Assessment Practitioners ("EAP"s) and specialists. The regulation states that:

An EAP and a specialist, appointed in terms of regulation 12(1) or 12(2), must –

(1)(a) be independent;
(b) have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity;
(c) ensure compliance with these Regulations;
(d) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
(e) take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; and
(f) disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-
(i) any decision to be taken with respect to the application by the competent authority in terms of these Regulations; or
(ii) the objectivity of any report, plan or document to be prepared by the EAP or specialist, in terms of these Regulations for submission to the competent authority; unless access to that information is protected by law, in which case it must be indicated that such protected information exists and is only provided to the competent authority.

(2) In the event where the EAP or specialist does not comply with sub regulation (1)
(a), the proponent or applicant must, prior to conducting public participation as contemplated in chapter 5 of these Regulations, appoint another EAP or specialist to externally review all work undertaken by the EAP or specialist, at the applicant's cost.

THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Nicolaas Willem Hanekom, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of NEMA, the Environmental Impact Assessment Regulations, 2014.

Signature of the specialist

Eco Impact Legal Consulting (Pty) Ltd
Name of company

15 February 2018
Date