

**APPENDIX D:  
RISK ASSESSMENT MATRIX REPORT**

# Wilmar Vegetable Oil Pipeline, KwaZulu-Natal Province

## DWS Risk Assessment Matrix (RAM) Report

December 2019

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## PROJECT DETAILS

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<b>Title</b>	:	Risk Assessment Report for the proposed development of the Wilmar vegetable oil pipeline, Kwa-Zulu Natal Province.
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<b>Client</b>	:	Wilmar Oils Processing (Pty) Ltd Mr Aidan Dowdle
<b>Report Revision</b>	:	Revision 2
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## SPECIALIST CONTACT DETAILS AND DECLARATION OF INTEREST

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I, Gideon Raath, declare that –

- » I act as the independent specialist in this application.
- » I will 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 applicant.
- » I declare that there are no circumstances that may compromise my objectivity in performing such work.
- » I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity.
- » I will comply with the Act, Regulations and all other applicable legislation.
- » I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- » I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.
- » All the particulars furnished by me in this form are true and correct.
- » I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the Act.

Gideon Raath

\_\_\_\_\_  
Name

December 2019

\_\_\_\_\_  
Date



\_\_\_\_\_  
Signature

Savannah Environmental Pty Ltd  
\_\_\_\_\_  
Name of Company

## SHORT SUMMARY OF SPECIALIST EXPERTISE

Gideon holds an MSc (Geography and Environmental Management; SU), a BSc Honours (Ecology and Environmental Studies - Cum laude; Wits) and a BSc (Geography and Environmental Management; UJ). His MSc thesis focused on the hydrological impact on the spatial distribution of invasive Eucalyptus trees along the Breede River, while his honours thesis evaluated ethnobotanical relationships around the Rio Tinto copper mine in Phalaborwa. Most recently he has worked as an Environmental Consultant at EOH Coastal and Environmental Services (EOH CES), conducting environmental authorisations applications (NWA, NEMA, MPRDA), Public Participation Processes, GIS specialisation as well as Ecological and Wetland specialist studies. Previously, Gideon worked as the Monitoring & Evaluation Project Manager for the City of Cape Town's invasive species unit (Environmental Resources Management Department).

Gideon's GIS background includes the management of the City of Cape Town invasive species GIS database, involving the storage, management, recall and quality control of all sightings, clearance visits and known infestations. Further experience includes mapping for various consulting projects, boundary verification through ground-truthing and the spatial mapping and delineation component of this MSc research. Gideon has further attended public participation workshops, and has been involved with Interested and Affected Parties (IAP) identification, translation, public meetings and engagement for a variety of projects, mainly within the Northern Cape. Gideon is interested in invasion ecology, treatment of groundwater pollution through phytoremediation, botanical and wetland specialist studies, GIS application for ecology and environmental management, and the EIA processes in general. Lastly, Gideon has undertaken several ecological impact assessments for various developments.

A selection of recent specialist wetland studies undertaken, include the following:

Project Name & Location	Client Name	Role
Boshoek Loop Rail Upgrade BAR and Water Use Licence, Rustenburg, North-West Province	Transnet SOC Ltd	Wetland specialist
Barberton IAPS Waste Water Treatment Works development BAR, water use licence and SASS 5 assessment, Barberton, Mpumalanga Province	Umjindi Local Municipality and Rhodes University	Aquatic specialist
Wijnberg Trust Dam 2 expansion Aquatic Impact Assessment, Greyton, Western Cape	Wijnberg Trust	Aquatic specialist
Bloekombos (Kraaifontein) botanical baseline and impact assessment, Cape Town, Western Cape	Western Cape Provincial Government (PGWC)	Wetland specialist Botanical specialist
Aggeneys 1 Solar PV – Gridlines Basic Assessment, Aggeneys, Northern Cape	ABO Wind Aggeneys 1 PV (Pty) Limited	Wetland specialist
Aggeneys 2 Solar PV – Gridlines Basic Assessment, Aggeneys, Northern Cape	ABO Wind Aggeneys 2 PV (Pty) Limited	Wetland specialist
Wilmar Vegetable Oil pipeline wetland impact assessment, Richards bay, KwaZulu-Natal	Wilmar Processing (Pty) Limited	Wetland specialist
Masetjaba 15ML Water Tower Development, Nigel, Gauteng	City of Ekurhuleni	Wetland specialist

A full curriculum vitae (CV) is attached to this report in **Appendix A**.

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## ACRONYMS

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BA	Basic Assessment
CITES	Convention on International Trade in Endangered Species
DEA	Department of Environmental Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESO	Environmental Site Officer
GN. R	Government Notice Regulation
GPS	Global Positioning System
Ha	Hectare
km	Kilometre
LM	Local Municipality
ML	Megalitre
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act (No. 107 of 1998)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PPP	Public Participation Process
RE	Resident Engineer
SACNASP	South African Council for Natural and Scientific Professions
SANBI	South African National Biodiversity Institute

# 1. INTRODUCTION

---

Wilmar Processing (Pty) Ltd (hereafter "Wilmar") proposes the development of a vegetable oil pipeline in the Richards Bay Port (RBT), located approximately 16km east of Empangeni and 4km south-east of the Richards Bay Central area in the KwaZulu-Natal Province (hereafter referred to as the Province) (Figure 1.1 and Figure 1.2). Based on the National Freshwater Ecosystem Priority Areas (NFEPA) database, and the freshwater wetland delineation and impact assessment conducted for the project (to accompany the Basic Assessment Report), four freshwater wetland features were located within the regulated area (Figure 1.3). These are:

- » A small depression wetland ("depression wetland");
- » An artificial drainage channel ("artificial drainage channel");
- » An un-channelled valley bottom wetland ("un-channelled valley bottom wetland"); and
- » A channelled valley bottom wetland ("channelled valley bottom wetland").

Wilmar subsequently appointed Savannah Environmental (Pty) Ltd to conduct a Risk Assessment Matrix (RAM) on the wetland features identified, which was subsequently applied as per regulation GN 509 of 2016, and the National Water Act (Act 36 of 1998). This RAM will be utilised in the General Authorisation process being submitted towards water use authorisation for this project.

**Please note:** for the purposes of this report, the term "site" refers to the 500m regulated area of all wetland features on site, and all project infrastructure that occurs within that zone.

## 1.1. Project Description

Wilmar Processing (Pty) Ltd is proposing the development of a ~2.8km vegetable oil pipeline within the Richards Bay Industrial Development Zone (RBIDZ) in the KwaZulu-Natal Province. The proposed pipeline is set to transport vegetable oil from vessels docking at the Richards Bay Port, to an oil processing facility to be located 2km north-east of the Port within the Richards Bay Industrial Development Zone (RBIDZ). The oil processing facility will be located on Phase 1A of the RBIDZ which consists of land set aside by the KZN Provincial Government for the development of agro-processing facilities within the RBIDZ. Further to this, the pipeline will be comprised of 4 pipelines held together on a frame structure, each transporting ~250m<sup>3</sup> of vegetable oil per hour to the processing facility on Lot 17422 within the IDZ, which is anticipated to have a development footprint of approximately 13.7ha.

The pipeline will transport vegetable oils (palm, Sunflower or Soybean oil), which is an edible form of vegetable oil, to the processing facility. Palm oil is readily biodegradable and not considered to be hazardous. Therefore, Wilmar Processing (Pty) Ltd intends on storing and processing the oil through its manufacturing facility which has not been assessed in this report, or the associated Basic Assessment Report.

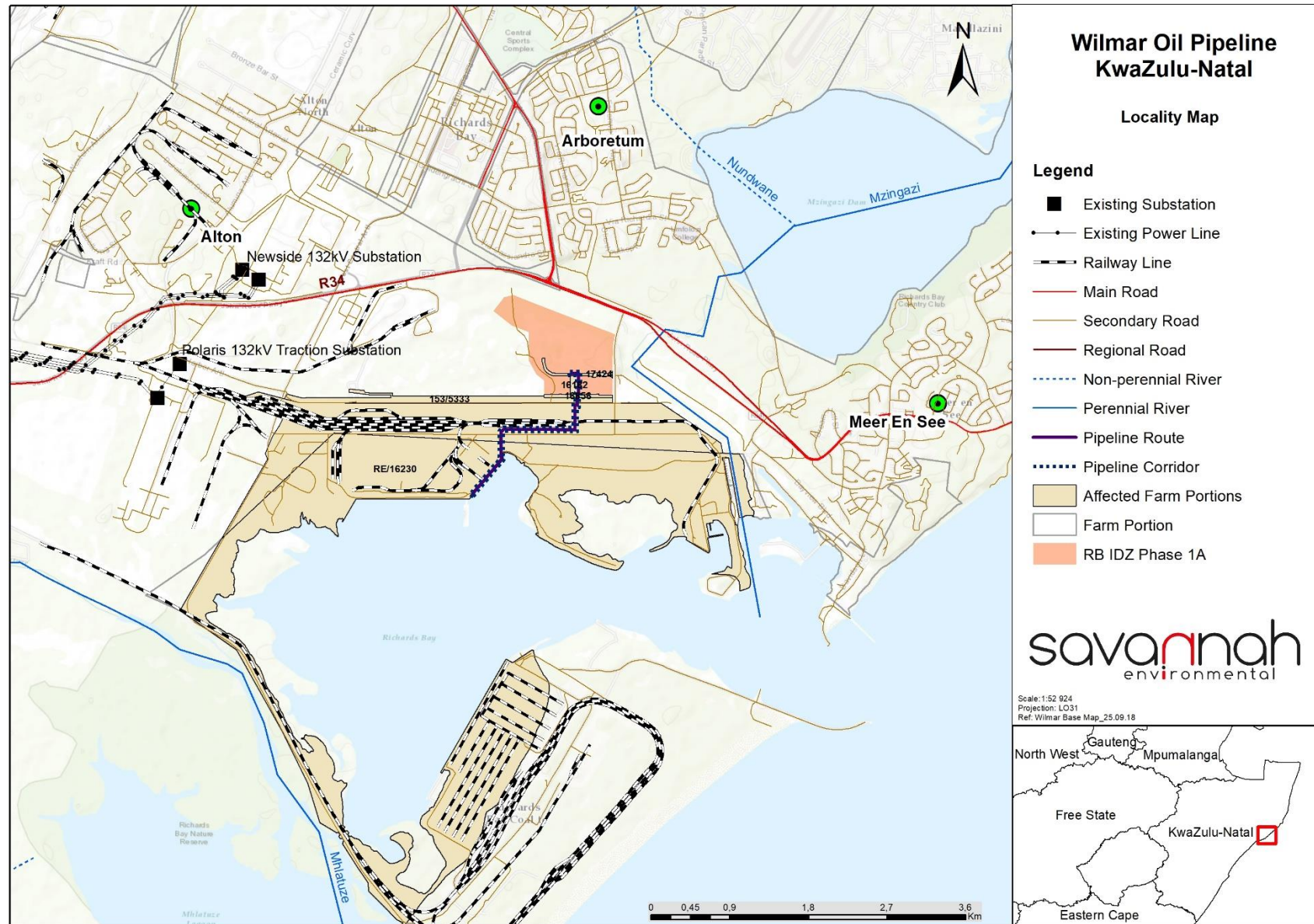
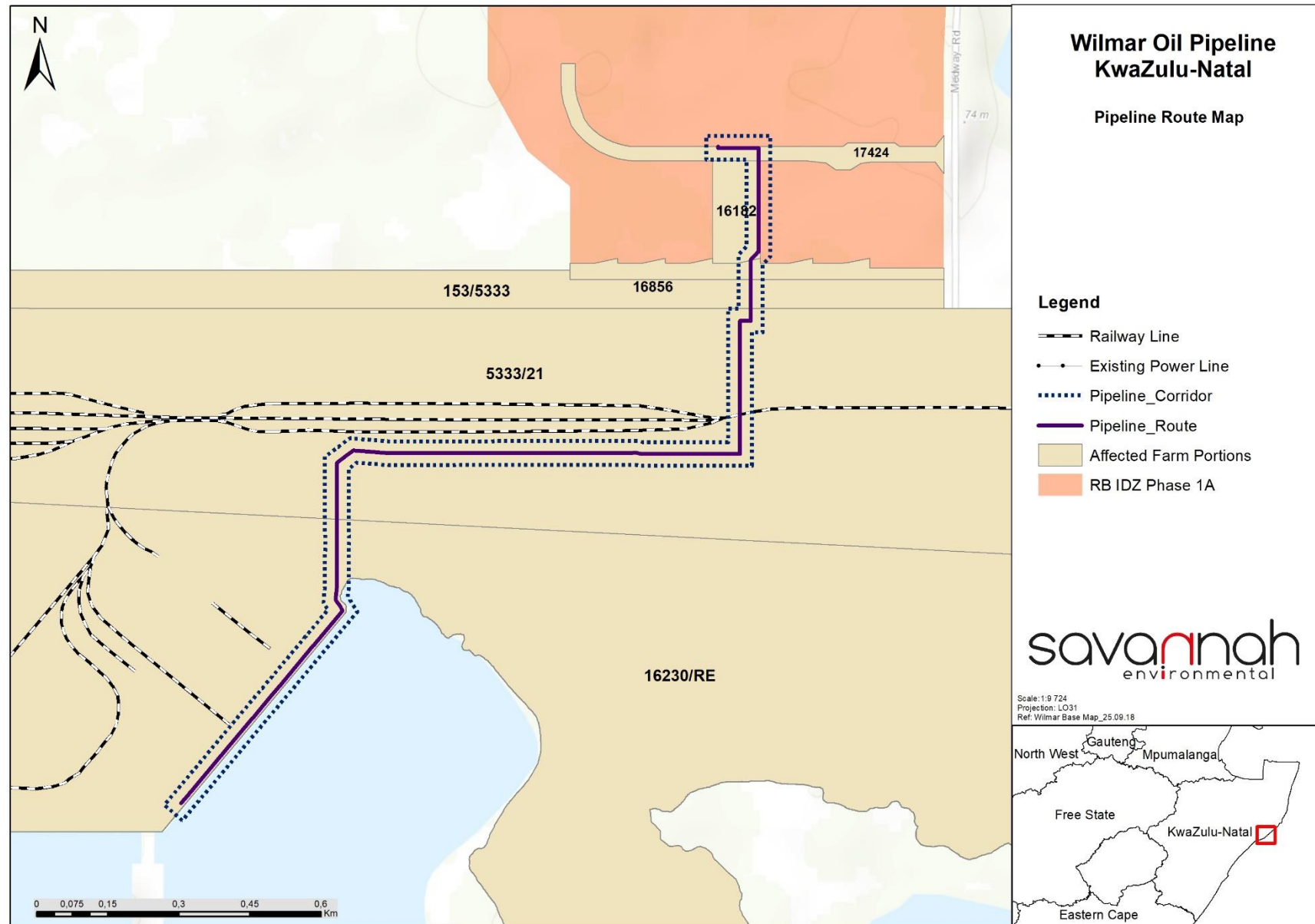


Figure 1.1. Locality map of the Wilmar vegetable oil site.



**Figure 1.2. Route map of the proposed development.**



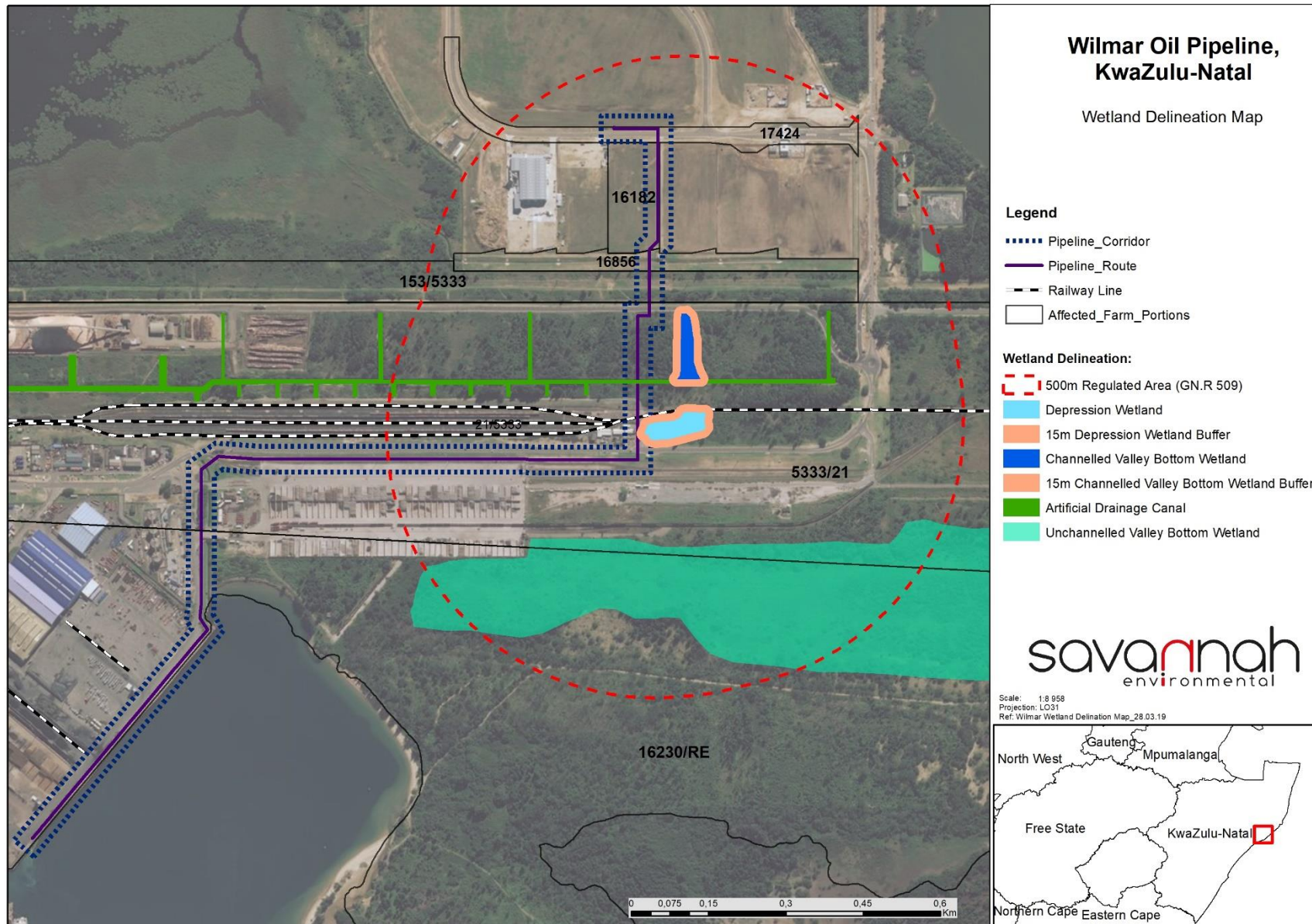


Figure 1.3. Wetland features present on site and within the 500m regulated area.

The proposed pipeline will route in a north-easterly direction for approximately 500m from Berths 706, 707 and 708 Quayside at the Richards Bay Port, where a hole in the concrete will be cut for the pitch pipe connection to the proposed pipelines. From the quay, the pipeline will route below ground until it reaches the road to the north, where after the pipeline will be placed aboveground. It is anticipated that the 4 x 216mm steel pipes will be mainly stacked vertically, in double rows, and will run side by side, however minor variations of stacking are considered for certain sections of the route.

The project site is located 16km east of Empangeni and 4km south-east of the Richards Bay Central district, with a fraction of the route located within an underground concrete tunnel at the Richards Bay Port. The project site can be accessed via the John Ross Highway (R34) Highway located to the north of the Richards Bay Industrial Development Zone.

The Wilmar Vegetable Oil Pipeline will consist of the following infrastructure:

- » Four (4) x 216mm Steel Pipes;
- » Overhead Steel Bridges on Rail/Road Crossings; and
- » Duct Access Shafts to provide below surface access.

**Table 1.1.** A detailed description of Wilmar Vegetable Oil Pipeline project site.

<b>Province</b>	Kwa-Zulu Natal
<b>District Municipality</b>	King Cetshwayo District Municipality
<b>Local Municipality</b>	City of uMhlathuze Local Municipality
<b>Ward number(s)</b>	02
<b>Nearest town(s)</b>	The Wilmar Vegetable Oil pipeline will be located ~16km east of Empangeni and 4km south-east of the Richards Bay Central district. .
<b>Farm Name(s) &amp; Portion Number (s)</b>	Remainder of the Farm Lot 233 Umhlatuzi No. 16230 Remainder of Portion 21 of Erf 5333 Portion 157 of Erf 5333 Erf 16856 Erf 16181 Erf 16182 Erf 17424 Erf 17422
<b>SG 21 Digit Code (s)</b>	N0GV0000000162300000 N0GV0421000053330021 N0GV04210000533300157 N0GV042100001685600000 N0GV04210001618100000 N0GV04210001618200000 N0GV04210001742400000 N0GV04210001742200000
<b>Physical Address</b>	uMhlathuze Building Gordon Road, Port of Richards Bay, Harbour Arterial Road Richards Bay 3900
<b>Current zoning</b>	Industrial Use- The affected properties are located within the Richards Bay Industrial Development Zone (RBIDZ), Phase 1A which has been reserved for agro-processing facilities.

The project site for the proposed Wilmar Vegetable Oil pipeline, located within the port area, is owned by Transnet SOC Limited, whereas the remaining portion of the pipeline (outside the port) is under the custodianship of the KwaZulu-Natal Provincial Government through the state-owned Richards Bay Industrial Development Zone (RBIDZ). Further to this, the site for the processing plant, Phase 1A of the RBIDZ is zoned for the development of agro-processing facilities (not included in this or the associated Basic Assessment report).

## 1.2. Terms of Reference

The terms of reference for this study were:

- » To consider the project activities and the potential risk of this infrastructure on the wetland resource/s characteristics;
- » To apply the Department of Water and Sanitation (DWS) Risk Assessment Matrix (RAM) as included in GN 509 of 2016, on the project activities;

## 1.3. National Water Act, 1998 (Act No. 36 of 1998) (NWA)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) was developed in order to ensure the protection and sustainable use of water resources (including wetlands) in South Africa. The NWA recognises that the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users. In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all "water uses" must be licensed with the Competent Authority (i.e. the Regional Department of Water and Sanitation (DWS) or the relevant Catchment Management Agency (CMA) where applicable). At a general level, the DWS is ultimately responsible for the effective and efficient water resources management to ensure sustainable economic and social development in line with the NWA. DWS is also responsible for evaluating and issuing licenses pertaining to water use (i.e. Water Use Licenses (WULs) and / or registration of General Authorisations (GAs) where this is applicable to developments.

A "water use" is defined in Section 21 of the NWA, and includes the following (**bolded** text applicable to this development):

- a) Taking water from a water resource;
- b) Storing water;
- c) Impeding or diverting the flow of water in a watercourse;**
- d) Engaging in stream flow reduction activity contemplated in Section 36 of the NWA;
- e) Engaging in a controlled activity identified as such in Section 37 (1) or declared under Section 38(1) of the NWA;
- f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- g) Disposing of waste in a manner which may detrimentally impact on a water resource;
- h) Disposing of waste in a manner of water which contains waste from, or which has been heated in any industrial or power generation process;
- i) Altering the bed, banks, course or characteristics of a watercourse;**
- j) Removing, discharging or disposing of water found underground if it is necessary for efficient continuation of an activity or for the safety of people; and
- k) Using water for recreational purposes.

With the above in mind, should any water resource be affected by any proposed development, the necessary WUL application and / or registration of GA will become relevant, where applicable.

Note that a WUL application is generally applied for where the above water uses are required as a result of direct impact to wetlands or watercourses. However, it must be noted that indirect impacts are also taken into consideration through the applicable Government Notices. In particular, Government Notice (GN) 509 of 2016, becomes relevant where a wetland or watercourse is affected by a proposed development and is within the "regulated area of a watercourse". The regulated area of a watercourse is defined as:

- a) *"The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;*
- b) *In the absence of a determined 1 in 100-year flood line or riparian area, the area within 100m from the edge of a watercourse where the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to Section 144 of the Act); or*
- c) *A 500m radius from the delineated boundary (extent) of any wetland or pan".*

In light of the above, an assessment of any direct and indirect impacts to water resources must be undertaken in terms of the Risk Assessment Protocol, where a proposed development affects a watercourse or wetland within the above-mentioned proximities, and when applying for authorisation from the DWS.

#### **1.4. Section 21(c) and (i) General Authorisation**

The Department of Water and Sanitation (DWS) has published General Notice (GN) 509. GN 509, which was published in Government Gazette (GG) no. 40229 under Section 39 of the National Water Act (Act no. 36 of 1998) in August 2016, was drafted to streamline the application for, and granting of, a Water Use Licence (WUL) in terms of Section 21 (c) & (i) water uses. The aforementioned water uses are associated with the c) *impeding or diverting of the flow of water within a watercourse* (streams and wetlands) and i) *the altering of the bed, banks, course or characteristics of a watercourse* (streams and wetlands). This regulation aimed at allowing water users to authorise water uses under Section 21 (c) & (i), through a General Authorisation (GA) process, as opposed to a full Water Use Licence Application (WULA).

Water uses refer to activities that may influence water resource characteristics, commonly including general construction, maintenance work, stormwater management activities or rehabilitation works – all within the regulated area of a watercourse, as defined within GN 509. In order for a water use (or potential) to qualify for a GA under GN 509, the proposed water use/activity must be subject to analysis by a suitably qualified natural scientist that is professionally registered with the South Africa Council for Natural Scientific Professions (SACNASP), using the DWS Risk Assessment Methodology.

This methodology is applied to all project-related activities (in terms of 21(c) and (i) water uses) within the regulated area of a watercourse, to determine the potential risk of those activities on the water resource characteristics of the receiving aquatic environment. Risk is divided into three categories, namely low, moderate and high, determined using the DWS Risk Assessment Methodology and the pre-determined calculator and risk classes. Should a water use be determined as a low risk, it may be subjected to a General Authorisation, however all moderate and high risks are excluded from a General Authorisation process, and must be subjected to a full Water Use Licence Application (WULA). The Risk Assessment Matrix (RAM) assesses



the risk significance of various aspects that are related to a specific activity. The scoring within the RAM must be conducted with the specialist-recommended mitigation and/or rehabilitation measures in mind.

The severity of each aspect of the activity is then determined by analysing the severity of the proposed impact on the receiving aquatic environment (post-mitigation), during the design, construction, operation and decommissioning/rehabilitation phases, via a series of drivers and responses. The primary being the flow regime, aquatic biota, physicochemical water quality and habitat (geomorphology and vegetation). Thereafter, the spatial scale, duration and legal context of each aspect is considered to ultimately determine the overall significance, and thus the risk category of each aspect associated with the activity. The risk category (low, moderate, or high), in conjunction with the proposed mitigation and/or rehabilitation measures, are then used to justify whether the water use/activity may be subject to either a GA, or full WULA process.

## **1.5. Assumptions and limitations**

### **1.5.1. General assumptions**

- This study assumes that the NFEPA delineated boundaries and SiVEST delineated boundaries are accurate for all water features found on site. No formal delineation was conducted as part of this risk assessment;
- Only freshwater resources were assessed as part of this RAM; and
- GIS spatial datasets used as part of the field surveys (site demarcation) and analyses are accurate.

### **1.5.2. Limitations**

The following refers to general limitations that affect the information represented within this report:

- The initial review of the site was undertaken as a desktop assessment and as such, potential inaccuracies may be present within the databases used (NFEPA, C-Plan, etc.);
- The field assessment (conducted on the 2<sup>nd</sup> of July, 2019) of the desktop delineated wetland(s), together with the desktop assessment is considered to provide adequate information for informed decision making;
- Accuracy of Global Positioning System (GPS) coordinates was limited to 3m accuracy in the field.
- The field assessment was undertaken in Autumn (July 2019). The assessment therefore does not cover the seasonal variation in conditions at the site. This will not have a significant impact on the conclusion made regarding the potential impacts of the development.
- Wetland boundaries may be delineated based on a selection of available techniques that have been developed through the Department of Water and Sanitation (DWS) as well as the Water Research Council (WRC), however, such delineation did not form part of the scope of work for this project. No formal delineation was conducted as part of this risk assessment.
- While every care is taken to ensure that the data presented are qualitatively adequate, inevitably conditions are never such that that is possible. The nature of the vegetation, seasonality, human intervention etc. limit the veracity of the material presented.
- The impact descriptions, assessment of impacts and recommendation of mitigation measures was informed by the site-specific aquatic concerns arising from the field survey and based on the assessor's working knowledge and experience with similar development projects.

## 2. METHODOLOGY AND APPROACH OF THE STUDY

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### 2.1. DWS Wetland Risk Assessment

Government Notice 509 of 2016 published in terms of Section 39 of the NWA sets out the terms and conditions for the General Authorisation (GA) of Section 21(c1) and 21(i2) water uses, most important of which is that only developments posing a low risk to watercourses – as determined by the supplied methodology - can apply for a GA.

The following activities are excluded from the provisions of a GA:

- » To the use of water in terms of section 21(c) or (i) of the Act for the rehabilitation of a wetland as contemplated in General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009;
- » To the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High as determined by the Risk Matrix. This Risk Matrix must be completed by a suitably qualified SACNASP professional member;
- » In instances where an application must be made for a water use license for the authorisation of any other water use as defined in section 21 of the Act that may be associated with a new activity;
- » Where storage of water results from the impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse; and
- » To any water use in terms of section 21(c) or (i) of the Act associated with construction, installation or maintenance of any sewerage pipelines, pipelines carrying hazardous materials and to raw water and wastewater treatment works.

Khangisa Environmental Consulting's SANS 10234 classification of the material contained in the proposed pipeline found the following:

- » *"The Palm Oil/Soya Bean Oil/Sunflower Oil are vegetable type products produced by Wilmar SA as per the supplied product MSDSs.*
- » *The major constituents of the Used Cooking Oil vegetable oils are vegetable oil triglycerides. Triglycerides have no identified intrinsic physical, health and aquatic environmental hazards, as defined within the scope of the Global Harmonized System (GHS).*
- » *The pH of the vegetable oils is considered to be > 2.5 but < 11.5; the vegetable oils pH is therefore not considered to contribute to the vegetable oils classification.*
- » *The flashpoint of the vegetable oils is considered to be > 250F. These Oils as a result, cannot be classified as a Flammable Liquid. The decision logic is a flashpoint of 93OC is the cut-off limit for the assigning of this physical hazard to a liquid/sludge vegetable oils.*
- » *Classification of these oils is proposed for none of the physical, health and environmental hazards currently defined within the scope of the GHS."*

On the basis of the Khangisa Environmental Consulting's assessment, none of the above exclusions apply to the proposed development, and as such Government Notice 509 of 2016 may apply to this project.

In order to standardise the risk assessment approach and results, the DWS have developed a Risk Assessment Matrix/Tool, based on the DWS 2015 publication: 'Section 21 c and i water use Risk Assessment Protocol'.

The tool calculates risk as follows:

$$RISK = CONSEQUENCE \times LIKELIHOOD;$$

Where

- Consequence = Severity + Spatial Scale + Duration; and
- Likelihood = Frequency of Activity + Frequency of Impact + Legal Issues + Detection.

It is important to note that the Risk Assessment Matrix (RAM) tool also makes provision for the downgrading of risk to low, in borderline moderate/low cases, subject to independent specialist motivation granted that the initial risk score is within twenty-five (25) risk points of the low class and that mitigation measures are provided to support the reduction of risk rating.

### 3. RESULTS

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#### 3.1. Freshwater resources

The presence of all four wetland features identified in the specialist Wetland Impact Assessment Report were confirmed during the site visit. The freshwater impact assessment report concluded with the following findings:

##### **Depression Wetland**

*The present ecological state of the depression wetland was assessed to be a Class D (largely modified) seasonal depression wetland system. The wetland was found to be affected most by the change in surface roughness and excavation in the western area of the wetland. Overall, an impact score of 5,06 was assessed which resulted in the Class D rating. The Class D rating is expected to slowly deteriorate over time with increased transformation of the surrounding catchment and change in surface roughness.*

*The ecosystem services which scored highest included sediment trapping, erosion control and flood attenuation. The depression wetland therefore offers good potential for stormwater management in the area. There however, are a number of other potential wetland ecosystem services which the wetland can provide. These include biogeochemical cycling in the form of phosphate trapping and nitrate and toxicant removal, a relatively limited role in the maintenance of biodiversity in the landscape as well as streamflow regulation. In general, the depression wetland was not found to offer a high number of potential ecosystem services to a significant degree, owing mainly to the limit extent and degraded current state.*

*In terms of the ecological importance and sensitivity, the depression wetland is situated within an area defined as a Critical Biodiversity Area (CBA) according to the KZNBS (2014), which contributed to assigning a score of moderate for protected status of wetland. All other determinants however scored low. Overall, the EIS of the wetland was assessed to be a Class C*

system which is considered to be moderately ecologically important and sensitive on a provincial or local scale.

### **Unchanneled Valley Bottom Wetland**

For the un-channelled valley bottom wetland, the present ecological state was assessed to be a Class B (largely natural) seasonal un-channelled valley bottom wetland system. The wetland was found to be minimally affected by a number of influences which included reduction of flows due to alien vegetation present in the wetland, an increase in flood peaks, increased run-off due to the increase of hardened surfaces in the catchment, deposition of materials (dumping) in the wetland and alien colonisation. Overall, an impact score of 1,54 was assessed which resulted in the Class B rating. The Class B rating for the wetland is expected to slowly deteriorate over time due to continued dumping and increased colonisation of alien vegetation.

The ecosystem services which scored highest included biogeochemical cycling (phosphate and nitrate / toxicant removal), sediment trapping, erosion control, streamflow regulation and flood attenuation. The wetland therefore offers good potential for water purification and stormwater control in the area. There are also a number of other potential wetland ecosystem services which the wetland can provide. From an ecological perspective, these include maintenance of biodiversity and carbon storage. There is also a value in the wetland providing education and research opportunities as well as tourism and recreation potential. Overall, the wetland has a significant ecological role within the surrounding landscape.

In terms of the ecological importance and sensitivity, a number of the determinants scored high for the unchanneled valley bottom wetland. The wetland is substantially bigger than the depression wetland, has an extent of open water and is more secluded from the Transnet Railyard operations. The wetland is therefore able to provide a sizeable area for habitat and exclusivity to sensitive species as identified in Table 5.2 below, and therefore has a greater chance of occurrence for these sensitive species. In addition to this, the wetland was assessed to be in a fairly decent present ecological state (Class B largely natural system) as per the assessment in Section 5.2.2. Overall, the EIS of the wetland was assessed to be a Class B system which is considered to be highly ecologically important and sensitive.

### **General**

Note that no present ecological state (PES) or wetland ecosystem services assessments were applied to the artificial drainage channel as this is an artificial wetland system for which the aforementioned methodologies are not applicable, and no alternative methodologies may be applied in South Africa.

In addition, no buffer zone was recommended since the proposed development will include the construction of a linear feature that can avoid the wetland and span the artificial drainage channel. A buffer zone was therefore deemed to be impractical and ineffective as the proposed pipeline can avoid the wetlands and span the artificial drainage channel without affecting it directly.

It is important to note that while four wetland features were identified within the broader study area, no wetland features will be directly impacted by the proposed construction infrastructure or methodology. This is due to the construction of the pipeline along elevated lattice structures that require only support structures.



These support structures may be spaced far apart and thus wetland features can be entirely spanned where necessary. This was proposed for the developed for the depression wetland, where doing so avoided placing infrastructure directly within the wetland, as well as the artificial drainage channel, where again all wetland features were avoided in doing so. For all other wetland features, no direct impact or spanning was required in order to avoid the features, as they were located at a sufficient distance from the proposed infrastructure.

### **3.2. Current condition**

Plate 3.1, Plate 3.2, Plate 3.3, and Plate 3.4 all indicate the current condition of the wetland features on site. Current disturbances experienced are shown in Plate 3.5 along with a brief explanation of the impacting activity.



**Plate 3.1. The unchanneled valley bottom wetland with dense vegetation cover.**





**Plate 3.2. The depression wetland, with distinctive *P. australis* growth on the right.**



**Plate 3.3. The artificial drainage channel showing clear channelling and invasive Pine trees along the channel edge.**





**Plate 3.4. The channelled valley bottom wetland.**

A moderate variety of disturbances were evident from the current and adjacent land uses (Plate 3.5 Plate 3.5), including:

- » The unchanneled valley bottom wetland was subject to the least amount of disturbance on site. This was due to the wetland being located to the extreme south of the facility, **adjacent to two derelict tarred, access roads**. The unchanneled valley bottom wetland is also located at a short distance from the road (~20m), with dense vegetation cover between the road and the wetland, thus shielding it from incidental human interference. The wetland does however experience impacts from the ongoing and **nearby operation of a storage and transfer facility**, which stores a wide variety of materials transported by the rail network (to and from the port). Chromium fines were evident during the site visit, with visible wind-blown fines found throughout the site. It is anticipated that other stored materials may also be introduced to the unchanneled valley bottom wetland during windy conditions, or rainfall events.
- » Disturbance to the depression wetland included the **ongoing parking of vehicles** adjacent (on the very edge of) to the wetland, where no formal parking has been created and vehicles make use of the available open space to park. Both the parking on the fringe of the wetland and the **inadvertent spills of motor oils during parking** currently influences the depression wetland. In addition, **numerous invasive species** were observed on site, such as invasive *Pinus* trees and herbaceous invaders such as *Bidens pilosa*, within the depression wetland itself. Another impact on the depression wetland was the ongoing **windblown material from the storage and transfer facility**, as well as **minor waste** (plastic



bottles, papers and bags from the nearby parking) within the wetland itself. A very large current disturbance to the depression wetland also includes clear **evidence of historical earthworks**, with a bulldozer track visible and associated earth mounds within the wetland feature itself. This may have been during historical construction but would alter the surface water flows and general wetland hydrology via channelling and ponding in an artificial manner.

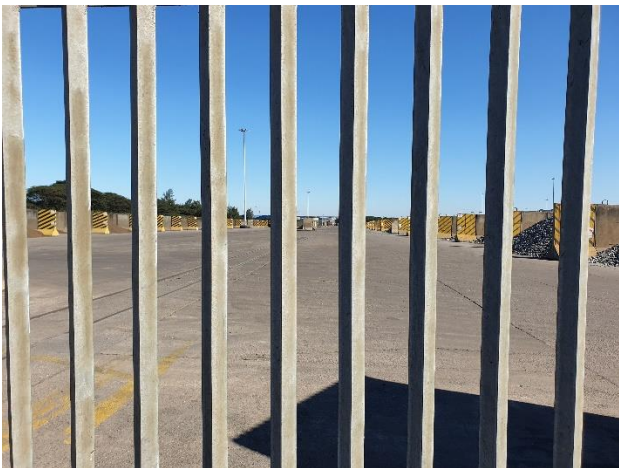
- » Current disturbance to the channelled valley bottom wetland, and the artificial drainage channel stemmed primarily from the **strong degree of invasive species present** – in particular by overshadowing of the large Pine stands. This caused a dense Pine needle mat underneath the canopy altering the species composition locally and within both these channelled wetland features. Furthermore, by virtue of **being channelled**, the hydrology of both these features are artificial and thus do not represent natural drainage conditions.



Derelict road adjacent to the unchanneled valley bottom wetland



Plastic bottles and waste near the unchanneled valley bottom wetland, representative of similar waste disposed at various locations on site



The materials handling facility, showing temporary storage of materials



Oil spills from vehicles evident adjacent to the depression wetland





Parking on the periphery of the depression wetland



Invasive Pine trees within the depression wetland



Historical earthworks via bulldozer evident within the depression wetland



Dense Pine needle mats and artificial channelling of the artificial drainage channel and the channelled valley bottom wetland

**Plate 3.5. Evidence of current and historic disturbance found on site.**

**3.3. Risk Assessment Matrix (RAM)**

The results of the RAM assessment are summarised in Table 3.1 below. Key mitigation measures have been supplied where applicable. The following potential construction and operations phase impacts were identified based on the current understanding of the proposed development activities.

Construction

- » Impact 1: Potential Impacts to the Hydrology and Geomorphology of the Depression Wetland and Artificial Drainage Channel; and
- » Impact 2: Potential Impacts to the Water Quality of the Depression Wetland and the Artificial Drainage Channel;

### Operation

- » Impact 3: Potential impacts due to spillages as a result of rupture of the pipeline and leakages of oil;

**Please note:** no wetland features will be directly impacted by the proposed construction infrastructure or methodology, due to the support structures being spaced far apart and thus allowing for flexibility to completely avoid wetland features (through spanning) where necessary.

From the RAM results it is clear these impacts can be successfully avoided provided the mitigation measures contained within this report are implemented. The following project related activities have minor potential to cause these impacts:

#### **Construction phase**

- » Vegetation clearing for site establishment and infrastructure
- » Unsecured material stockpiles/stores
- » Vehicle movements in close proximity to the depression wetland
- » Excavation, piling and foundation/support installation
- » Improper maintenance of construction vehicles may lead to spillages and leaks of oil or other hazardous substances
- » Improper bunding, storage and handling of hazardous materials during construction

#### **Operations phase**

- » Inadequate operational controls, monitoring and maintenance of the pipeline.

From the results of the RAM it is also clear that the construction and operation of the proposed project can be considered as a **Low Risk** to the resource quality characteristics of the wetland/s, due partly to the extremely low risk nature of the construction activities/methodology, the distance to the wetland features itself and the ability to span the wetland features in the design, the non-hazardous nature of the vegetable oil being transported within the pipeline, as well as the mitigation measures provided in this report. Due to the low risk rating determined, it is clear that the constructions of the proposed project can be considered for authorisation under a General Authorisation.

### **3.4. RAM Scoring Sheet**

The ratings applied in this section are based on the assumption that the construction and operation activities would be carried out according to widely accepted good practice. The mitigation measures considered to be widely accepted good practice in this assessment, and those recorded in the associated Basic Assessment reporting (BAR and EMPr) should also be implemented. For completeness, these management measures are recorded in the risk assessment template. Additional or site/wetland specific mitigation measures are also supplied, where applicable. The ratings provided are applicable to all identified wetlands.

**Table 3.1. Risk Assessment Matrix scoring sheet, according to DWS RAM for General Authorisation.**

No.	Phases	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Classes	PES AND EIS OF WATER COURSE
					Flow Regime	Physical & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota															
1	Construction Phase	Earthworks related to excavation, piling and foundation/support installation or material stockpiles may cause sediment to wash or blown into the depression	Vegetation clearing for site establishment and infrastructure	Potential Impacts to the Hydrology and Geomorphology of the Depression Wetland and Artificial Drainage Channel	2	2	1	1	1,5	1	2	4,5	1	1	5	2	9	41	LOW	90	<ul style="list-style-type: none"> <li>All mitigation measures provided in the EMP must be adhered to where relevant to the aspects mentioned here.</li> <li>Specific areas must be designated on-site for the temporary management of various waste streams. Location of such areas must minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.</li> <li>No liquid waste, including grey water, may be discharged into any water body or drainage line.</li> <li>Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of waste.</li> <li>SABS approved spill kits to be available on site and easily accessible.</li> </ul>	N/A	PES: D; EIS: C.

No.	Phases	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Classes	PES AND EIS OF WATERCOURSE
					Flow Regime	Physical & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota															
		wetland during rainfall or strong wind events	Unsecured material stockpiles/stores	el: Increase in sedimentation and erosion	1	2	2	2	1,8	1	2	4,75	1	1	5	2	9	43	LOW	90	<ul style="list-style-type: none"> <li>Stockpiling of soil or any other materials during construction must not be allowed near steep slopes or near watercourses.</li> <li>Vegetation clearance must start in the dry season as far as possible.</li> <li>Ensure that vegetation is not unnecessarily cleared or removed during the construction phase.</li> <li>No laydown areas, operation and maintenance buildings are to be established in the wetland areas and associated buffer zones.</li> <li>Vehicle movement within the wetlands must be prohibited, and existing service roads utilised were practical and feasible.</li> <li>Ensure strict management of potential sources of pollution (hydrocarbons from vehicles and machinery, cement during construction, etc.).</li> <li>General storage of fuels, oils and any other hazardous substances must be contained in bunded areas.</li> <li>All vehicles and machinery must be checked for leaks before being allowed to operate on the project site. Should leaks be detected, the relevant vehicles and machinery must be repaired before being allowed to operate on the project site.</li> <li>Temporary sanitation facilities may not be placed directly or within 100m of the depression wetland or the artificial drainage channel.</li> </ul>	N/A	
			Vehicle movements in close proximity to the depression wetland		1	2	1	2	1,5	1	1	3,5	5	3	5	2	15	53	LOW	90			

No.	Phases	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Classes	PES AND EIS OF WATER COURSE
					Flow Regime	Physical & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota															
			Excavation, piling and foundation/support installation		2	2	1	2	1,8	1	2	4,7 5	1	3	5	2	11	52	LOW	90	<ul style="list-style-type: none"> <li>Temporary sanitation facilities must be regularly checked for leaks and spillages, and repaired where any leakages are detected before being allowed for use on the project site.</li> </ul>	N/A	



No.	Phases	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Class	PES AND EIS OF WATER COURSE
					Flow Regime	Physical & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota															
2	Construction Phase	Improper handling of hazardous materials, including cement bags (and other solid wastes), oil drums or any other chemicals required during construction may be introduced into the wetland features during rainfall events	Improper maintenance of construction vehicles may lead to spillages and leaks of oil or other hazardous substances	Potential Impacts to the Water Quality of the Depression Wetland and the Artificial Drainage Channel through improper construction vehicle maintenance or constru	1	3	2	3	2,3	1	2	5,2 5	1	3	5	1	10	53	<b>LOW</b>	95	<ul style="list-style-type: none"> <li>All mitigation measures provided in the EMP must be adhered to where relevant to the aspects mentioned here.</li> <li>Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.</li> <li>Establish an appropriate Hazardous Stores which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not be limited to: Designated areas; all applicable safety signage; Firefighting equipment; Enclosed by an impermeable bund; Protected from the elements, Lockable; Ventilated; Has adequate capacity to contain 110% of the largest container contents.</li> <li>Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately in line with procedures by trained staff with the appropriate equipment.</li> <li>Routine servicing and maintenance of vehicles must not take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.</li> <li>All stored fuels to be maintained within an appropriate bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1 and any relevant by-laws.</li> </ul>		PES: D; EIS: C.

No	Phases	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Class	PES AND EIS OF WATER COURSE
					Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota															
				ction materials handling (oils, chemicals etc)	1	4	1	3	2,3	1	2	5,2 5	1	2	5	1	9	47	<b>LOW</b>	95	<ul style="list-style-type: none"> <li>Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.</li> <li>An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.</li> <li>Should any hazardous substances be stored on site, these should not pose a risk to the environment, and must be kept outside the 1:100 year floodline. A bund wall must be built around the storage areas and access must be restricted to authorized personnel only.</li> <li>Implement a Spillage Contingency Plan to handle spills, so that environmental damage is avoided. In the event of a spillage, the following procedure should be followed: 1 - Stop the spill at the source, 2 - Contain the spill; 3 - Remove the spillage for authorised disposal; 4 - Assess and determine if there was any impact to the natural environment following the spill; 5 - Where necessary, undertake remedial actions in consultation with KZN DWS, 6 - Record the incident and keep all records.</li> <li>No laydown areas, operation and maintenance buildings are to be established in the wetland areas and associated buffer zones.</li> <li>Vehicle movement within the wetlands must be prohibited, and existing service roads utilised were practical and feasible.</li> <li>Ensure strict management of potential sources of pollution (hydrocarbons from vehicles and machinery, cement during construction, etc.).</li> </ul>	N/A	

No	Phases	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Classes	PES AND EIS OF WATER COURSE
					Flow Regime	Physical & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota															
																				<ul style="list-style-type: none"> <li>General storage of fuels, oils and any other hazardous substances must be contained in bunded areas.</li> <li>Temporary sanitation facilities may not be placed directly or within 100m of the depression wetland or the artificial drainage channel.</li> </ul>			



No.	Phases	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Class	PES AND EIS OF WATER COURSE
					Flow Regime	Physical & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota															
3	Operations Phase	Pipeline rupture or containment breach due to improper controls, monitoring and maintenance	Inadequate operational controls, monitoring and maintenance of the pipeline	Potential water quality, biota or habitat impacts due to spillages as a result of rupture of the pipeline and leakages of oil	2	2	4	4	3	1	2	6	2	1	5	1	9	54	LOW	85	<ul style="list-style-type: none"> <li>All mitigation measures provided in the EMP must be adhered to where relevant to the aspects mentioned here.</li> <li>Monitor the pipeline, valves and joints for potential mechanical failure points. These should be reported to the Technical or Operations Manager immediately.</li> <li>In the event of a significant spill or leak, the following procedure should be followed in addition to that provided by SOPs:                             <ol style="list-style-type: none"> <li>Stop the spill or leak at the source.</li> <li>Contain the spill.</li> <li>Remove the spillage for authorised disposal.</li> <li>Assess and determine if there was any impact to the natural environment following the spill.</li> <li>Where necessary, undertake remedial actions in consultation with KZN DWS.</li> </ol> </li> <li>Undertake non-destructive tests on the pipeline continuously to ensure its competency to handle the envisaged volume of raw material (vegetable oil) being transported from the Richards Bay Port to the oil processing facility at Phase 1A of the RBIDZ.</li> <li>Develop and implement an emergency plan which includes the abovementioned monitoring and emergency response procedures, to be implemented by the operating contractor.</li> </ul>	N/A	PES: D; EIS: C.

## 4. CONCLUSION

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This report set out to assess the potential risks to the resource characteristics related to the proposed development activities, as per the DWS Risk Assessment Matrix. Four wetland features were located within the regulated area on site, found to be subject to varying current disturbances. All risks pertaining to these wetlands were identified and assessed in this RAM. Current impacts on site ranged from litter and solid waste, to oil spills from current vehicle traffic, invasive alien plants and historical earthworks. Due to the construction methodology, no direct impact was anticipated for any of the wetland features identified on site, with only indirect impacts applicable.

The potential impacts determined related to an impact on water quality, habitat quality and geomorphological integrity of the wetland units, as well as the potential for spillage and ruptures of the pipeline during the operations phase. No manual reduction of risk rating scores was applied. Suitable mitigation measures were provided for the mitigation of the impacts. The results of the RAM indicated an overall **LOW** risk rating for all identified wetlands, making this project suitable for General Authorisation, provided the mitigation measures contained in this report, and that of the associated EMPr, are implemented.

## 5. APPENDIX A: SPECIALIST CV

### CURRICULUM VITAE OF GIDEON RAATH

**Profession :** Environmental and Permitting Consultant  
**Specialisation:** Environmental Impact Assessments, Water Use Licencing, Waste Licencing, Environmental Compliance Officer, Ecological Specialist, Wetland Specialist, GIS, MPRDA permitting  
**Work Experience:** 5.5 years' experience in environmental management, National Water Act, Mineral and Petroleum Resources Development Act, ECO and compliance auditing, wetland and ecological specialist reporting

#### VOCATIONAL EXPERIENCE

Gideon holds an MSc (Geography and Environmental Management; SU), a BSc Honours (Ecology and Environmental Studies - Cum laude; Wits) and a BSc (Geography and Environmental Management; UJ). His MSc thesis focused on the hydrological impact on the spatial distribution of invasive Eucalyptus trees along the Breede River, while his honours thesis evaluated ethnobotanical relationships around the Rio Tinto copper mine in Phalaborwa. Most recently he has worked as an Environmental Consultant at EOH Coastal and Environmental Services (EOH CES), conducting environmental authorisations applications (NWA, NEMA, MPRDA), Public Participation Processes, GIS specialisation as well as Ecological and Wetland specialist studies. Previously, Gideon worked as the Monitoring & Evaluation Project Manager for the City of Cape Town's invasive species unit (Environmental Resources Management Department).

Gideon's GIS background includes the management of the City of Cape Town invasive species GIS database, involving the storage, management, recall and quality control off all sightings, clearance visits and known infestations. Further experience include mapping for various consulting projects, boundary verification through ground-truthing and the spatial mapping and delineation component of this MSc research. Gideon has further attended public participation workshops, and has been involved with IAP identification, translation, public meetings and engagement for a variety of projects, mainly within the Afrikaans speaking Northern Cape. Gideon is interested in invasion ecology, treatment of groundwater pollution through phytoremediation, botanical and wetland specialist studies, GIS application for ecology and environmental management, and the EIA processes in general.

#### SKILLS BASE AND CORE COMPETENCIES

- Environmental Management
- GIS data manipulation, storage, management and mapping
- EIA Impact Assessments and Basic Assessment
- Environmental Management Programmes
- Environmental Compliance Monitoring
- Mining Rights, Mining Permits, Prospecting Rights (and renewal) applications (MPRDA & NEMA)
- Public and Stakeholder Engagement (NEMA)
- Ecological/Botanical Specialist Studies

- Wetland Delineation, Functional and Impact Assessment studies
- Water Use Licence Applications (NWA)
- General Authorisations (NWA)

## EDUCATION AND PROFESSIONAL STATUS

### Degrees:

- M.Sc. Geography and Environmental Science (2014), Stellenbosch University (2014)
- B.Sc. (Hons) Ecology, Environment and Conservation (Cum Laude), University of the Witwatersrand (2011)
- B.Sc. Life and Environmental Sciences, University of Johannesburg (2010)

### Short Courses:

- GroundTruth SASS5 competency course, GroundTruth Aquatic Consulting (2017)
- DWS 21C&I GA training workshop, Department of Water and Sanitation (2016)
- IAIAAsa Public Participation Process Workshop, IAIA South Africa (2016)
- EIA Theory and application, EOH Coastal and Environmental Services (2015)
- Water Safety Training, City of Cape Town Environmental Resources Department (2014)
- Herbicide safety and application for weed control, City of Cape Town Environmental Resources Department (2014)
- Snake awareness training, City of Cape Town Environmental Resources Department (2014)
- Habitable Planet Workshop, Applied Centre for Climate & Earth Systems Science, Cape Town (2011)

### Professional Society Affiliations:

- Golden Key International Honour Society – University of the Witwatersrand Chapter
- South African Council for Scientific Natural Professionals (SACNASP): Certified Natural Scientist – Pr.Sci.Nat. (Membership No.: 117178)
- IAIAAsa (Membership No.: 3619)

### Other Relevant Skills:

- GPS use, spatial data capturing and ground truthing

## EMPLOYMENT

Date	Company	Roles and Responsibilities
October 2018 - Current:	Savannah Environmental (Pty) Ltd	Environmental and Permitting Consultant  <u>Tasks include:</u> Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments, water use license applications, general authorisations, wetland assessments, botanical/ecological assessments, mining rights and permit applications, prospecting rights applications, environmental compliance officer audits and reporting, Ensuring environmental compliance on permitting processes, client liaison and relationship management.
February 2015 – September 2018	EOH Coastal and Environmental Services (Pty) Ltd	Senior Environmental Consultant

Date	Company	Roles and Responsibilities
		<p><u>Tasks included:</u> Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments, water use license applications, general authorisations, wetland assessments, botanical/ecological assessments, mining rights and permit applications, prospecting rights applications, environmental compliance officer audits and reporting, Ensuring environmental compliance on permitting processes, client liaison and relationship management, public participation processes for environmental authorisations.</p>
<p><b>March 2014 – February 2015</b></p>	<p>Invasive Species Unit (ISU), Environmental Resources Management Department (ERMD), City of Cape Town</p>	<p>Professional Officer</p> <p><u>Tasks included:</u> Managed the Monitoring &amp; Evaluation project portfolio, entailing the establishment of an invasive species monitoring &amp; evaluation system for the ISU, as well as GIS database management, quality assurance and reporting thereof. Position required managing a small staff compliment (dealing directly with GIS database management), managing time and budgets for the monitoring division, conducting monitoring trials and research, writing species management plans as well as handling the GIS database, quality control, verification and integrity for the ISU.</p>
<p><b>January 2012 – March 2014</b></p>	<p>University of Stellenbosch</p>	<p>Departmental Assistant</p> <p><u>Tasks included:</u> Technical editing of academic reports. Formatting of PhD and MSc reports on a weekly basis, with short turnaround time and good quality feedback.</p>
<p><b>January 2011 – January 2012</b></p>	<p>University of the Witwatersrand</p>	<p>Departmental Assistant</p> <p><u>Tasks included:</u> Responsible for practical tutorials and marking of 1st year medical students. Included zoology and botany.</p>
<p><b>January 2006 – November 2010 (part time)</b></p>	<p>Codeon Networking CC</p>	<p>Co-founder and web developer</p> <p><u>Tasks included:</u> Small business owner, responsible for all facets of the business. Self-taught HTML, CSS, PHP and MySQL. Won and produced two medium enterprise websites serving the gaming</p>

Date	Company	Roles and Responsibilities
		community. Websites required user profiles & permissions, CMS system and automated payment options as functionality. Development and maintenance of a user database and account management system.

## PROJECT EXPERIENCE

Project experience includes project management, EIA, BA and EMPr documentation development, integrated water use license applications, general authorisations, specialist botanical and ecological impact assessments, specialist wetland delineation and impact assessments, GIS applications and mapping, compliance auditing and monitoring, vegetation rehabilitation and monitoring plans, integrated waste management plans and waste licencing, mining right & permits, as well as prospecting rights applications.

Industry experience includes the waste sector (IWMP's and waste licencing), road and rail infrastructure (BAR, S&EIR, WUL/GA, Waste Licence), ports and harbours (management plans), private sector clients across varying industries (various permits), mining sector (BAR, S&EIR, mining permits and rights, prospecting rights), conservation sector (biodiversity plans), renewable energy industry (BAR, S&EIR) as well as the gas and oil industry (biodiversity reports).

## RENEWABLE POWER GENERATION PROJECTS: SOLAR ENERGY FACILITIES

### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Enel Paleisheuwel Solar compliance auditing, Paleisheuwel, Northern Cape	Enel Green Power RSA (EGP RSA)	Environmental consultant

## RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES

### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
G7 Brandvalley S&EIR, Matjiesfontein, Northern Cape	G7 Renewable Energy (Pty) Ltd	Environmental consultant
G7 Rietkloof S&EIR, Matjiesfontein, Northern Cape	G7 Renewable Energy (Pty) Ltd	Environmental consultant

## Basic Assessments

Project Name & Location	Client Name	Role
G7 Renewable Energy 132kV BAR & EMPr, Matjiesfontein, Northern Cape	G7 Renewable Energy (Pty) Ltd	Project Manager, Environmental consultant, Public Participation

## Compliance Advice and ESAP reporting

Project Name & Location	Client Name	Role
Biotherm Energy Golden Valley Wind Energy Facility ESAP, Bedford, Eastern Cape	Biotherm Energy Pty Ltd	Environmental consultant

## Amendments

Project Name & Location	Client Name	Role
Mosselbay Energy EA Amendment, Mosselbay, Western Cape	Mosselbay Energy IPP (Pty) Ltd	Environmental consultant

### **GAS PROJECTS**

#### **Screening Studies**

Project Name & Location	Client Name	Role
iGas integrated biodiversity screening, Saldanha, Western Cape	Central Energy Fund - iGas (subsidiary)	Environmental consultant, Faunal specialist (assistant)

### **MINING SECTOR PROJECTS**

#### **Environmental Impact Assessments and Environmental Management Programmes**

Project Name & Location	Client Name	Role
Triton Minerals Limited Ancuabe and Nicanda Hills EPDA, Ancuabe, Cabo Del Gado Province, Mozambique	Triton Minerals Ltd	Environmental consultant
Ancuabe graphite mine Environmental and Social Impact Assessment (ESIA), Cabo Del Gado Province, Mozambique	Grafex Limitada Mozambique	Environmental consultant

#### **Basic Assessments**

Project Name & Location	Client Name	Role
SANRAL material sourcing BAR (DMR), Hendrina, Mpumalanga Province	SANRAL SOC Ltd & Leo consulting engineers	Project Manager, Environmental consultant, Public Participation
SANRAL Bierspruit R510 Borrow Pit authorisation, Thabazimbi, Limpopo Province	SANRAL SOC Ltd & Royal HaskoningDHV South Africa	Project Manager, Environmental consultant, Ecological specialist, Public Participation
Almenar tin prospecting BAR, Carnarvon, Northern Cape	Almenar Property Investments (Pty) Ltd	Environmental consultant

#### **Rehabilitation Studies**

Project Name & Location	Client Name	Role
Ancuabe baseline vegetation monitoring assessment and programme, Ancuabe, Cabo Del Gado Province, Mozambique	Grafex Limitada Mozambique	Botanical specialist
Prospecting pit rehabilitation programme, Ancuabe, Cabo Del Gado Province, Mozambique	Grafex Limitada Mozambique	Botanical specialist, Environmental consultant
Mayfield Quarry rehabilitation plan, Grahamstown, Eastern Cape	Mayfield Quarry	Environmental consultant

#### **Environmental Compliance, Auditing and ECO**

Project Name & Location	Client Name	Role
Construction monitoring and DMR environmental authorisation, Hendrina, Mpumalanga Province	SANRAL SOC Ltd & Leo consulting engineers	Project Manager, ECO,



SANRAL Caledon N2 Section 3 road upgrade ECO Audits and Reporting, Caledon, Western Cape Province	JG Afrika Engineering	Project Manager, ECO
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#### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

Project Name & Location	Client Name	Role
VMC Mining permit renewal application, Rust De Winter, Gauteng	Vergenoeg Mining Company (Pty) Ltd	Environmental consultant
Zirco Resources Kamiesberg heavy mineral sand mine water use licence, Kamiesberg, Northern Cape	Zirco Roode Heuwel (Pty) Ltd	Environmental consultant

#### **INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)**

##### **Environmental Impact Assessments and Environmental Management Programmes**

Project Name & Location	Client Name	Role
S&EIR authorisation for the SANRAL Zandkraal-Windburg N1 road upgrade, Windburg, Free State Province	SANRAL SOC Ltd & SMEC Consulting Engineers	Project Manager, Environmental consultant, Public Participation
Thabazimbi Local Municipality Integrated Waste Management Plan, Thabazimbi, Limpopo Province	Thabazimbi Local Municipality & Anglo American Plc	Environmental consultant, Public Participation

##### **Basic Assessments**

Project Name & Location	Client Name	Role
SANRAL Masekwaspoort N1 Road Upgrade BA, Louis Trichardt, Limpopo Province	SANRAL SOC Ltd & Knight Piésold Consulting	Project Manager, Environmental consultant, Public Participation
SANRAL Polokwane N1 Ring Road Upgrade Basic Assessment, Polokwane, Limpopo Province	SANRAL SOC Ltd & KBK Engineers	Environmental consultant
Boshoek Loop Rail Upgrade BAR, Rustenburg, North-West Province	Transnet SOC Ltd	Project Manager, Environmental consultant, Wetland specialist, Public Participation
Heysterkrand Loop Rail Upgrade BAR, Rustenburg, North-West Province	Transnet SOC Ltd	Project Manager, Environmental consultant, Public Participation
SANRAL Bierspruit R510 road upgrade Basic Assessment, Thabazimbi, Limpopo Province	SANRAL SOC Ltd & Royal HaskoningDHV South Africa	Project Manager, Environmental consultant, Ecological specialist, Public Participation
Barberton IAPS Waste Water Treatment Works development BAR, Barberton, Mpumalanga Province	Umjindi Local Municipality and Rhodes University	Project Manager, Environmental consultant, Public Participation
SANRAL Caledon N2 Section 3 road upgrade project Basic Assessment, Caledon, Western Cape Province	JG Afrika Engineering	Project Manager, Environmental consultant, Ecological specialist, ECO

##### **Environmental Compliance, Auditing and ECO**



Project Name & Location	Client Name	Role
Construction Monitoring and DMR environmental authorisation, Hendrina, Mpumalanga Province	SANRAL SOC Ltd & Leo consulting engineers	Project Manager, Environmental consultant, ECO

#### Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Water use licence for the SANRAL Zandkraal-Windburg N1 road upgrade and quarrying, Windburg, Free State Province	SANRAL SOC Ltd & SMEC Consulting Engineers	Project Manager, Environmental consultant, Public Participation
SANRAL Masekwaspoort N1 road upgrade water use licence application, Louis Trichardt, Limpopo Province	SANRAL SOC Ltd & Knight Piésold Consulting	Project Manager, Environmental consultant, Public Participation
Boshhoek Loop Rail Upgrade water use licence application, Rustenburg, North-West Province	Transnet SOC Ltd	Project Manager, Environmental consultant, Wetland specialist, Public Participation
SANRAL Bierspruit R510 road water use licence, Thabazimbi, Limpopo Province	SANRAL SOC Ltd & Royal HaskoningDHV South Africa	Project Manager, Environmental consultant, Ecological specialist, Public Participation
Barberton IAPS Waste Water Treatment Works water use licence and SASS 5 assessment, Barberton, Mpumalanga Province	Umjindi Local Municipality and Rhodes University	Project Manager, Environmental consultant, Aquatic specialist, Public Participation
SANRAL Caledon N2 Section 3 road upgrade water use licence and specialist reports, Caledon, Western Cape Province	JG Afrika Engineering	Project Manager, Environmental consultant, Ecological specialist, Public Participation

#### HOUSING AND URBAN PROJECTS

##### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Scoping and EIR authorisation, Water Use Licence, for the Ganspan tourism facility development, Jan Kempdorp, Northern Cape	Frances Baard Local Municipality	Project Manager, Environmental consultant, Public Participation

##### Basic Assessments

Project Name & Location	Client Name	Role
Basic Assessment for the office complex development within the Pretoria National Botanical Gardens, Pretoria, Gauteng	South African National Biodiversity Institute (SANBI)	Project Manager, Environmental consultant, Public Participation, ECO
Corner Berg and Drooge Street township development BAR, Zeerust, North-West Province	Ramotshere Moiloa Local Municipality	Project Manager, Environmental consultant, Public Participation

Corner Kort and Bree Street township development BAR, Zeerust, North-West Province	Ramotshere Moiloa Local Municipality	Project Manager, Environmental consultant, Public Participation
Hope Village township development BAR, Johannesburg, Gauteng	Door of Hope Charity Organisation	Project Manager, Environmental consultant, Public Participation
ACSA Jones Road Filling Station Basic Assessment, Johannesburg, Gauteng	Airports Company South Africa SOC Ltd	Project Manager, Environmental consultant, Public Participation

### Screening Studies

Project Name & Location	Client Name	Role
Kibler Park Church Development ecological assessment, Johannesburg, Gauteng	Riverside Community Church	Project Manager, Ecological specialist
DEA Quoin Point dune specialist assessments, Gansbaai, Western Cape	Department of Environmental Affairs (national)	Project Manager, Environmental consultant

### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Transnet Depot and Siding compliance auditing programme, Johannesburg, Gauteng & Rustenburg, North-West Province	Transnet SOC Ltd	ECO
Environmental compliance monitoring for the office complex development within the Pretoria National Botanical Gardens, Pretoria, Gauteng	South African National Biodiversity Institute (SANBI)	Project Manager, Environmental consultant, Public Participation, ECO

### Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Atmospheric Emissions Licence, Section 24G for the ER Galvanizing plant and operations, Johannesburg, Gauteng	ER Galvanizers Pty Ltd	Project Manager, Environmental consultant, Public Participation
City of Johannesburg nature reserve proclamation (Phase II), Johannesburg, Gauteng	City of Johannesburg SOC Ltd	Project Manager, Environmental consultant, Public Participation, Botanical specialist
Hope Village township development water use licence, Johannesburg, Gauteng	Door of Hope Charity Organisation	Project Manager, Environmental consultant, Public Participation
Diamond Park Township Development Section 24G, Kimberley, Northern Cape	Sol Plaatje Local Municipality	Project Manager, Environmental consultant, Public Participation
Boschendal Wine Estate hydro-electric power station Water Use Licence and S24G application, Stellenbosch, Western Cape	Boschendal Wine Estate	Environmental consultant

Project Name & Location	Client Name	Role
City of Johannesburg nature reserve proclamation boundary verification (Phase I), Johannesburg, Gauteng	City of Johannesburg SOC Ltd	Environmental consultant
PRDW Cape Town harbour breakwater rehabilitation EMPr, Cape Town, Western Cape	PRDW Engineering	Project Manager, Environmental consultant
PRDW Bushman's Estuary dune encroachment project management, Kenton-on-sea, Eastern Cape	PRDW Engineering	Environmental consultant
Corner Berg and Drooge Street township development water use licence application, Zeerust, North-West Province	Ramotshere Moiloa Local Municipality	Project Manager, Environmental consultant
Corner Kort and Bree Street township development water use licence, Zeerust, North-West Province	Ramotshere Moiloa Local Municipality	Project Manager, Environmental consultant
Bloekombos (Kraaifontein) hospital water use licence application, Cape Town, Western Cape	Western Cape Provincial Government (PGWC)	Project Manager, Environmental consultant, Botanical specialist, Wetland specialist

#### **SPECIALIST STUDIES**

Project Name & Location	Client Name	Role
Boshoek Loop Rail Upgrade BAR and Water Use Licence, Rustenburg, North-West Province	Transnet SOC Ltd	Wetland specialist
City of Johannesburg nature reserve proclamation (Phase II), Johannesburg, Gauteng	City of Johannesburg SOC Ltd	Botanical specialist
SANRAL Bierspruit R510 road upgrade Water Use Licence, Basic Assessment, Thabazimbi, Limpopo Province	SANRAL SOC Ltd & Royal HaskoningDHV South Africa	Ecological specialist
Kibler Park Church Development Ecological Assessment, Johannesburg, Gauteng	Riverside Community Church	Ecological specialist
Barberton IAPS Waste Water Treatment Works development BAR, water use licence and SASS 5 assessment, Barberton, Mpumalanga Province	Umjindi Local Municipality and Rhodes University	Aquatic specialist
Wijnberg Trust Dam 2 expansion Aquatic Impact Assessment, Greyton, Western Cape	Wijnberg Trust	Aquatic specialist
SANRAL Caledon N2 Section 3 road upgrade project Basic Assessment, Water Use Licence and Specialist reports, Caledon, Western Cape Province	JG Afrika Engineering	Ecological specialist
City of Johannesburg nature reserve proclamation boundary verification (Phase I), Johannesburg, Gauteng	City of Johannesburg SOC Ltd	GIS specialist
iGas integrated biodiversity screening, Saldanha, Western Cape	Central Energy Fund - iGas (subsidiary)	Faunal specialist (assistant)
Bloekombos (Kraaifontein) botanical baseline and impact assessment, Cape Town, Western Cape	Western Cape Provincial Government (PGWC)	Wetland specialist Botanical specialist



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