ENVIRONMENTAL MANAGEMENT PROGRAMME

FOR THE

PROPOSED ONION DEHYDRATION PLANT ON PORTION 26 OF FARM 817 MALMESBURY

2ND DRAFT

MARCH 2018

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eco impact Environmental Health & Safety Legal Consulting	**Title:** **PROPOSED ONION DEHYDRATION PLANT ON PORTION 26 OF FARM 817 MALMESBURY** **2nd DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME**

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Verification	Capacity	Name	Signature	Date
By Author(s):	Senior EAP	Jessica Le Roux		14 March 2018

COMMITMENT AND DECLARATION OF UNDERSTANDING BY CONTRACTOR AND DEVELOPER FOR THE PROPOSED ONION DEHYDRATION PLANT ON PORTION 26 OF FARM 817 MALMESBURY

I, the undersigned …….., as duly authorized by the Contractor, have studied and understand the contents of this document. On behalf of the Contractor, I confirm that the Contractor undertakes to adhere to the conditions as set out herein, unless specifically otherwise agreed to in writing.

Signed at ……. on this …….. Day of …….20……

…….
For Contractor

I, the undersigned ……, as duly authorized by the Developer have studied and approve the contents of this document on behalf of the Developer, for implementation by all Contractors involved at the site.

Signed at ……. on this …….. day of …….20…….

…….
Developer's Representative

DEFINITIONS

Auditing:	A systematic and objective assessment of an organization's activities and services conducted and documented on a periodic basis based to a (e.g. ISO 19011:2011) standard.
Biodiversity:	The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.
Contractor:	An employer, as defined in section 1 of the Occupational Health and Safety Act 85 of 1993, who performs construction work and includes principal contractors
Environment:	A place where living, non-living and man-made features interact, and where life and diversity is sustained over time.
Evaporation:	The change by which any substance (e.g. water) is converted from a liquid state into and carried off as vapour.
Developer:	One who builds on land or alters the use of an existing building for some new purpose
Independent:	Is independent and has no interest in any business related to the development site, nor will receive any payment or benefit other than fair remuneration for the task undertaken
Groundwater:	Subsurface water in the zone in which permeable rocks, and often the overlaying soil, are saturated under pressure equal to or greater than atmospheric.
Landowner:	Holder of the estate in land with considerable rights of ownership or, simply put, an owner of land
Monitoring:	A systematic and objective observation of an organisation's activities and services conducted and reported on regularly.
Monitoring programme:	A programme for taking regular measurements of the quantity and quality of a water resource, waste or wastewater discharge at specified intervals and at specific locations to determine the chemical, physical and biological nature of the water resource, waste or wastewater discharge.
Natural vegetation:	All existing vegetation species, indigenous or otherwise, of trees, shrubs, groundcover, grasses and all other plants found growing on a site.
Pollution:	The result of the release into air, water or soil from any process or of any substance, which is capable of causing harm to man or other living organisms supported by the environment.
Protected Plants:	Plant species officially listed under the Threatened or Protected Species regulations as well as on the Protected Plants List (each province has such a list), and which may not be removed or transported without a permit to do so from the relevant provincial authority.
Red Data Species:	Plant and animal species officially listed in the Red Data Lists as being rare, endangered or threatened.
Rehabilitation:	Making the land useful again after a disturbance. It involves the recovery of ecosystem functions and processes in a degraded habitat. Rehabilitation does not necessarily re-establish the pre-disturbance condition, but does involve establishing geological and hydro logically stable landscapes that support the natural ecosystem mosaic.
Site:	Property or area where the proposed development will take place

ACRONYMS

DEA&DP:	Department of Environmental Affairs and Development Planning
DWS:	Department of Water and Sanitation
ECO:	Environmental Control Officer
EA:	Environmental Authorisation
EIA:	Environmental Impact Assessment
EM:	Environmental Manager
EMP:	Environmental Management Programme
EO:	Environmental Officer
ER:	Engineer's Representative
I&AP:	Interested and Affected Party
IEM:	Integrated Environmental Management
MS:	Method Statement
PM:	Project Manager
SANS:	South African National Standards

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DEVELOPER'S COMMITMENT

The Du Toit Agri (Pty) Ltd / CBI Invest group ("DTA") has committed itself to a set of values that include the maintenance of good relations and transparent communications with all stakeholders, and the dynamic engagement of the larger community.

DTA undertakes to implement suitable management systems for all the areas and aspects of this operation. This will ensure that development itself and management of the project will comply with legal, technical, environmental and transformation policies and standards.

DTA, in drafting this EMP for implementation, intends to enable continuous improvement in legal compliance and the sustainable operation of the site.

The EMP intends to change the way in which the owners, the construction process they have commissioned and the contractor plan for and manage resources to achieve sustainability.

The satisfactory implementation of the EMP on site will require both the full support and commitment of all personnel.

CHAPTER 1

1.1. Executive Summary

This EMP has been prepared principally in compliance with the requirements of section 24N and Section 34 of the National Environmental Management Act 107 of 1998. This document, together with the conditions in the Environmental Authorisation, must be adhered to.

The EMP must be included as part of all contract documentation for all contractors in the construction phase of the development.

The Author and Eco Impact Legal Consulting (Pty) Ltd ("Eco Impact")

Eco Impact is an independent consulting company and has no interest in any business related to the development site, nor will it receive any payment or benefit other than fair remuneration for the task undertaken, as required in terms of the NEMA Regulations.

This report has been prepared by Jessica Le Roux, of Eco Impact, an environmental consultancy, engaged in providing professional services in the field of environmental planning, -systems, -auditing and -biodiversity assessment and -management.

Jessica has a BSc (Honours) in Environmental and Geographical Science in 2011 from the University of Cape Town and subsequently obtained her MSc in Zoology in 2013.

Jessica has trained as an Environmental Assessment Practitioner since August 2013 and has been involved in the compilation, coordination and management of Basic Assessment Reports, Environmental Impact Assessments, Environmental Management Programmes, Waste Licence Applications, Water Use Licence Applications and Baseline Biodiversity Surveys for numerous clients.

DTA has appointed Eco Impact to prepare an Environmental Management Programme that meets the technical standards as required by DEA&DP.

1.2. Project Description

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act, 107 of 1998.

ACTIVITY DESCRIPTION

BUILDINGS AND PROCESS

The proposed onion processing facility will be a steel framed structure of approximately 6300 m^2, with an additional 7 395 m^2 of paving and concrete loading and circulation hardstanding. The building will comprise a main process shed, cold stores, finished product storage and dispatch as well as office, staff and plant facilities.

The proposed onion processing facility is designed to dehydrate 15 000 tons of fresh onions per annum. This translates to 3 000 kg of fresh onions per hour. Incoming onions have a moisture content of approximately 80 to 85% and final dehydrated product will have a moisture content of 5%. The intent is to process 100% of the incoming onions. The factory will produce dehydrated onion in three formats – granulated, minced and powdered. The raw materials consist of onions only. The onions will be delivered in wooded crates containing about 420kg of onions. The onions will be delivered by truck which is offloaded by forklifts. The onions will be dumped from the bins into a receiving hopper where they will be elevated into a cleaning and washing process. The cleaning process will remove stones, sticks and other debris that was collected during harvesting. The washing process will remove other items that might cling to the onions. After washing the onions are inspected for quality – poor quality onions are manually removed and collected in waste bins. Poor quality onions will be returned to the suppliers on neighbouring farms. After inspection the onions are conveyed to the top and tail section where the root and stem sections of the onions is removed. The tops and tails are collected for further processing later in the plant. The rest of the onion is then conveyed to the peeler. Peels are also collected for further processing. The peeled onions pass through a slicer to reduce the overall particle size to facilitate the drying process.

The drying process consists of heated air being passed through a layer of sliced onions – the heat removing the moisture by evaporation. The dryer comprises three stages; each subsequent stage having a lower temperature to prevent damage to the onions as the moisture content decreases. Three metal conveyor belts slowly transport the onion layer through the length of the dryer. The air is heated by passing steam though a heat exchanger on the air circulation loop. The air temperature, the belt speed, the layer thickness and other factors can be controlled to provide optimum drying to achieve the desired final moisture content.

Fresh air is continuously feed into the dryer and an equal amount of air is discharged through a filtration system to remove any dust particles.

After dehydration, the onion particles are conveyed to size reduction machines to produce three products. The size reduction machines use either a method of automated cutting or milling to achieve the required particle sizes. The particles are sieved to remove oversized or undersized particles. Both under- and oversized particles are reused. When a particular product is produced, the tops and tails and the skins which were previously collected are introduced to the dryer. The final particles of correct dimension are packed into either 1-ton bulk bags or 25 kg bags. Final products are stored in the finished goods store. Due to the loss of water, final plant output is approximately 500 kg per hour.

The factory will be designed to meet food production GMP standards and all building finishes and materials of construction are selected to be compliant with good food production standards.

STORMWATER

All stormwater run-off from the roofs of the buildings and the proposed new hard surfaces will be collected via a minor system of piped stormwater reticulation and directed to the new stormwater detention pond. The detention pond will be adequately sized to cope with a 1:50 year recurrence interval storm event and to attenuate the post-development inflow and release outflow at a pre-development rate. The stored volume in the detention facility will also be utilised for re-irrigation of the landscaped zones around and within the new facility. Overflow from the pond will be managed via a

suitably graded and profiled vegetated swale, which will discharge into the existing box culvert below the N7.

BLACK/GREY SEWAGE

There will be a sewer system for black/grey sewage. Black and grey sewer from the staff ablutions, kitchens etc., will be reticulated via an underground piped system to a Scarab package treatment plant situated on the southern boundary. This plant will process the raw sewerage into a state that is suitable for irrigation. The purified outflow from the package plant will be conveyed through a dedicated open vegetated swale into the detention pond. The vegetated swale will further purify and aerate the treated outflow.

PROCESS EFFLUENT

The internal wash-down water and the liquid extracted from the dehydration process will discharge via an underground piped system to a small aeration pond. This effluent will be aerated by a pump and fountain to provide a degree of purification before passing through the vegetated open swale into the detention pond.

The anticipated flow of treated effluent water into the detention pond from the abovementioned systems (sewage and effluent) will be in the order of 1200 litres per hour.

WATER

There is no mains supply of potable water to the site. However, the site has two boreholes currently in use, both of which are producing groundwater for irrigation purposes. This groundwater will be filtered and harvested to a series of storage tanks. The stored groundwater will be treated with either a UV system or RO system to ensure that the water is suitable for human consumption. The water will be used for consumption as well as fresh product washing prior to dehydration.

ROADS

The new access to the du Toit farm “Skaapkraal” off the N7 will be relocated to the grade separated intersection presently being constructed. At this intersection, access will be provided off the N7 overpass to both the Du Toit farm (west side of N7) and the Rainbow Chicken facility (east side of N7), with on/off ramps and an underpass link. The access to the Onion Dehydration Facility on Portion 26 will be taken northwards off the new Du Toit farm entrance, within the farm property, and the access road will be aligned northwards and then westwards around existing onion plantations to the proposed site, approximately 900m from the main entrance. The internal access road to the facility is anticipated to be an 8m wide road, either paved or surfaced, and vehicles would circulate through the new facility before exiting via the same internal access.

CHAPTER 2

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act 107 of 1998.

It deals with issues relating to the implementation of the EMP.

2.1 Organizational Structure

The organizational structure identifies and defines the responsibilities and authority of the various persons and organizations involved in the project. All instructions and official communications regarding environmental matters must follow the organizational structure.

The Environmental Official (EO), to whom the Engineer's Representative (ER) and/or Environmental Control Officer (ECO) must report and interact, must be the responsible client representative.

The EMP must be an agenda item at the monthly site and operations meetings and the responsible client representative(s) may attend these meetings in order to provide input with respect to compliance with the EMP.

2.2 Responsibilities and Functions of the Environmental Control Officer

The ECO will be responsible for monitoring, reviewing and verifying compliance with the EMP and/or EA by all contractors and site management during site visits.

The ECO duties in this regard will include the following:

With the assistance, where necessary of the ER, to ensure all necessary environmental authorizations and permits have been obtained and are available and visible on site at the ER offices.

- monitor and verify that the EMP and/or EA is adhered to at all times and by taking action if the specifications are not followed;
- monitor and verify that environmental impacts are kept to a minimum;
- review and approve construction method statements, with input as appropriate from the ER;
- assist the contractor in finding environmentally responsible solutions to problems;
- report on the environmental issues at the site meetings and other meetings that may be called regarding environmental matters, if requested by ER;
- inspect the site and surrounding areas regularly with regard to compliance with the EMP and/or EA;
- monitor the environmental awareness training for all personnel coming onto site;
- advise management on the removal of person(s) and/or equipment not complying with the specifications, after collaboration with the ER. Recommendations must be recorded by the ER in Site Instruction Book.
- ensure that activities on site comply with known legislation of relevance to the environment;
- recommend the issuing of penalties via the developer for contraventions of the EMP and/or EA;
- keep a photographic record of progress on site from an environmental perspective; and
- Undertake a continual internal review of the EMP and/or EA and submit a report to the developer and the responsible DEA&DP Environmental Official as according to EA conditions.

2.3 Agreed Work Plan and Site Visit Schedule of ECO

After initial construction start-up site visit it is recommended that an ECO site visit be conducted once a month during construction.

Information recording activity on site, and any guidelines or instructions emanating there from will be routinely made available electronically to the developer and applicable contractors and a copy of the report must be available at the site office.

Clearly matters of urgency or immediate action may be channelled appropriately on an urgent basis.

2.4 Site Manager

The site manager will have the following environmental control responsibilities:

- In conjunction with the ECO will present the environmental education programs to all persons employed on site.
- Consult with the ECO, landowner, developer and any contractor to resolve all environmental issues.
- Issue any instructions from the ECO to the management team via a formal site instruction book or appropriate management tool used for the purpose.
- Take responsibility for the penalty system. The ECO and developer recommendations must be considered when deciding whether or not to impose a penalty.
- The engineer will, via the ECO actions, be accountable for the overall implementation of the Environmental Management Programme.
- Keep a site diary and complaints register.

2.5 Contractors

As part of any tender, the tendering contractor must submit a first draft of a contractor's programme, to the developer which must include the environmental considerations to be followed prior to appointment.

The appointed Contractor's representative will have the following responsibilities:

- Ensure that all staff is familiar with the Environmental Management Programme, which explains the environmental policy for the project.
- Allow for sufficient time between surveying the exact locations where services will be intended and actual construction, for the ECO to facilitate and instruct for the removal of plants, seeds and cuttings if necessary.
- The contractor must keep his personnel fully aware of environmental issues and ensure they show adequate consideration to all environmental aspects.
- Establish environmental signs to be erected on the construction site at locations identified by the ECO and approved by the engineer.
- Be responsible for the cost of the restoration of any damage caused, in environmentally sensitive areas, as a result of contractor responsibility regarding negligence. This must be done in accordance with the engineer / ECO's specifications.
- Take responsibility and active steps to avoid any increase in the fire hazard.
- The contractor must take responsibility for implementing all the relevant provisions of the EMP, or if he encounters difficulties with the specifications, he must discuss alternative approaches with the ECO and engineer prior to proceeding.

Failure to comply with the EMP may result in the application of fines as set out, and any reported non-compliance may result in the suspension of work or termination of a contract.

2.6 Record keeping of activities, inclusive of recording of non-compliances and corrective actions

The site must keep a record of all activities relating to environmental matters on site, including:

- Meetings attended;
- Method statements received and approved;
- Issues arising on site;
- Cases of non-compliance with the EMP;
- Corrective action taken and penalties issued.

This information will be recorded in an appropriate manner in a site diary, registers, issues/warning book, etc.

2.7 Compliance with other legislation

It is important that all on site staff are aware of other relevant legislation that may relate to the activities taking place on site, especially local authority required compliances.

CHAPTER 3

Applicable Legislation, Policy and Environmental Principles

3.1 Applicable Legislation Identified

1. ADVERTISING ON ROADS AND RIBBON DEVELOPMENT ACT, 21 OF 1940
2. BASIC CONDITIONS OF EMPLOYMENT ACT, 75 OF 1997
3. COMPENSATION FOR OCCUPATIONAL INJURIES AND DISEASES ACT, 130 OF 1993
4. CONSERVATION OF AGRICULTURAL RESOURCES ACT, 43 OF 1983
5. CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996
6. ENVIRONMENT CONSERVATION ACT, 73 OF 1989, WESTERN CAPE NOISE CONTROL REGULATIONS
7. EMPLOYMENT EQUITY ACT, 55 OF 1998
8. ENVIRONMENT CONSERVATION ACT, 73 OF 1989
9. FENCING ACT, 31 OF 1963
10. HAZARDOUS SUBSTANCES ACT, 15 OF 1973
11. LABOUR RELATIONS ACT, 66 OF 1995
12. NATIONAL HEALTH ACT 61 OF 2003
13. NATIONAL HEALTH ACT 61 OF 2003 REGULATIONS RELATING TO THE MANAGEMENT OF HUMAN REMAINS
14. NATIONAL BUILDING REGULATIONS AND BUILDING STANDARDS ACT, 103 OF 1977
15. NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 107 OF 1998
16. NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT, 39 OF 2004
17. NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 10 OF 2004
18. NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 59 OF 2008
19. NATIONAL FORESTS ACT, 84 OF 1998
20. NATIONAL HERITAGE RESOURCES ACT, 25 OF 1999
21. NATIONAL VELD AND FOREST FIRE ACT, 101 OF 1998
22. NATIONAL WATER ACT, 36 OF 1998
23. OCCUPATIONAL HEALTH AND SAFETY ACT, 85 OF 1993
24. TOBACCO PRODUCTS CONTROL ACT, 83 OF 1993
25. WATER SERVICES ACT, 108 OF 1997
26. SWARTLAND LOCAL MUNICIPALITY AIR QUALITY BY-LAW, 2015
27. SWARTLAND LOCAL MUNICIPALITY CONTROL OF BOUNDARY WALLS AND FENCES ON STREETS AND PUBLIC OPEN SPACES BY-LAW, 2003
28. SWARTLAND LOCAL MUNICIPALITY DILAPIDATED BUILDINGS AND UNSIGHTLY AND OBJECTIONABLE STRUCTURES BY-LAW, 2002
29. SWARTLAND LOCAL MUNICIPALITY ELECTRICITY SUPPLY BY-LAW, 2014
30. SWARTLAND LOCAL MUNICIPALITY FIRE SAFETY BY-LAW, 2014
31. SWARTLAND LOCAL MUNICIPALITY OUTDOOR ADVERTISING AND SIGNAGE BY-LAW, 2015
32. SWARTLAND LOCAL MUNICIPALITY PUBLIC NUISANCES BY-LAW, 2015
33. SWARTLAND LOCAL MUNICIPALITY ROADS AND STREETS BY-LAW, 2014
34. SWARTLAND LOCAL MUNICIPALITY STORM WATER MANAGEMENT BY-LAW, 2014
35. SWARTLAND LOCAL MUNICIPALITY WASTE MANAGEMENT BY-LAW, 2011
36. SWARTLAND LOCAL MUNICIPALITY WATER SERVICES BY-LAW, 2014

CHAPTER 4

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act, 107 of 1998.

Compliance

4.1 Monitoring and Auditing

4.1.1 Introduction

In keeping with current environmental and associated legislation, all environmental management procedures and actions must be reviewed and refined on an ongoing basis.

This is in accordance with the dynamic nature of environmental management and allows for the timeous identification and mitigation of issues as they come to light.

The process of review and refinement, built into the requirements of the EMP, is known as monitoring and auditing.

4.1.2. Roles and Responsibilities

Efficient implementation of the performance specifications, effective monitoring and auditing, as well as clear responsibility and accountability allocation requires that various role-players be defined for the construction implementation project.

Depending on the nature and scale of a project, implementing teams could be composed of any number of role-players, each with their own specified responsibilities.

Therefore, for the purpose of this document, the following role-players are defined, based purely on responsibility and accountability allocation. The actual designation of role-players may vary, but the responsibilities will largely remain as stated.

4.1.2.1. Developer/landowner or custodian of the land

The developer/landowner or custodian of the land is the person or organization with decision making capacity for the land in question, and thus ultimately accountable for what takes place on that land.

4.1.2.2. Contractor

Contractors are appointed to undertake the works as specified in the contract. It is the responsibility of the contractor to do whatever is necessary from their side to ensure that he or an appointed advisor is well versed in environmental studies, so that they may accurately and efficiently carry out the requirements of the environmental specification.

The contractor is liable for any and all remedial work required in terms of the environmental specification, resulting from his environmental negligence, mismanagement and / or non-compliance.

4.1.2.3. Environmental Control Officer

An environmental control officer will manage and undertake monthly environmental inspections for the duration of the construction phase of the project as required.

The contractors or line management are answerable to the ECO for non-compliance. Issues of non-compliance raised by the ECO/EO must be taken up by the project manager, and resolved as per the conditions of his contract.

Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation and not allowed for in the performance specification) must be endorsed by the project manager.

4.2 The Monitoring Procedure

Environmental monitoring is the continuous evaluation of the status and condition of environmental elements. Its purpose is to detect change that takes place in the environment over time and involves the measuring and recording of physical, social and economic variables associated with development impacts.

Many techniques for environmental monitoring have been proposed, each detailing a specific protocol. Regardless of which technique is used, the ultimate aim is that each environmental management specification be checked by means of a system in which a score may be allocated for:

- Full compliance;
- Satisfactory performance;
- Unsatisfactory performance and
- No action taken.

Completed monitoring reports will be submitted to the project engineer, developer/landowner and the contractor, who will attend to issues. These reports must be kept on file and be made available upon request by any environmental authority requesting such.

All persons employed, the contractor or his sub-contractors, must abide by the requirements of these performance specifications as they apply to the works. Any employees, the contractor or his sub-contractors found to be in breach of any of the environmental specifications, may be ordered to vacate the site forthwith and/or be subject to a disciplinary process.

The order may be given orally or in writing by the ECO. Confirmation of an oral order will be given as soon as practicable, but lack of confirmation in writing must not be a cause for the offender to remain on site, or not be subject to a disciplinary process. Supervisory staff, the contractor or his sub-contractor may not direct any person to undertake any activities which would place such person in contravention of the EMP, legislation and specifications.

The contractor and staff are deemed not to have complied with the performance specifications if:

- There is evidence of wilful or accidental contravention of any specification included in the specification;
- There is evidence of the contractor carrying out activities not permitted in terms of the EMP, contract and / or the specification;
- There is evidence of environmental negligence and / or mismanagement resulting in negative impacts on the environment;
- Has failed to meet with the requirements of the approved schedule.

The contractor and developer/landowner will be informed via ECO monthly reports, as well as by means of direct instruction (if necessary) as to what corrective actions are required in terms of environmental compliance.
Disregard for an instruction, and failure to respond adequately to complaints from the public will be construed as non-compliance. Non-compliance may lead to parties being penalised.

In more serious cases, the ECO may give notice, and halt operations until such a time that the corrective action is taken and the site complies with the performance specifications.

In cases of persistent non-compliance, the contractor or staff may be evicted from site after disciplinary process is followed. Only the developer/landowner may issue such instruction, retaining any costs required to remedy situations perpetuated by environmental negligence, mismanagement and / or non-compliance.

4.3 The Auditing Procedure

Environmental auditing is the process of comparing the impacts predicted with those which have actually occurred during implementation.

An environmental performance audit examines and assesses practices and procedures which, in the event of failure, would cause an environmental impact or result in an environmental risk. During each of the lifecycle phases, various issues will be monitored. The performance audit will ensure that the monitoring was correctly undertaken and that compliance was best achieved.

To these ends the project will be audited versus this EMP for effectiveness. ISO/SANS 19011:2011 auditing standards will be applied.

Audits will be undertaken at completion of the construction phases. Audit reports will be submitted to management, who will attend to all noted issues.

These reports must be kept on record and be made available upon request by the developer/landowner/custodian of the land and any environmental authority or I&AP requesting such.

4.4 Retentions and Penalties

It is recommended that a penalty retention system be combined with the penalty system to both motivate and compel the contractor to adhere to the EMP for the duration of the contract.

In this way incentives may be created to perform (i.e. in the form of the retention amounts that will only be paid to the contractor at the end of the contract), without creating the misunderstanding that adherence to the EMP is optional.

Persistent non-compliance will not only result in the contractor forfeiting any retention amount, but he will also be fined.

Of importance is that the contract specifies exactly how the penalty and retention system will operate, as well as how any funds resultant from retentions and penalties will be utilised.

All such funds must be used to improve environmental conditions on the site in general.

4.4.1. The Retention System

For this system, a percentage value for each of the sections priced for in the environmental bill of quantities is retained until the full completion of the contract works.

If the monitoring process reveals persistent and/or wilful non-compliance with any aspect of the environmental performance specifications, then the full retention associated with that particular item will be withheld.

The project may then apply these retained funds to rectify the problem on site possibly making use of other or alternate resources at his disposal.

At the end of the contract or action, all remaining environmental retention amounts will be paid out to the contractor or staff pending approval by the ECO, after having confirmed full compliance with the relevant performance and rehabilitation specifications.

4.4.2. Penalty System

A system of penalties will be introduced to reinforce environmentally sensitive and prudent behaviour. The maximum penalties that will be fined per incident that may be enforced are listed below. The penalty amount will be determined (inter alia) by the severity of the offence.

Offence	Amount
Non-compliance of EA or EMP condition	R 5 000.00 (ex VAT) per non-compliant act, per day until compliance is achieved
Casual Litter on site resulting from operation	R250 / offence / day
Disposal of any litter or construction material in non-specified area or by non-compliant means	R5000 / m^3 / per day
Dumping of cement, concrete, fuel or oil in an area or other than that authorised and suitable	R10 000 per offence / day
Failure to use portable / toilets	R100 / observed incident or evidence of human excrement on site

In addition to the above, all costs incurred by the client / developer to remedy any damage will be the responsibility of the offender.

Should the monitoring process reveal acts of persistent and / or wilful non-compliance with the environmental performance specifications, then the contractor or staff member will be fined according to the specified value of that item. The retention and penalty system should be adhered to.

4.5 Method Statements

Contractors must provide written statements for discussion with the ECO on environmentally sensitive aspects of the contract. Environmentally sensitive aspects include by example excavations, work close to sensitive areas, collection and storage of top soil and vegetation, erosion control, wash water control, waste control, etc.

CHAPTER 5

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act 107 of 1998.

5.1. Good Housekeeping

The developer/landowner will ensure the maintenance of “good housekeeping” practices during operations.

This will help avoid several disputes regarding responsibility and will allow for the smooth running of the operation as a whole.

Good housekeeping extends beyond the environmentally sensitive construction methods to include the care for and preservation of the surrounding environment.

5.2 Record Keeping

The developer/landowner will ensure that a filing system, identifying all documentation related to the EMP, is established.

A list of reports likely to be generated during the project is set out below.

All applicable documentation must be included in the environmental filing system catalogue or document retrieval index.

- Approved EMP, authorizations, licenses or permits;
- Final design documents and diagrams issued;
- All communications detailing changes of design/scope that may have environmental implications;
- Daily, weekly and monthly site monitoring reports;
- Complaints register;

- Environmental training manual;
- Environmental training attendance registers;
- Incident and accident reports;
- Emergency preparedness and response plans;
- Copies of all relevant environmental legislation;
- Permits and legal documents as part of emergency preparedness teams e.g. fire teams, etc.;
- Crisis communication manual;
- Disciplinary procedures;
- Monthly site meeting minutes during construction;
- All relevant permits;
- All method statements for all phases of the project.

5.3 Document Control

The developer/landowner will be responsible for establishing a procedure for document control.

The document control procedure must comply with the following requirements:

Documents must be identifiable by organisation, division, function, activity and contact person;
Every document must identify the person and their positions, responsible for drafting and compiling the document, for reviewing and recommending approval, and final approval of the document for distribution;

All documents must be dated, provided with a version number and reference number, filed systematically, and retained for a specified period.

The owner will ensure that documents are periodically reviewed and revised where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMP are performed. All documents will be made available to the external auditor.

5.4 Reporting Requirements

All advice and recommendations made by the ECO must with the project engineer/engineers compliance be recorded on site in the site instruction book/ suitable register for his attention.

All spills will need to be documented and reported to DWS and other relevant authorities. Any event resulting in the spill or leak of fuels or any other hazardous solvents into the ground and/or water courses (e.g. that of hazardous substances used during the construction or operational phase), must be reported to all relevant authorities, including DEA&DP Directorate: Pollution and Chemicals Management, within 14 (fourteen) days. This requirement is in terms of Section 30 (10) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) that pertains to the control of emergency incidents and should include the reporting, containment and clean-up procedure of such incident and the remediation of the affected area. All necessary documentation must be completed and submitted within the prescribed timeframes. Containment, clean-up and remediation must commence immediately in the case of NEMA Section 30 incidents.

CHAPTER 6

6.1. Public Communication Protocols

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act 107 of 1998.

The developer/landowner must be responsible for regulating public access to information and compliance reporting.

The developer/landowner must respond to third party or public queries and complaints.

The developer/landowner must also be responsible for maintaining the compliance register to record complaints received and action taken.

CHAPTER 7

This section of the report is included in compliance with Section 24 N 2 (d - g) and 3 (a - b) of the National Environmental Management Act 107 of 1998.

Goal for Planning and Design

Overall Goal for Planning and Design: Undertake the planning and design phase of the onion dehydration plant in a way that:

- Ensures that the design of the onion dehydration plant responds to the identified environmental constraints and opportunities.
- Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- Ensures that adequate regard has been taken of any landowner concerns and that these are appropriately addressed through design and planning (where appropriate).
- Ensures that the best environmental options are selected for the project.
- Enables the onion dehydration plant construction activities to be undertaken without significant disruption to other land uses in the area.
- In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE PD1: PRE-CONDITIONS

The following pre-conditions must be fully met before any construction activities may commence.

A site meeting between the contractors and the representatives of the developer must take place at least 5 days prior to commencement of construction work to:

- Demarcate micro construction sites, services routes, access routes, working boundaries and no-go areas;
- Discuss methods of stockpiling (vegetation, topsoil, sub-soil, shell-grit, etc);
- Check required toilets and fire-fighting facilities to be in place;
- Discuss and agree restricted access to construction site;
- Sign the Declaration of Understanding (Contractors);
- Discuss and agree communication channels including contact details;
- Discuss and agree areas of responsibility;
- Discuss and agree the demarcation and control of construction and building sites.

Minutes of this site meeting must be kept, and are to be distributed to all parties.

The following equipment must be on every micro or sub site before any construction work is due to start:

- Sufficient and suitable chemical toilet facilities.
- Sufficient refuse bins, which are weather and wind proof, with proper lids.
- 1 x type ABC (all purpose) 12.5 kg fire extinguisher.

This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD2: LAYOUT PLAN CONTROLS

The contractor must ensure that a copy of the signed approved layout plan is available at the office on site at all times for inspection by the developer or his representative(s). Any variation to the approved layout plan must be submitted to the developer for signed approval and may only be implemented once the approved variation is available to the contractor and available on site at the office. The variation of changes to the layout must be approved by the competent authority as per the EA conditions. This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD3: ADVERTISING

The contractors may place no advertising material on the property unless prior formal written permission has been obtained from the landowner and SANRAL.

This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD4: METHOD STATEMENTS

To ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMPr.

The environmental specifications are required to be underpinned by a series of Method Statements, within which the contractors and service providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the contractor will be required to describe how specified requirements will be achieved through the submission of written method statements to the site manager.

A method statement is defined as “a written submission by the contractor in response to the environmental specification or a request by the site manager, setting out the plant, materials, labour and method the contractor proposes using to conduct an activity, in such detail that the site manager is able to assess whether the contractor's proposal is in accordance with the specifications and/or will produce results in accordance with the specifications”.

The method statement must cover applicable details with regard to:

- Details of the responsible person/s
- Construction procedures
- Materials and equipment to be used
- Getting the equipment to and from site
- How the equipment/material will be moved while on-site
- How and where material will be stored
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur
- Timing and location of activities
- Compliance/non-compliance with the specifications
- Any other information deemed necessary by the site manager

Method statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities.

Specific areas to be addressed in the method statement pre, during and post construction (where applicable) include:

General Administration:

- Designate access road and the protocol on while roads are in use.
- Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these). Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).

Soil Management:

- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure.

Water Management:

- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions).
- Stipulate the storm water management procedures recommended in the storm water management method statement.
- Ablution facilities (placement, maintenance, management and servicing).

Fire Prevention and Management:

- Fire management protocols and procedures to be put in place on site in accordance with relevant legislature.

Indigenous Fauna and Flora:

- Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).

Environmental Reporting:

- Incident and accident reporting protocol

Solid Waste Management:

- Description of the waste storage facilities (on site and accumulative).
- Placement of waste stored (on site and accumulative).
- Management and collection of waste process.
- Recycle, re-use and removal process and procedure.

Liquid Waste Management:

- The design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
- Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facility where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.

Dust and Noise Pollution:

- Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.
- Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.

Hazardous Substance Storage:

- Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials (South African National Standards apply.
- Lists of all potentially hazardous substances to be used. Appropriate handling, storage and disposal procedures.
- Prevention protocol of accidental contamination of soil at storage and handling areas. All storage areas, (i.e.: for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).

The contractor may not commence the activity covered by the method statement until it has been approved by the site manager, except in the case of emergency activities and then only with the consent of the site manager. Approval of the method statement will not absolve the contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD5: ENSURE THE DESIGN RESPONDS TO THE IDENTIFIED ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES

The most sensitive landscape features for planning purposes in the study area are the Ecological Support Area (ESA), a wetland and the agricultural activities.

Project Component/s	Storm water structures; Access roads; Laydown areas and construction camp area.
Potential Impact	Design fails to respond optimally to the environmental consideration.
Activities/Risk Sources	Positioning of onion dehydration plant and access roads.
Mitigation: Target/Objective	Ensure that the design of the onion dehydration plant responds to the identified environmental constraints and opportunities.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer	Pre-construction
Access roads to be carefully planned to minimise the impacted area and prevent unnecessary over compaction of soil.	Developer	Design phase
As far as possible, existing roads must be used.	Developer	Design phase
Develop a site-specific waste management plan for the construction phase.	Developer	Pre-construction
The holder of an environmental authorisation has the responsibility to notify the competent authority of any alienation, transfer and, change of ownership rights in the property on which the activity is to take place.	Developer	Pre-construction
Fourteen (14) days written notice must be given to the Department that the activity will commence. The notification must include a date on which the activity will commence as well as the reference number.	Developer	Pre-construction
ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name and contact details of the ECO must be submitted to the DEA&DP.	Developer	Pre-construction

Performance Indicator	Design meets objectives and does not degrade the environment. Design responds to the mitigation measures and recommendations in the BAR. Minimal impact on the surrounding agricultural land.
Monitoring	Ensure that the design implemented meets the objectives and mitigation measures in the BAR through review of the design by the Project Manager, Developer and the Contract or prior to the commencement of construction.

OBJECTIVE PD6: ENSURE EFFECTIVE COMMUNICATION MECHANISMS WITH THE VARIOUS STAKEHOLDERS

On-going communication with affected and surrounding landowners and key departments is important to maintain during the construction and operational phases of the onion dehydration plant. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project Component/s	Storm water structures; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses.
Activities/Risk Sources	Activities associated with facility construction and operation.
Mitigation: Target/Objective	Effective communication with affected and surrounding landowners. Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Compile and implement a grievance mechanism procedure	Developer	Pre-construction,

for the public to be implemented during both the construction and operational phases of the facility. This procedure must include details of the contact person who will be receiving issues raised by I&APs, and the process that will be followed to address issues.		construction and operational phase

Performance Indicator	Effective communication procedures in place.
Monitoring	An incident must be reported in the site book and monitored by the ECO.

CONSTRUCTION AND REHABILITATION PHASE
CIVIL CONTRACTOR

Goals for Construction Phase

Overall Goal for Construction:
Undertake the construction of the onion dehydration plant infrastructure in a way that:

- Ensures that construction activities are properly managed in respect of environmental aspects and impacts;
- Enables construction activities to be undertaken without significant disruption to other land uses in the area, in particular concerning noise impacts, dust, farming practices, traffic and road use, and effects on local residents;
- Minimises the impact on the surrounding area;
- Minimises impacts on sensitive environments;
- Minimises the impact on the heritage and historical value of the site and
- Minimises possible health impacts.

Objectives
In order to meet this goal, the following objectives have been identified, together with the necessary actions and monitoring requirements.

OBJECTIVE C1: WORKING HOURS

Civil & Construction Sites	
Mondays to Fridays	06h00 – 19h00
Saturdays & Public Holidays	06h00 – 17h00

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as noise impacts.
Activities/Risk Sources	Activities associated with facility construction that creates disturbing noises.
Mitigation: Target/Objective	Effective communication with affected and surrounding landowners. Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Contractors may only be present on the site during the public time hours.	Developer and contractor	Construction phase

Performance Indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C2: SAFETY

Project Component/s	Onion dehydration plant; Access roads.

Potential Impact	Impacts on affected and surrounding landowners and land uses such as crime, violence and incidents.
Activities/Risk Sources	The proposed development may result in an increase in crime levels in the surrounding community.
Mitigation: Target/Objective	To protect all involved from incidents and injury.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Telephone numbers of emergency services, including the local firefighting services, must be posted conspicuously in the contractor's office and near the telephone. No firearms are permitted on the construction site, other than those authorised by the developer for the property security service provider if needed. Notices should be displayed at all public entrances to the property, warning visitors that they are entering a construction site.	Contractor	Construction phase

Performance Indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C3: SPEED LIMIT

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as dust, noise and traffic accidents.
Activities/Risk Sources	Activities associated with facility construction such as transport of construction material, rubble and contractors.
Mitigation: Target/Objective	To protect all involved from incidents and injury and keep dust and noise impacts to a minimum.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
For security and safety reasons the speed limit on the property for all contractors' vehicles is 30 km per hour. The contractor is responsible for ensuring that all his employees, sub-contractors and delivery vehicles adhere to this rule.	Contractor	Construction phase

Performance Indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C4: CONTRACTOR'S CAMP

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as pollution and litter as well as visual impacts.
Activities/Risk Sources	Setting up and operation of the contractor's camp.
Mitigation: Target/Objective	Construction camp must be neatly fenced and construction site must be neat and tidy.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
The contractor's camp will be indicated by and to landowner management and the ECO on the site. The final location of the	Developer / Contractor	Construction phase

contractor's camp will be authorized by the ECO and landowner. Construction camp must be neatly fenced and construction site must be neat and tidy.		

Performance Indicator	Contractor's camp is neat and tidy and fenced.
Monitoring	The ECO in conjunction with the landowner will approve construction camp area. This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C5: DELIVERIES TO CONTRACTORS

Project Component/s	Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as dust, noise, increased traffic, soil compaction and traffic accidents.
Activities/Risk Sources	Vehicles on site transporting material to contractors.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment and surrounding land uses.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Contractors will at all times be responsible for compliance by their delivery service providers as engaged. Delivery times will be limited to working times as defined in this document. Contractors have the responsibility of advising the property security staff of deliveries expected and to be executed. Contractors shall further ensure that drivers of service providers are informed of all procedures and restrictions e.g. which access road to use, speed limits, no-go areas, demarcated construction areas, and maximum allowed vehicle mass etc., as applicable before their first visit to site. Washing of service provider delivery vehicles and equipment will not be allowed on the property and must be carried out elsewhere.	Contractor	Construction phase

Performance Indicator	Site is secure and there is no unauthorised entry. No members of the public/landowners injured.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C6: ALIEN/INVASIVE PLANTS

Project Component/s	Onion dehydration plant; Access roads
Potential Impact	Impacts on indigenous vegetation due to spreading of alien/invasive plants.
Activities/Risk Sources	Activities associated with facility construction such as the removal of vegetation and top soil.
Mitigation: Target/Objective	To prevent the spread of alien/invasive plants. .

Mitigation: Action/Control	**Responsibility**	**Timeframe**
A contractor appointed by the developer and engineer shall be tasked to ensure that all weeds and alien/invasive species are removed as instructed and approved by the ECO. No on-site burying, dumping or stockpiling of any weeds and aliens or invasive species shall occur. Such should be removed from the site to a suitable dumping site	Contractor	Construction phase

from which seed cannot escape.		

Performance Indicator	All possible introduction and spreading of alien invasive plant species are controlled.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C7: STORM WATER MANAGEMENT

Project Component/s	Storm water infrastructure; Access roads.
Potential Impact	Potential pollution of water resources and erosion. Erosion due to poor storm water infrastructure. Pooling of water / flooding in portions of the development site due to poor storm water infrastructure.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To manage storm water effectively and prevent pollution and erosion.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Areas disturbed during construction must be re-vegetated as soon as possible. All roads need to be maintained and monitored and visible signs of possible erosion immediately rehabilitated. Undertake storm water management measures as required. Rehabilitate or stabilise eroded areas immediately to prevent increase in erosion.	Contractor	Construction phase

Performance Indicator	No signs of storm water pollution or accumulation that will result in a nuisance. All possible erosion impacts are controlled.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C8: ARCHAEOLOGY AND PALAEONTOLOGY MANAGEMENT

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	The loss of cultural or heritage resources.
Activities/Risk Sources	Activities associated with facility construction such as excavation.
Mitigation: Target/Objective	To protect and mitigate impacts on the areas heritage.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Should any heritage or fossil remains be exposed during any excavation or related activities, these must immediately be reported to the provincial heritage resource authority of the Western Cape, Heritage Western Cape (in terms of the National Heritage Resources Act, 1999 (Act No.25 of 1999) via the ECO. Heritage remains uncovered or disturbed during earthworks must not be disturbed until inspection and verified by the professional.	Contractor	Construction phase

Performance Indicator	Protection of heritage resources
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C9: SERVICES

Project Component/s	Onion dehydration plant; Associated services infrastructure; Access roads.
Potential Impact	Damage/loss of services infrastructure or supply.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the surrounding land uses.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Care and due cognisance must be taken of existing services, service routes and services restrictions. The main Eskom substation in the area is situated at Kalbaskraal, approximately 6,0km to the south-east of the site. An 11kV feeder known as "Kalbaskraal Farmers 1" originates from Kalbaskraal and provides power to the irrigation pumps on the south-east corner of the site. The existing "Kalbaskraal Farmers 1"- feeder can provide a maximum 550kVA (0,55MVA) power supply without any upgrade of the overhead line. The transformer, 11kV switchgear, and metering equipment must be upgraded at the transformer on site. The developer and landowners shall not be liable for damages, expenses or costs incurred for any interruption in supply, variation, frequency, or failure of any utility provider to supply service.	Contractor	Construction phase

Performance Indicator	Protection of existing services and infrastructure.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C10: ROADS

Project Component/s	Access roads.
Potential Impact	Increased traffic/congestion. Construction vehicles pose a potential risk to other road uses and the natural environment if they do not use designated routes.
Activities/Risk Sources	Deliveries and construction vehicle travelling to site and on site.
Mitigation: Target/Objective	Designation of specific routes for construction vehicles to reduce impact on the environment and other road users.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Only existing access routes to the property will be used during construction work, so as to control the movement of construction vehicles. The contractor shall ensure that access to construction sites and associated infrastructure and equipment is designated off-limits to the public at all times during construction. Traffic safety measures shall be considered in determining entry or exit points to public roads. Construction vehicles to be restricted only to demarcated footprint areas.	Contractor	Construction phase

Performance Indicator	To minimise the impacts on road users and the environment.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C11: ANTI-EROSION MEASURES

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Wind/water erosion as a result of construction/operation activities.
Activities/Risk Sources	Activities associated with facility construction such as excavation, removal of vegetation etc.
Mitigation: Target/Objective	Reduce erosion by implementing anti-erosion measures.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
The contractor shall take all appropriate and active measures to prevent erosion, especially wind and water erosion, resulting from operations and activities, specifically of storm water control measures to the satisfaction of the ECO/ER. During construction the contractor shall protect areas susceptible to wind and water erosion, by installing all the necessary temporary and permanent works. Measures can include brush packing, anchovy net stabilisation, etc. Where required erosion protection measures must be installed. Aspects normally covered in construction contracts in terms of protection of works are standard and are not to be confused with those under environmental legislation.	Contractor	Construction phase

Performance Indicator	All possible erosion impacts are controlled and rehabilitated
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C12: CONSTRUCTION MATERIAL

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Visual impacts and causing a nuisance to surrounding landowners/residents.
Activities/Risk Sources	Activities associated with facility construction such as storage of construction material.
Mitigation: Target/Objective	Reduce the visual impact or nuisance to the surrounding landowners/residents.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Construction material will be stored at the contractor's camp, as well as on the construction site within the demarcated working areas at each construction point. Special permission may be obtained from the ECO/ER to store material on suitable substitute or ancillary locations should the need arise, and as communicated by the project engineer.	Contractor	Construction phase

Performance Indicator	To minimise the impact on the surround land uses and environment.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C13: FIRES

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Uncontrolled fire on/off site, resulting in damage to the environment,

	property, injuries/death to personnel on site, or injuries/death to the public.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate the safety of people, property, and the environment on and off site by preventing uncontrolled fires.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
No open fires will be allowed on site and adequate firefighting equipment should be available on site in good working order at all times as prescribed by the fire management protocols.	Contractor	Construction phase

Performance Indicator	No fire occurred to damage the surrounding environment and land uses and management actions are in place should a fire occur.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C14: HERBICIDES, PESTICIDES AND FERTILIZERS

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Adjacent land/property or natural environments contaminated by the application of herbicides, fertilizers and pesticides.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment and surrounding land uses.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
The contractor must make sure of, and allow, all legal requirements regarding herbicide application procedures. It is vital that the contractor becomes familiar with all the information detailed on every herbicide label before using it. The instructions on the label must be strictly followed throughout. The contractor shall take all necessary precautions to prevent overspray of herbicides outside of the demarcated construction areas and onto natural veld. All personnel working with any herbicide, pesticide or fertilizer must be registered and comply with the requirements set in these registrations. The contractor must put a system in place to control the use of herbicides and pesticides. All equipment associated to herbicides and pesticides must be maintained in accordance to the set standards. The disposal of all redundant and empty containers of herbicides and pesticides must be controlled and disposed of at a waste management facility licensed under the National Environmental Management: Waste Act.	Contractor	Construction phase

Performance Indicator	Herbicide, pesticides and fertilizer use is controlled to prevent impacts on the environment and surrounded land uses.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C15: MEASURES TO PROTECT HYDROLOGICAL FEATURES SUCH AS STREAMS, RIVERS, WETLANDS AND THEIR CATCHMENTS, AND OTHER ENVIRONMENTAL SENSITIVE AREAS FROM CONSTRUCTION IMPACTS

Project Component/s	Onion dehydration plant; Access roads; Adjacent natural environments/features.
Potential Impact	Destruction of natural hydrological systems and the pollution of ground water resources.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment and hydrological features.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
No development may take place in the ecological support area (water course) adjacent to the site. Buffers must be maintained as per Appendix B. Undertake storm water management measures as required. All spillage incidences and actions taken consequent thereto must be reported to the ECO and recorded in the site register.	Contractor	Construction phase

Performance Indicator	Impacts on hydrological features minimized and mitigated.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C16: AN EFFECTIVE MONITORING SYSTEM TO DETECT ANY LEAKAGE OR SPILLAGE OF ALL HAZARDOUS SUBSTANCES DURING THEIR TRANSPORT, HANDLING USAGE AND STORAGE. THIS MUST INCLUDE PRECAUTIONARY MEASURES TO LIMIT THE POSSIBILITY OF OIL AND OTHER TOXIC LIQUIDS FROM ENTERING THE SOIL OR STORM WATER SYSTEMS

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Contamination of soil, storm water and ground water resources by hazardous substances.
Activities/Risk Sources	The handling, storage and use of hazardous substances.
Mitigation: Target/Objective	Prevention and mitigation of the environment contaminated as a result of exposure to hazardous substances.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
The EA holder, Land Owner, Site Environmental Officer and Environmental Control officer will do daily, weekly and monthly inspections and report and monitor compliance with the management actions included in the EMPr and EA conditions. These monitoring and reporting requirements are recorded in several sections of the EMPr. Monitoring will focus on signs of spillages and procedures during handling and storage of dangerous goods as described in the EMPr. The section on storage and handling of dangerous goods in the EMPr will be enforced.	Contractor	Construction phase

Performance Indicator	Impacts on hydrological features minimized and mitigated.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C17: DIESEL FUEL AND LUBRICANT HANDLING PROGRAMME

Project Component/s	Onion dehydration plant; Access roads.
Potential Impact	Contamination of soil, storm and ground water resources as a result of an oil/diesel/lubricant spill/leak.
Activities/Risk Sources	Diesel fuel and lubricant use and storage.
Mitigation: Target/Objective	To protect and mitigate impacts of contaminants on the environment and hydrological features.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Servicing of construction vehicles and machinery to take place of site. All vehicles must be in a good condition with no leakages leading to possible contamination of soil or water supplies. The following conditions related to the temporary fuel tanks must be implemented: The fuel tanks must be designed and installed in accordance with relevant Oil Industry standards and SANS codes where applicable for the aboveground storage tanks. The tanks must be located within a bund (110 % of the tanks capacity) in order to contain potential spills. During fuel tanker delivery, the tanker driver must be present at all times during product offloading. Should an incident occur the supply vehicle emergency cut-off switch must be activated to immediately stop fuel delivery. Flexible hoses with dry-break couplings and emergency isolation must be used. All spillage incidences and actions taken consequent thereto must be reported to the ECO and recorded in the site register. All fuel and flammable liquids should be stored under secure and fenced conditions and in a bunded site with the volume of the bunding capable of holding 110% of the liquid. Double bunded tanks, with leak monitoring sensors should be used. The applicant must ensure that effective stock inventory monitoring and regular auditing take place for the early identification of possible leaks. The requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), must be adhered to. Within three months of the tanks ceasing to be used the tanks must be removed at the expense of the applicant, and the site, including all associated infrastructure must be rehabilitated to the satisfaction of the relevant authority. **Refuelling:** Refuelling of equipment must be conducted from the bunded fuel tank and pump at the contractor's camp. Fuel tanks must be bunded and supplied with a concrete apron. The concreted refuelling apron will be constructed with a drain along its extremities to collect any diesel contaminated run-off and channel it to the oil trap where separated oil will be collected and disposed of in the oil recycling container and process. Any spills on the concrete apron of floor below the tank are to be treated with OT8 or Spillsolve or equivalent as per the product instructions. A 500-litre drawn trailer to convey diesel to the equipment	Contractor	Construction phase

for re-fuelling may also be used. Such trailer will be drawn by a specified vehicle and driver, with alternate nominated as approved by the Project Engineer. Such tow vehicle may travel at 20kms per hour maximum at any time, be clearly identifiable as such, and may only tow the diesel cart should the pre-requisite drip trays and emergency equipment be on the vehicle at the time. In situ refuelling activity may only take place during a standard specified daily time slot as displayed in the construction office, unless specific per day permission has been given to refuel at any other time by the ECO. This must be pre-recorded in the site record book. Staff will require instruction in the identification of diesel and oil leaks and the use of Spillsolve (or equivalent) products. **On-site emergency repairs:** Only small mobile plant and emergency repairs are to take place on site. These will require the provision of drip trays and funnels to ensure that no oil or fuel leakages occur onto the ground. Should such spill take place, then the oil saturated soil is to be placed in suitable containers and disposed of at a hazardous waste disposal site. Any contamination of soil is to be treated with Spillsolve or similar product. Contaminated water as a result of an oil or fuel spillage on the area should similarly be treated in appropriate way, and the polluted water should not be specifically removed and not allowed to merge with run-off water collected in the trap collecting all run offs from the slab. **Collection of contaminated spares and waste oils:** Contaminated spares, oil filters, gaskets, water, etc. will be collected in separate holders at the designated storage facility for disposal at a licensed H:h site. Staff will require instruction in: • Deleterious effects of oil / fuel on the environment • Identification of oil leaks • Handling of oil / fuel leaks into soil • Location and method in storage of contaminated spares • Fire prevention and emergency drills in case of an accident		

Performance Indicator	Ensure that no spillages occur and if it occurs that it is handled and cleaned up.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C18: APPROPRIATE HANDLING AND STORAGE OF CHEMICALS, HAZARDOUS SUBSTANCES AND WASTE (WASTE MANAGEMENT PLAN)

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility will include will include general solid waste and liquid waste, and may include hazardous waste.

Project Component/s	Access roads; Construction camp; Storage areas.

Potential Impact	• Release of contaminated water from contact with spilled chemicals. • Generation of contaminated wastes from used chemical containers. • Inefficient use of resources resulting in excessive waste generation. • Litter or contamination of the site or water through poor waste management practices. • Pollution of water and soil resources.
Activities/Risk Sources	• Vehicles associated with site preparation and earthworks. • Packaging and other construction wastes. • Hydrocarbon use and storage. • Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	• To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. • Good housekeeping of chemicals and other materials on site for the duration of the construction will minimize, avoid any spillages, or other incidents. All spillages should be reported immediately. • To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. • To comply with waste management guidelines. • To minimise production of waste. • To ensure appropriate waste storage and disposal. • To avoid environmental harm from waste disposal.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
• Implement a site-specific waste management plan during the construction phase. • The applicant, land owner and environmental control officer (ECO) must ensure that the inert waste is separated from other hazardous construction materials. • All hazardous waste should be treated and or disposed of in the correct manner. • The National Information System regulations must be adhered to and the registration and reporting of hazardous waste generated must be done online to the Integrated Pollution and Waste Information System (IPWIS) system once the stations are operational. • Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants. • Corrective action must be undertaken immediately if a complaint is received, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. • Implement an effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems. • Leakage of fuels must be avoided at all times and if spillage occurs, it must be remediated immediately. • In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. • Spilled cement, fly ash and concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. • Please note all material used to clean hazardous material spills	Contractor	Construction phase

must be considered as hazardous waste, together with contaminated soil. Moreover, if hazardous waste is mixed with general waste, the entire content of waste must be seen as hazardous and therefore be disposed at a licenced hazardous disposal facility. • Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility. • All stored fuels to be maintained within a sealed bund and on a sealed surface. The bund must be at least 110% of the volume of the total containers. • Adjacent fuelling areas situated around fuel tanks must be provided with an impervious layer or drip trays must be used during refuelling. • Areas around fuel tanks must be appropriately bunded or contained in an appropriate manner as per the requirements of SABS 089:1999 Part 1. • Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function. • Oily water from bunds at the substations must be removed from site by licensed contractors. • The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with MSDS files. • The environmental officer must ensure all material data sheets of chemicals utilized on site is kept in the site office. • Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with and copies kept on site in the environmental file. • Transport of all hazardous substances must be in accordance with the relevant legislation and regulations. • Construction sub-contractors must provide specific detailed waste management plans to deal with all waste streams. • Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control. • Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.). • Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and disposal at appropriately licensed waste disposal sites. • Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area. • Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal and copies of the safe disposal slips must be kept in the environment file on site. • Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time. • An incident/complaints register must be established and		

maintained on-site. • The sediment control and water quality structures used on-site must be monitored and maintained in a fully operational state at all times. • An integrated waste management approach that is based on waste minimisation must be used and must incorporate reduction, recycling, re-use and disposal where appropriate • Upon the completion of construction, the area must be cleared of potentially polluting materials. • Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site. • Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.		

Performance Indicator	• Limited chemical spills outside of designated storage areas. • No water or soil contamination by spills. • No complaints received regarding waste on site or indiscriminate dumping. • Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. • Provision of all appropriate waste manifests for all waste streams.
Monitoring	• Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. • A complaints register must be maintained, in which any complaints from the community will be logged. • Complaints will be investigated and, if appropriate, acted upon • Observation and supervision of waste management practices throughout construction phase. • Waste collection will be monitored on a regular basis. • Waste documentation completed. • An incident reporting system will be used to record non-conformances to the EMPr. This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C19: EFFECTIVE MANAGEMENT OF CONCRETE BATCHING AREA

Project Component/s	Concrete batching area.
Potential Impact	• Dust emissions. • Release of contaminated water, pollution of ground water resources. • Ground, soil pollution. • Generation of contaminated wastes from used chemical containers. • Inefficient use of resources resulting in excessive waste generation.
Activities/Risk Sources	• Operation of the batching area. • Packaging and other construction wastes. • Hydrocarbon use and storage. • Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	To ensure that the operation of the batching area does not cause pollution to the environment or harm to persons.

Mitigation: Action/Control	**Responsibility**	**Timeframe**

• Concrete mixing must be conducted on an impermeable surface that is bunded. • Concrete batching plants to be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised. • Access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment. • The concrete batching plant site should demonstrate good maintenance practices, including regular sweeping to prevent dust build-up. • The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind. • Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage. • The site should be designed and constructed such that clean storm water, including roof runoff, is diverted away from contaminated areas and directed to the storm water discharge system. • Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation. • Contaminated storm water and process wastewater should be captured and recycled where possible. • Areas where spills of oils and chemicals may occur should be equipped with easily accessible spill control kits to assist in prompt and effective spill control. • Ensure that all practicable steps are taken to minimise the adverse effect that noise emissions. This responsibility includes not only the noise emitted from the plant and equipment but also associated noise sources, such as radios, loudspeakers and alarms. • Where possible, waste concrete should be used for construction purposes at the batching area or project site. • The batching area to be monitored by the ECO to ensure that the area is operating according to its environmental objectives and within legislative requirements.	Contractor	Construction phase

Performance Indicator	• No complaints regarding dust or contamination • No water or soil contamination by chemical spills/concrete • No complaints received regarding waste on site or indiscriminate dumping
Monitoring	Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. All registers should be kept on site and must be made available to the department on request. An incident reporting system will be used to record non-conformances to the EMPr.

	Developer or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OPERATIONAL PHASE

OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME

This following section defines the management programme for each of the identified goals during the operational phase. The programme is presented in the form of a table, which includes the components described. This programme consists of the following components:

Goals
Over-arching environmental goals for the management phase.

Objectives
The objectives are in place in order to meet these goals. These take into account the findings from existing studies and monitoring programmes.

Management Actions
The actions needed to achieve the objectives, taking into consideration factors such as responsibility, methods, frequency, resources required and prioritisation.

Monitoring
*K*ey actions to verify that objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

Criteria/Targets
The criteria or targets indicate the efficacy of the management programme. The targets should be readily measurable, understandable to the layperson, cost-effective to monitor, and meet legal requirements.

Remedial Actions
Specifies actions needed to be taken if the targets are not met; or if there is an unforeseen event.

Goals
The following 9 are specified goals:

Goal 1: Waste Management
Goal 2: Pollution Control
Goal 3: Water Quality and Storm Water Management
Goal 4: Soil Erosion
Goal 5: Fire Management
Goal 6: Safety, Security and Emergency Procedures (including Fences)
Goal 7: On-going Monitoring of Social Environmental Impacts
Goal 8: Vegetation Management, inclusive of Alien management and Landscaping
Goal 9: Emissions and Odour Management

Goal 1: Waste Management

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
Ensure allocation of sufficient resources for on-going Integrated Waste Management e.g. staff, equipment.	Pollution and odours	1. No solid waste may be incinerated on the property. 2. All vehicles transporting waste must be closed to avoid possible pollution of waste on transport routes. 3. Waste needs to be sorted and recycled were necessary. 4. Domestic waste not suitable for compost needs to be stored in skips for transport to a registered Landfill site. 5. Squatting and rubble dumping adjacent to the new development must be controlled and regular inspections conducted to ensure control. 6. An integrated waste management approach must be implemented on site, based on waste minimisation, reduction, recycling, re-use and disposal where possible.	Audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of in house maintenance staff	If pollution on site is detected immediate actions must be taken to contain the pollution. Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. Depending on type and extent of pollution occurred specialists may be contacted to provide specific recommendations. An incident report to be compiled and sent to municipal and governmental authorities.

Waste Management

Waste is defined as any matter for which the current user has no further purpose, or any matter, gaseous, liquid, or solid or any combination thereof originating from any residential, commercial or industrial use, which has been discarded, accumulated, or stored.

It further is worth noting that on average 80% of waste management costs accrue to transport.

Principally three types of waste occur-

- Gaseous	Open fires
- High moisture (effluent)	Sewerage/waste water/ petroleum products
- Low moisture (solid/semi solid)	Gass/plastic/ cardboard/ paper/ domestic/ chemical

Some potential consequences-

- Salination of ground/surface/ river water.
- Eutrophication (nutrient enrichment) of natural areas.
- Microbiological contamination of natural areas.
- Sediment & silt migration inflows.
- Harmful inorganic/organic compounds introduction into soil.

Identified Waste Streams:

Components-
Sewerage (black water)
Sewerage (grey water)
Garden refuse
General other waste

Integrated Waste Management Strategy:

Waste Avoidance-
Objective is to promote the concept of minimisation in the generation of any waste in all activities and sites.

Waste Reduction-
To promote the reduction of all waste by ensuring that nothing that can be decomposed is disposed of to waste as opposed to recycling.

Waste Recycling-
Re-using waste or selling waste to recycling companies as far as and if possible to prevent re-usable waste from going to municipal landfill site.

Waste Disposal-
To store, dispose or treat all waste that cannot be avoided, recycled, or composted at licensed facilities within regular operational and environmental monitoring and always in accordance with regulatory requirements.

Storm water Pollution Management-
Storm water and effluent systems must be separated by cut-off trenches to ensure that storm water is not contaminated by effluent water.

The facility should be registered with Province in terms of the new Norms & standards - National Environmental Management: Waste Act (59/2008): National Norms and Standards for the sorting, shredding, grinding, crushing, screening or baling of general waste.

Goal 2: Pollution Control

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
Ensure allocation of sufficient resources for on-going Integrated Waste and pollution control Management e.g. staff, equipment, budget.	Pollution, odours and health.	1. Waste to be stored on the property appropriate containers or facilities as provided by the municipality. 2. All vehicles transporting waste must be closed to avoid pollution of transport routes. 3. Special measures such as surface drainage works to prevent water from running onto this area must be constructed.	Audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of in house maintenance staff	If pollution on site is detected immediate action must be taken to contain the pollution. Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. Depending on type and extent of pollution occurred specialists may be contacted to provide specific recommendations. An incident report to be compiled and sent to municipal and governmental authorities.

Goal 3: Water Quality and Storm Water Management Measures

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
1] Ensure allocation of sufficient resources for on-going Water Quality and Storm Water Management *e.g. staff, equipment, budget*	Pollution, odours, erosion and illegal quality of waste water discharge.	1. Ensure no pollution of any water resources, including surface water, storm water and groundwater takes place as a result of any activities on the site. 2. The proposed storm water channels must be monitored and maintained on a regular basis. 3. All waste within the channels must be removed on a weekly base. 4. If any erosion and/or degradation of the storm water channel or surrounds are noticed immediate action must be taken to rectify the situation. (Corrective and preventative measures taken will depend upon type and extent of erosion and/or degradation occurring).	Audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of in house maintenance staff	If pollution or erosion is detected immediate action must be taken to contain the pollution or erosion. Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. Depending on type and extent of pollution or erosion occurred specialists may be contacted to provide specific recommendations. An incident report to be compiled and sent to municipal and governmental authorities.

Groundwater Monitoring Programme/Protocol

All necessary precautions should be in place to prevent groundwater contamination as groundwater is very difficult and almost impossible to remediate. The precautionary principles would thus apply.

A groundwater monitoring programme will be required to assess groundwater conditions during baseline (pre-construction), construction and operational phases. The groundwater monitoring protocol must include the following:

- Groundwater sampling should be carried out every six months and this must include field measurements of pH and also chemical analysis (at an accredited laboratory) for major cations and anions and also for hydrocarbons.
- The groundwater monitoring protocol needs to be revised every two years.

All boreholes must be sealed with lockable caps and concrete collars installed around the standpipes

The chemistry monitoring intervals should be increased when a substantial deterioration in quality from the initial groundwater is detected.

Effluent Monitoring Program and Irrigation Management Plan

This monitoring programme and management plan is in accordance with National Water Act 36 of 1998 Revision of General Authorisations in Terms of Section 39 of The National Water Act, 1998 (Act No. 36 of 1998) (The Act) - Published under Government Notice 665 in Government Gazette 36820 of 6 September 2013:

"ENGAGING IN A CONTROLLED ACTIVITY, IDENTIFIED AS SUCH IN SECTION 37(1)(a): IRRIGATION OF ANY LAND WITH WASTE OR WATER CONTAINING WASTE GENERATED THROUGH ANY INDUSTRIAL ACTIVITY OR BY A WATERWORK".

This monitoring programme and management plan must be implemented to ensure that the effluent conforms to prescribed discharge and irrigation standards to prevent contamination of ground water.

The developer may irrigate up to 50 cubic metres of domestic or biodegradable industrial wastewater on any given day but only in if authorised by the Department of Water and Sanitation.

Table 1: Wastewater limit values applicable to the irrigation of any land or property up to 50 cubic metres

VARIABLES	LIMITS
pH units	Not less than 6 or more than 9 pH units
Electrical conductivity	Not exceed 200 milliSiemens per metre (mS/m)
Chemical Oxygen Demand (COD)	Does not exceed 5000 mg/l after removal of algae
Faecal coliforms	Do not exceed 100 000 per 100 ml
Sodium Adsorption Ratio (SAR)	Does not exceed 5 for biodegradable industrial wastewater

The water user must follow acceptable construction, maintenance and operational practices to ensure the consistent, effective and safe performance of the wastewater irrigation system, including the prevention of -

- Waterlogging of the soil and pooling of wastewater on the surface of the soil;
- Nuisance conditions such as flies or mosquitoes, odour or secondary pollution;
- Waste, wastewater or contaminated stormwater entering into a water resource;
- The contamination of run-off water or stormwater;

- The unreasonable chemical or physical deterioration of, or any other damage to, the soil of the irrigation site;
- The unauthorised use of the wastewater by members of the public; and
- People being exposed to the mist originating from the irrigation of the wastewater.

The quantity must be metered and the total recorded weekly.
The quality of water irrigated must be monitored once every month by taking a grab sample at the point at which the wastewater enters the irrigation system for all parameters listed in the table above and results submitted to the responsible authority.

The following must be tested each month:

- pH units;
- Electrical conductivity;
- Chemical Oxygen Demand (COD);
- Faecal coliforms;
- Sodium Adsorption Ratio (SAR).

Samples of the water containing waste must be taken in accordance with the applicable South African National Standard (SANS) for sampling.

The methods for the measurement of specific substances and parameters in any waste or wastewater must be carried out by an laboratory that has been accredited in accordance with SANS 17025:2005 by the South African National Accreditation System (SANAS) to conduct the analysis in accordance with the prescribed SANS method for each applicable variables.

The water user must keep a written record, for at least five years, of the following information:

- Both the location of the irrigation area and the extent of the area or areas under irrigation, which must be demarcated on a suitable scale map;
- Details of the crops and the size of the area under irrigation;
- Details of the type of irrigation being practiced;
- Details of the monitoring programme, including-
    - The quantity of wastewater irrigated;
    - The results of the analysis of the quality of wastewater irrigated as obtained from the laboratory for the samples taken in accordance with paragraph 1.12;
- Details of the irrigation management techniques being practised;
- Details of precautionary practices and pollution prevention measures implemented; and
- Details of failure and malfunctions in the irrigation system, and details of the effects of (if any), as well as details of, measures taken to prevent such failures and malfunctions in the future.

The above-mentioned information must be made available upon written request to the responsible authority and interested and affected parties regarding the wastewater irrigation and related activities.

Goal 4: Erosion Control

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
Ensure allocation of sufficient resources) for on-going erosion control management (e.g. staff, equipment, budget	Erosion, sink-holes and or blocking of storm water systems. Damage to Infrastructure.	1. On-going control and management of roads, roadways and areas susceptible to erosion. 2. Ensure suitable vegetation cover or surface on non-hardened surfaces. 3. Control runoff of storm water to prevent soil erosion. 4. Avoid the formation of sink-holes on sensitive soils. 5. Management and control of erosion.	Audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of in house maintenance staff	If erosion is detected immediate actions must be taken to contain the erosion. Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. Depending on type and extent of erosion occurred specialists may be contacted to provide specific recommendations. An incident report to be compiled and sent to municipal and governmental authorities.

Erosion Control

Erosion control and maintenance will be an on-going process, especially erosion developing on or as a result of roads. The applicant must implement erosion control measures to ensure that no erosion occurs on site. The area must also be regularly monitored and erosion maintenance measures implemented to prevent erosion.

Goal 5: Fire Management

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
Ensure allocations of sufficient resources e.g. staff, equipment, Budget,) for Ongoing fire management	Pollution, fire, damage to property and health risks.	1. Sufficient Fire Fighting equipment to be on site. 2. Yearly pre-fire season clearing and maintenance of fire breaks. 3. Yearly pre-season testing and servicing of firefighting equipment.	Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of staff	To be determined when required

Fire Management

Such legislation applies to the open countryside beyond urban limits and puts in place a range of legal requirements.

The responsibilities of people who own or control land

The landowner on whose land a fire may start, or from whose land it may spread across boundaries, must have in place:

- Prepared firebreaks on your boundary, if there is a reasonable risk of fire.
- Have available such equipment, protective clothing and trained personnel required to extinguishing such fire as may occur.
- Take all reasonable steps to notify the fire chief of the local authority should a fire break out.
- Do everything in their reasonable power to stop the spread of the fire.

The Act also requires that should the owner be absent, a known and identified other person responsible needs to be present on or near this land to:

- Extinguish a fire if one breaks out, or assist or instruct others to do so
- Take all reasonable steps to alert the neighbours and Fire Chief.
- The owner may appoint an agent to act on his or her behalf to perform these duties.

Goal 6: Safety and Security Measures and Emergency Procedures

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
Ensure allocation of sufficient resources for on-going safety, security and emergency procedures. e.g. staff, equipment, budget	Pollution, fire, security and health risks.	1. The site should be probably fenced and access allowed at controlled points. 2. One site emergency plans should be reviewed regularly.	Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of staff.	To be determined when required

Any emergency incident, originating at the facility, which falls within the definition of section 30 (1) a of the National Environmental Management Act (NEMA) Act 107 of 1998, must be dealt with by the facility in accordance with section 30 of NEMA". In the event of any incident the facility must ensure containment by the responsible person and report the incident to DEADP (Mr Simon Botha 0214830752).

Goal 7: On-going Monitoring of Social Environmental Impacts

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
Ensure allocation of sufficient resources for on-going monitoring of environmental impacts. e.g. staff, equipment, budget	Pollution, nuisances and health risks.	1. Internal formal management inspections on a weekly and monthly basis. 2. Vegetation Monitoring once a year (refer to section below). 3. Ground and surface water monitoring as per EA requirements.	Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of staff.	To be determined when required

Goal 8: Vegetation Management, Inclusive of Alien Vegetation and Landscaping.

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
Ensure allocations of sufficient resources (e.g. staff, equipment, Budget,) for ongoing alien and vegetation management	Loss of conservation worthy species, fire and health.	1. All areas to be kept clear of aliens. 2. Landscaping as per landscaping plan. 3. Landscaped areas to be maintained.	Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of staff.	To be determined when required

Goal 9: Emissions and Odour Management

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
Ensure allocations of sufficient resources (e.g. staff, equipment, Budget,) for ongoing alien and vegetation management	Emissions from the process are: •Steam (excess) from the boiler. •Smoke from the coal / HFO boiler. •Dust from the incoming products. •Dust from the cutting and milling. •Onion fumes from the peeling and drying process.	1. The added washing steps will keep this to a minimum. 2. The emissions from the coal / HFO boiler must be controlled with filters to reduce the contaminants. 3. Dust must be controlled by cyclones. 4. A complaints register must be in place and available on site. 5. All complaints must be investigated. 6. A weekly odour score card that rates the odours from 1-10 must be completed and retained on site.	Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. **Responsibility:** Applicant	Adequate annual Budgets. On-going employment of staff.	To be determined when required

CHAPTER 8

ENVIRONMENTAL REPORTING

In order to ensure that the necessary environmental issues are adequately addressed and recorded, the following environmental reporting shall be undertaken:

- Incident reporting; and
- Compliance reporting

See below for a template of an Incident Report to serve as a guideline for the recording and addressing of emergency incidents as and when they occur.

ENVIRONMENTAL INCIDENT REPORT

DATE:	**File Ref:**
NAME:	**Copy to:**
EXACT LOCATION OF INCIDENT:	

SECTION 1 : DESCRIPTION OF INCIDENT

SECTION 2 : REMEDIAL ACTION REQUIRED

Remedial Action Due Date:
Confirmation of implementation: **Name:** **Date:**

SECTION 3 : RELEVANT DOCUMENTATION

SECTION 4 : SIGNATURES

Municipal Engineer:

.....

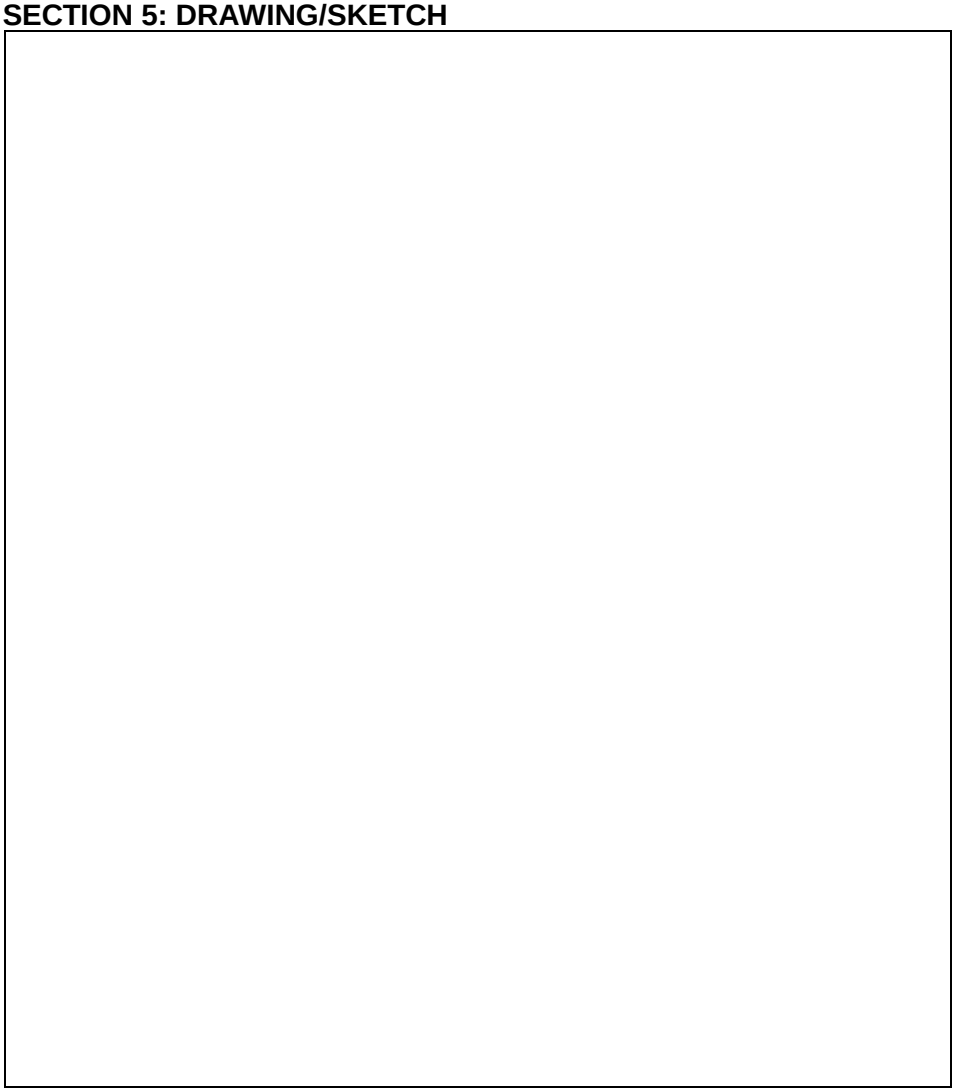
Name:
Date:

ECO:

.....

Name:
Date:

SECTION 5: DRAWING/SKETCH



CHAPTER 9

DECOMMISSIONING PHASE

As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased.

The decommissioning phase EMP provides specific guidance with respect to the management of the environmental risks associated with the decommissioning stage of a project.

Closure and decommissioning impacts are likely to be similar to the construction phase impacts. The management actions and control under the construction phase EMP need to be implemented to mitigate the negative impacts on the environment and to restore the property to its natural state.

A decommissioning phase is where a structure is removed or otherwise modified to make it incapable for re-use for the original design purpose.

The results of environmental monitoring during the decommissioning phase will be used to assess the impact of the decommissioning on the surrounding environment and demonstrate compliance with regulatory requirements.

The actual scope of the decommissioning environmental monitoring will be established following consultation with the regulatory authorities. The format of decommission management strategy will probably be similar to that of earlier development phases and consist of the following:

- Management Principles
    - Develop monitoring procedures in accordance with standard protocols and the requirements of the environmental legislation.
    - Undertake environmental monitoring during the decommissioning phase as shown below.

Environmental monitoring during the decommission phase will include water quality, terrestrial flora rehabilitation monitoring.

CHAPTER 10

REHABILITATION SPECIFICATIONS AND SITE CLEAN-UP

The contractors must ensure that all temporary structures, equipment, materials and facilities used or created on site for, or during construction activities, are removed once the project has been completed. The construction sites must be cleared, and cleaned to the satisfaction of the developer.

Stabilisation and rehabilitation must take place immediately after construction operations have been completed. No vehicles or unauthorised personnel must be allowed onto areas that have been rehabilitated.

The areas impacted during construction must be stabilised and shaped according to the natural surrounding contours. If topsoil was removed during construction the topsoil must be used to stabilise the impacted areas.

The impacted areas must be re-vegetated with indigenous vegetation species within 3 months after completion of construction activities. Rehabilitated areas must be irrigated if required.

If erosion occurred the ECO must be informed immediately who will then recommend erosion mitigation measures to be implemented.

Alien vegetation monitoring of the rehabilitated areas and surrounds must be conducted on an annual basis and if alien vegetation is detected the ECO must be informed immediately who will then recommend eradication methods.

CHAPTER 11

ENVIRONMENTAL AWARENESS INDUCTION COURSE MATERIAL

This section of the report is included in compliance with Section 24N (3) (c) of the National Environmental Management Act 107 of 1998.

WHAT IS THE ENVIRONMENT?

- Soil
- Water
- Plants
- People
- Animals
- Air we breathe

WHY MUST WE LOOK AFTER THE ENVIRONMENT?

- It affects us all as well as future generations
- We have a right to a healthy environment
- A Policy and System will be signed

HOW DO WE LOOK AFTER THE ENVIRONMENT?

- Report problems to your supervisor/ foreman
- Team work
- Follow the rules in the EMP

WORKING AREAS

Workers & equipment must stay inside the site boundaries at all times

RIVERS & STREAMS

- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in the stream
- Do not work in the stream without direct instruction
- Do not damage the banks or vegetation of the stream

ANIMALS

- Do not injure or kill any animals on the site
- Ask your supervisor or Contract's Manager to remove animals found on site

TREES AND FLOWERS

- Do not damage or cut down any trees or plants without permission
- Do not pick flowers

SMOKING AND FIRE

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires without permission
- Know the positions of fire fighting equipment
- Report all fires
- Do not burn rubbish or vegetation without permission

PETROL, OIL AND DIESEL

- Work with petrol, oil & diesel in marked areas
- Report any petrol, oil & diesel leaks or spills to your supervisor
- Use a drip tray under vehicles & machinery
- Empty drip trays after rain & throw away where instructed

DUST

Try to avoid producing dust

NOISE

- Do not make loud noises around the site, especially near schools and homes
- Report or repair noisy vehicles

TOILETS

- Use the toilets provided
- Report full or leaking toilets

EATING

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging & leftover food into rubbish bins

RUBBISH

- Do not litter – put all rubbish (especially cement bags) into the bins provided
- Report full bins to your supervisor
- The responsible person should empty bins regularly

TRUCKS AND DRIVING

- Always keep to the speed limit
- Drivers – check & report leaks and vehicles that belch smoke
- Ensure loads are secure & do not spill

EMERGENCY PHONE NUMBERS

Know all the emergency phone numbers:

- Ambulance:
- Fire:
- Police: 10111

FINES AND PENALTIES

- Spot fines of between R20 and R2000
- Your company may be fined
- Removal from site
- Construction may be stopped

PROBLEMS - WHAT TO DO!

- Report any breaks, floods, fires, leaks and injuries to your supervisor
- Ask questions!

ATTENDANCE REGISTER FOR ……	
PLACE ……..	TRAINER……
NAME & SURNAME	SIGNED
SIGNED ……..	DATE & TIME ……

CHAPTER 12

COMPLIANCE WITH THE ENVIRONMENTAL AUTHORISATION

All conditions of the Environmental Authorisation must be adhered to onsite during the construction-, operational-, decommissioning- and rehabilitation phases of the proposed project. A copy of the Environmental Authorisation must be available on site together with the EMP and all contractors on site must sign the Declaration of Understanding as proof of awareness and understanding of all the conditions to be adhered to on site in terms of the EA and EMP.

CHAPTER 13

UPDATING/ADAPTING THE EMP

Although care has been taken to address all known relevant environmental issues for the development, it will become necessary to add or amend certain procedures or instructions to improve the efficiency of the EMP. Only those additions to, or amendments of, this EMP that will either improve environmental protection or can be proven not to have any negative effects would be considered to be included, and any amendments to the EMP must first be approved by the ECO and competent authority/ies i.e. DEA&DP.

REFERENCES

City of Cape Town (2002) Environmental Management Programme (Version 5) for Civil Engineering Construction Activities.

DEA&DP: ENVIRONMENTAL MANAGEMENT PROGRAMME. VER 5 (04/2002). Guideline Document for the ECO / ESO and the ER

Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

APPENDIX A

Stormwater Management Plan

The development of the site is expected to increase the stormwater run-off due to the fact that new hard surfaces will be created.

It is therefore required from the developer to improve the quality of the post development runoff by removing pollutants before discharging it the following specific sustainable urban drainage system objectives:

- Improve quality of stormwater runoff;
- Control quantity and rate of stormwater runoff;
- Encourage natural groundwater recharge.

The stormwater management plan requires that the amount of post-developed runoff which is discharged into the existing system cannot exceed the pre-developed discharge in a major storm event as to prevent flooding. It is therefore required that excess discharge be managed on site by a detention ponds. Overflow from the pond will be managed via a suitably graded and profiled vegetated swale, which will discharge into the existing box culvert below the N7.

Once the stormwater facilities have been completed, the maintenance and monitoring thereof will remain the sole responsibility of the developer.

A litter clean-up of the retention ponds is to take place once every four weeks or as required.

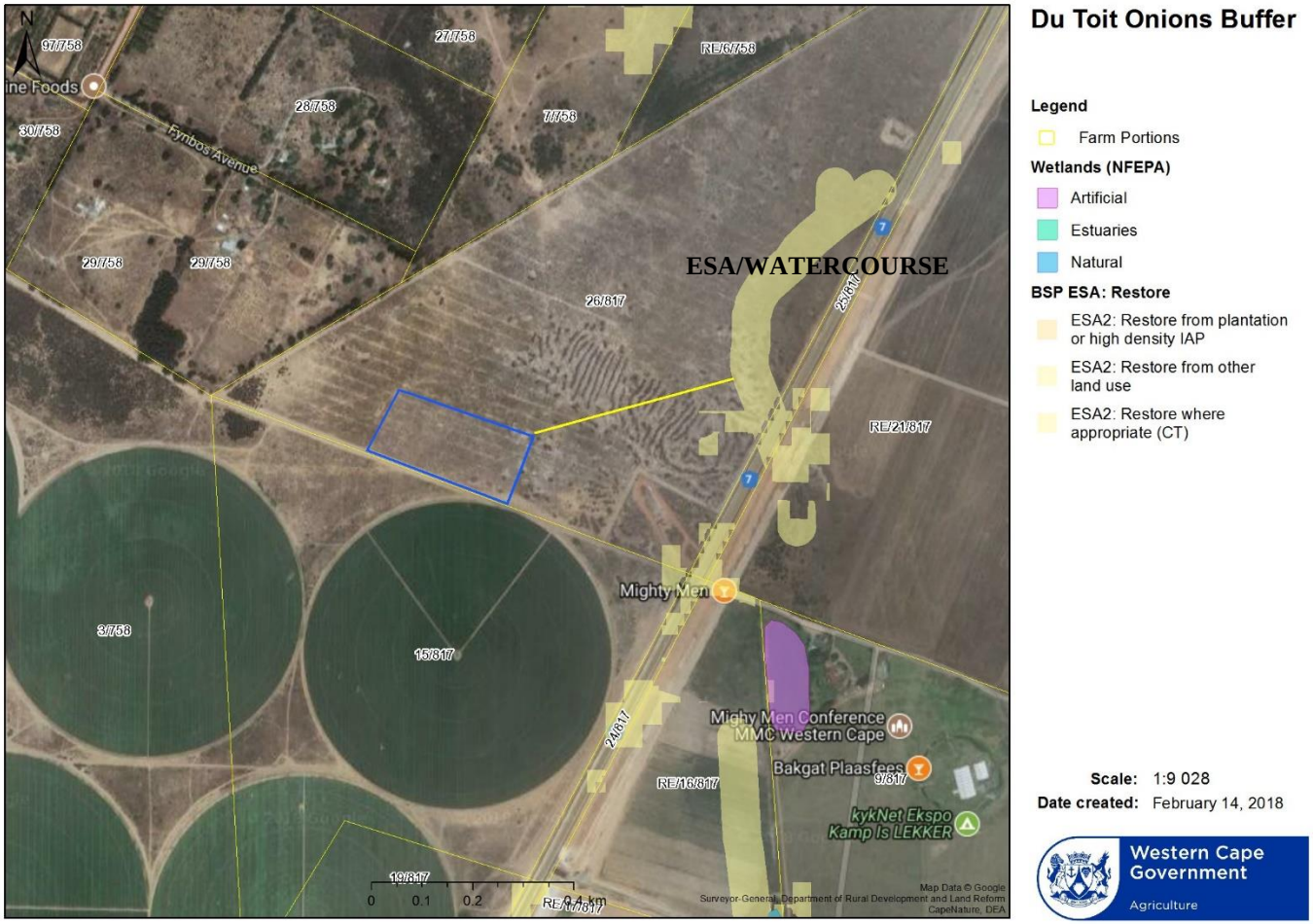
The stormwater infrastructure must be inspected every six months, with one of the inspections taking place just before the first seasonal rains. These will be inspected for a build-up of silt, dirt, mud and similar material. All silt and other material will be removed and disposed of at a suitable landfill site. Care must be taken to ensure that no silt enters the stormwater system during the cleaning process.

Black and grey sewer from the staff ablutions, kitchens etc., will be reticulated via an underground piped system to a Scarab package treatment plant situated on the southern boundary. This plant will process the raw sewerage into a state that is suitable for irrigation. The purified outflow from the package plant will be conveyed through a dedicated open vegetated swale into the detention pond. The vegetated swale will further purify and aerate the treated outflow.

The internal wash-down water and the liquid extracted from the dehydration process will discharge via an underground piped system to a small aeration pond. This effluent will be aerated by a pump and fountain to provide a degree of purification before passing through the vegetated open swale into the detention pond.

APPENDIX B

MAP 1: YELLOW LINE INDICATES WIDTH OF "BUFFER" OR WIDTH OF SPACE BETWEEN THE **ECOLOGICAL SUPPORT AREA** AND THE EDGE OF THE PROPOSED DEVELOPMENT (BUFFER 400m METRES)



Curriculum vitae of Jessica Louise Le Roux

Personal Details
Nationality: South African
ID: 9003160270083
Address: 6a Avalon Road, Claremont, Cape Town 7708
Date of Birth: 16.03.1990
Marital Status: Single
Health: Excellent
Language Proficiency: English - Excellent: speaking, reading, writing Afrikaans- Second language, moderate skill
Driver's license: Yes
Cell: 083 666 8046
Email: jessica@ecoimpact.co.za

Jessica Le Roux has completed her professional registration in terms of section 20(3) (b) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003) as a Professional Natural Scientist in the field of practice Environmental Science (Registration number 400192/16).

Work Experience
May-July 2013: Research assistant at the University of Cape Town Zoology Department
August 2013- Current: ISO50001 Energy Expert and Head of Training at Eco Impact Legal Consulting (Pty) Ltd.

Key Responsibilities:
ISO50001
Implementing ISO50001including:

- Baseline calculation of recent energy consumption
- Detailed baseline calculation
- Support to the exercise of Measurement & Verification of implemented measures
- Developing procedures and policy documents

Training

- Marketing
- Handling of accreditation process
- Compiling training material
- Compiling examination paper questions and marking of papers
- Facilitating training

Senior EAP

- Drafting / Completing Application forms for Basis Assessment Reports and Full Scoping Environmental Impact Reports
- Drafting / Completing draft and final Basis Assessment Reports and Full Scoping Environmental Impact Reports
- Public participations process
- Drafting Environmental Management Plans / BBS

Education

2012 - University of Cape Town

MSc in Applied Marine Science (by coursework and dissertation)

Course work subjects: Project Management, Numerical skills & Statistics, Ocean Tools, Marine Environmental Law, Introduction to Global Warming & Earth System Science, Population & Fisheries Modelling, Marine Conservation, Ecosystem Approach to Fisheries and Marine Ecosystems.

Master's thesis- "A comparison of parasite assemblages of Cape horse mackerel (*Trachurus capensis*) from the northern and southern Benguela."

2011 - University of Cape Town

BSc (Honours) in Environmental and Geographical Science (specialization Environmental Management)

Course work subjects: Environmental Law for non-lawyers, Living with Environmental Change, Environmental Management and Applied research in Environmental Management.

Honours thesis – "An examination of the encroachment of *Putterlickia pyracantha* in the Witzands Aquifer Nature Reserve."

2008 – 2010 - University of Cape Town

BSc in Environmental and Geographical Science and Oceanography and Atmospheric Science

Deans Merit list 2010

1996 – 2007 - St Mary's DSG, Kloof, KZN Subjects: Mathematics, English, Afrikaans, Geography, Biology, History