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Environmental Management and Impact Assessment
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NEM:WA WASTE LICENCE APPLICATION

KWV UPINGTON

APPLICATION FOR THE UPGRADE AND LICENSING OF THE EXISTING KWV UPINGTON EFFLUENT MANAGEMENT FACILITY AND ASSOCIATED INFRASTRUCTURE ON ERF 5410, UPINGTON (NORTHERN CAPE PROVINCE)

DRAFT BASIC ASSESSMENT REPORT

DEA REF NO.: 12/9/11/L1096/8

August 2013

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EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

This is an application for the licensing and upgrade of an existing effluent management facility on Erf 5410, Upington, Northern Cape Province (Siyanda Municipality). The KWV Upington Distillery is situated on Erf 5412 (Upington), right next to OWK Wines. Note that OWK Wines bought the KWV grape juice concentrate facility in 2009, which is still located on a portion of Erf 5412. The KWV / OWK complex in Upington now comprises a brandy distillery owned by KWV and a modern wine cellar and grape juice concentrate plant owned by OWK.

All effluent from both KWV and OWK (hereafter referred to as the KWV / OWK Complex) are treated / disposed (through evaporation) at the Effluent facility on Erf 5410.

PROJECT DESCRIPTION

During 1980's KWV made a capital investment and purchased a piece of land (Erf 5410) from the local authority with the aim of providing evaporation ponds for the treatment of effluent. This was required, as the local authority declined to accept their effluent into the municipal sewage system as it could be detrimental to the activated sludge process at the municipal wastewater treatment plant. Since 1981 KWV and OWK has been disposing their industrial effluent into large evaporation ponds on Erf 5410 in accordance with the conditions set out in Exemption 838 B, issued by the Department of Water Affairs in terms of section 21(4)(e) of the Water Act (Act 54 of 1956). Recently the volumes of industrial effluent that are disposed at Erf 5410 had increased significantly. These ponds were never formally lined and the possibility exists that it might have led to soil contamination. In addition, solid waste (e.g. coal ash) is also now temporarily stored on this site, before final reuse/disposal. KWV / OWK therefore committed themselves to the upgrade of the treatment system.

In accordance with the NEM: WA (Act 59 of 2008) and the "List of Waste Management activities that have, or are likely to have, a detrimental effect on the environment", it was determined that any upgrade to the facility will trigger activities listed under category A of the listed activities (Please note that in the original application it was still believed that this will be a Category B application. However, it has since been determined that because the facility is an existing facility which was operated under an existing Authorisation from the Department of Water Affairs **it will** trigger Activity 19 of Category A).

The Applicant had appointed BVi Engineers to investigate options for effluent treatment with the aim of future treatment of the effluent to beneficial irrigation standards (as opposed to evaporation). BVi Engineers looked at various scenarios to upgrade the treatment system and proposed the following as the most viable and cost effective upgrade:

Pre-treatment (solid separation and pH correction)

- The existing pre-treatment (solid separation) system will be improved.
- Please note that pre-treatment is already done at Erf 5412 and will remain on Erf 5412 (not located on Erf 5410), since it needs constant monitoring and management.

Reed bed Effluent Treatment

- The evaporation pond system will be de-commissioned and replaced by a reed bed treatment system (note that the reed bed treatment system is expected to have a much smaller footprint (<10ha) than the current evaporation pond system (>22ha);
- The reed bed system will be placed within the footprint of the current evaporation pond system (the exact size and location to be advised by the results from the results of the pilot treatment project currently being conducted);
- The remaining evaporation pond system will decommissioned and remediated;
- The reed bed treatment system will be lined (prevention of soil contamination);
- Treated effluent from the reed bed treatment will be available for re-use (which is a significant improvement from evaporation).

Treated effluent (re-use)

- Treated effluent from the reed bed will be used for washwater or garden irrigation in the OWK / KWV complex, with overflow (if any) going into the Upington Sewage system – thus conserving water).
- The possibility for re-using this water for other irrigation purposes (e.g. small farming projects) also remains.

TABLE OF CONTENT

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

	(For official use only)
File Reference Number:	Waste Management Licence Application - 12/9/11/L1096/8 NEM:WA Application
Application Number:	
Date Received:	

Basic assessment report in terms of the Environmental Impact Assessment Regulations, 2010, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

LICENSING AND UPGRADE OF THE EXISTING KWV UPINGTON EFFLUENT MANAGEMENT FACILITY AND ASSOCIATED INFRASTRUCTURE, ERF 5410 (UPINGTON), NORTHERN CAPE PROVINCE

Kindly note that:

1. This **basic assessment report** is a standard report that may be required by a competent authority in terms of the EIA Regulations, 2010 and is meant to streamline applications. Please make sure that it is the report used by the particular competent authority for the activity that is being applied for.
2. This report format is current as of **1 September 2012**. It is the responsibility of the applicant to ascertain whether subsequent versions of the form have been published or produced by the competent authority
3. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.
4. Where applicable **tick** the boxes that are applicable in the report.
5. An incomplete report may be returned to the applicant for revision.
6. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the rejection of the application as provided for in the regulations.
7. This report must be handed in at offices of the relevant competent authority as determined by each authority.
8. No faxed or e-mailed reports will be accepted.
9. The signature of the EAP on the report must be an original signature.
10. The report must be compiled by an independent environmental assessment practitioner.
11. Unless protected by law, all information in the report will become public information on receipt by the competent authority. Any interested and affected party should be provided with the information contained in this report on request, during any stage of the application process.
12. A competent authority may require that for specified types of activities in defined situations only parts of this report need to be completed.
13. Should a specialist report or report on a specialised process be submitted at any stage for any part of this application, the terms of reference for such report must also be submitted.
14. Two (2) colour hard copies and one (1) electronic copy of the report must be submitted to the competent authority.
15. Shape files (.shp) for maps must be included on the electronic copy of the report submitted to the competent authority.

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section? YES
If YES, please complete the form entitled "Details of specialist and declaration of interest" for the specialist appointed and attach in Appendix I.

1. PROJECT DESCRIPTION

a) Describe the project associated with the listed activities applied for

Background history

This is an application for the licensing and upgrade of an existing effluent management facility in Upington, Northern Cape Province (Siyanda Municipality). The KWV Upington Distillery is situated on Erf 5412 (Upington), right next to OWK Wines. Note that OWK Wines bought the KWV grape juice concentrate facility in 2009, which is still located on a portion of Erf 5412. The KWV / OWK complex in Upington now comprises a brandy distillery owned by KWV and a modern wine cellar and grape juice concentrate plant owned by OWK. All effluent from both KWV and OWK (hereafter referred to as the KWV / OWK Complex) are treated / disposed (through evaporation) at the Effluent facility on Erf 5410.

Introduction

During 1980's KWV made a capital investment and purchased a piece of land (Erf 5410) from the local authority with the aim of providing evaporation ponds for the treatment of effluent. This was required, as the local authority declined to accept their effluent into the municipal sewage system as it could be detrimental to the activated sludge process at the municipal wastewater treatment plant. Since 1981 KWV and OWK has been disposing their industrial effluent into large evaporation ponds on Erf 5410 in accordance with the conditions set out in Exemption 838 B, issued by the Department of Water Affairs in terms of section 21(4)(e) of the Water Act (Act 54 of 1956). Recently the volumes of industrial effluent that are disposed at Erf 5410 had increased significantly. These ponds were never formally lined and the possibility exists that it might have led to soil contamination. In addition, solid waste (e.g. coal ash) is also now temporarily stored on this site, before final reuse/disposal. KWV / OWK therefore committed themselves to the upgrade of the treatment system.

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The Applicant had appointed BVi Engineers to investigate options for effluent treatment with the aim of future treatment of the effluent to beneficial irrigation standards (as opposed to evaporation). BVi Engineers looked at various scenarios to upgrade the treatment system and

proposed the following as the most viable and cost effective upgrade:

Pre-treatment (solid separation and pH correction)

- The existing pre-treatment (solid separation) system will be improved.
- Please note that pre-treatment is already done at Erf 5412 and will remain on Erf 5412 (not located on Erf 5410), since it needs constant monitoring and management.

Reed bed Effluent Treatment

- The evaporation pond system will be de-commissioned and replaced by a reed bed treatment system (note that the reed bed treatment system is expected to have a much smaller footprint (<10ha) than the current evaporation pond system (>22ha);
- The reed bed system will be placed within the footprint of the current evaporation pond system (the exact size and location to be advised by the results from the results of the pilot treatment project currently being conducted);
- The remaining evaporation pond system will decommissioned and remediated;
- The reed bed treatment system will be lined (prevention of soil contamination);
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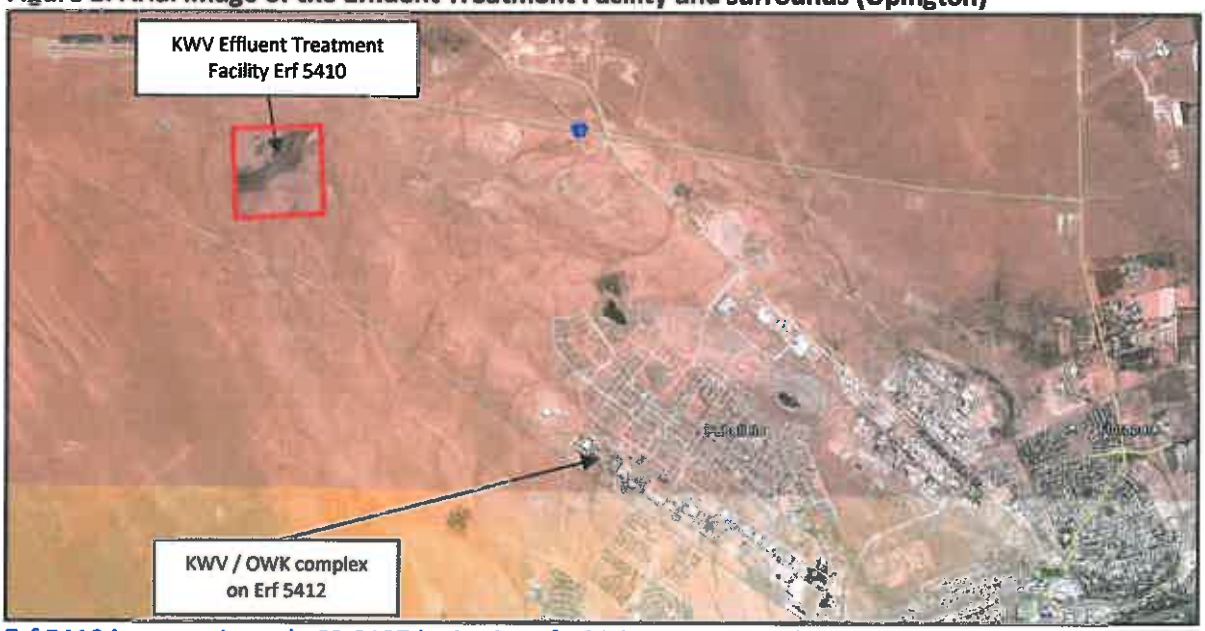
Treated effluent (re-use)

- Treated effluent from the reed bed will be used for washwater or garden irrigation in the OWK / KWV complex, with overflow (if any) going into the Upington Sewage system – thus conserving water).
- The possibility for re-using this water for other irrigation purposes (e.g. small farming projects) also remains.

Figure 1: Arial image of the Effluent Treatment Facility and surrounds (Upington)



Erf 5410 is approximately 60.0197 ha in size of which approximately 60-70% have been utilised for the construction of the evaporation ponds and associated infrastructure.

Project description

The applicant is KWV SA (PTY) Ltd who will undertake the activity should it be approved. Consideration is been given to the upgrading of the existing effluent management system, which

will also change the end-use from evaporation to re-use of the treated effluent. The upgrading will entail the following:

- Replacing the current evaporation pond system with a suitable treatment system.
- Construction of a suitable treatment system in order to treat the effluent from the various facilities to such an extent that it can be considered for beneficial irrigation (SA being a water scarce land).
- Remediation of possible contaminated soils (the current evaporation pond system).

Please note that the existing infrastructure (pipeline and pumping facilities) will be used to transfer the pre-treated wastewater from the KWV / OWK complex to the Effluent Treatment Facility (ETF), but than a new pipeline will have to be constructed from the treatment works back to the KWV / OWK complex in order to re-use the treated effluent. Treated effluent will be re-used as washwater within the complex and for garden irrigation. Any surplus treated effluent (if any) will be re-directed into the Upington Sewerage system.

Figure 2: Close-up of the existing Effluent Treatment Facility (Erf 5410)

Some 90% of the effluents that will be treated at the proposed effluent facility are generated by the Orange River Wine Cellars (OWK) and grape juice concentrate facility. Only approximately 10% of the effluent comes from the KWV distillery. OWK is a cooperative wine cellar established in Upington in 1965. Over the years the intake tonnage has increased from a meagre 5000 tons per annum to some 180 000 tons per annum. The KWV / OWK complex in Upington now comprises a brandy distillery owned by KWV and a modern wine cellar and grape juice concentrate plant owned by OWK. All wastewater from both KWV and OWK are disposed on Erf 5410 (Upington).

As is commonly known, wineries and distilleries are notorious for the quality of their effluent and at this complex it is no different. Typically, the combined effluent from the three processing plants equates to an average volume of 1 350m^3 per day or some 40 000m^3 per month. An analysis of the effluent has indicated that it has a chemical oxygen demand varying between 8 000mg/l to 10 000mg/l with high concentrations of Total Suspended Solids and Total Dissolved Solids. Typically the

COD of winery effluent comprises some 91% of ethanol and other organic components such as acetic acid and phenols.

These constituents are notoriously difficult to treat and the analysis results indicate that the effluent is at the upper limit for aerobic process treatment and at the lower limit of anaerobic process treatment, making it extremely difficult to select a suitable process train for this effluent. Given the above, BVi, in consultation with the client have investigated several options which are described under alternatives in this document.

Existing Effluent Treatment Facility

Based on the projected flows and the net average daily evaporation rates, a series of evaporation ponds were developed on this piece of land (Erf 5410) located approximately 4km west of the KWV / OWK Complex. The evaporation ponds cover an area of 22ha and were designed so that a single day's effluent is discharged onto a pan. Some 36 evaporation pans were provided which are then used sequentially. Evaporation in the Upington area is high and averages at about 120mm per month. This system worked fairly well in that the evaporation has exceeded the effluent volume for almost 20 years. The problem with this system is that it produces odour. Twenty years ago, this was not problematic, as the evaporation ponds where far from any residential areas. This has; however, changed and residential development has extended considerably the last 10 years to an extent that the residential area is now within 2km of the evaporation ponds. In addition, the reigning winds are either north or north-west which now blows the odours directly to the residential areas. This has led to complaints and subsequently, the OWK / KWV have decided to investigate other possibilities. In addition to the above, legislation has changed to such an extent that this practice is now no longer acceptable for disposing of this effluent.

Although this practice is currently still being used, OWK/KWV has committed themselves to find a solution to legalize and improve their current practice. They have also started dosing Lime into the effluent in an effort to increase the pH. In addition, they have started dosing Effective Microorganisms in an effort to abate the odour problem. Both these actions are considered of interim nature, but have had a positive, if not permanent effect on the problem.

Proposed Effluent Treatment Facility

Reed beds or constructed wetlands are large areas of land inundated with water typically not deeper than 600 mm that support the growth of emergent plants such as cattail, bulrush, reeds and sedges. The most popular of these plants being the common reed or *Phragmites australis* hence the name "reed bed treatment system". The plants or more specifically their roots in combination with the growth media they are planted in act as natural biological filters. The aerobic zones around their roots are the habitat for a multitude of microorganisms that utilize the nutrients found in wastewater as food.

Typically reed beds are shallow basins filled with a growth medium such as soil, sand or gravel which has an impervious layer that retains the water and prevents contamination of the natural ground below. The media is then planted with distinct plant communities such as reeds, sedges, bulrushes, etc.

Constructed wetlands have distinct advantages over other means of treating wastewater in that they **are not dependent on external energy or chemical inputs and require very little maintenance**. Their lifespan can reach anything up to 80 years and in addition they are scenically attractive and provide a habitat for a wide variety of plants, birds, reptiles and invertebrates. **Reed beds generally provide an effluent much better than an oxidation pond system, and better or similar to that of a conventional treatment system and are especially suited to fluctuating flows**. Reed beds can be constructed with unskilled labour and are devoid of high tech equipment and therefore can be considered a low maintenance option. The water purification function of reed beds is dependent on four principle components: the vegetation, the water column, substrate and the associated microbial populations. The only function of the vegetation is to provide additional environments/habitat for the microbial populations. The stems of the plants and the falling leaves in the water column obstruct flow and facilitate sedimentation and increase surface area. Therefore the choice of vegetation is critical as most terrestrial plants cannot survive in waterlogged soils due to the depletion of oxygen which is normally associated with flooding. Aquatic plants have specialized stems, which enable them to conduct atmospheric gases such as oxygen down into their roots. The oxygen is exuded out of their root hairs forming an aerobic rhizosphere around every root hair while the rest of the surface volume remains anaerobic. Within the rhizosphere large populations of common aerobic and anaerobic bacteria thrive and aid the biological breakdown of the organic compounds found in wastewater.

The vegetation only take up a fraction of the available nutrients found in the wastewater, their primary role being to increase the amount of aerobic environment for the microbial populations found in the water column and below the water/substrate interface. Suspended solids in the wastewater are aerobically composted in the above substrate layer of straw and plant debris formed by the dead leaves and stems. By this means, constructed wetlands are able to remove organic compounds (measured as Chemical Oxygen Demand), suspended solids and nitrogen. The removal of phosphorous is possible through adsorption by the substrate. The selection of specialized substrate is however important to remove significant amounts of this element.

There are **two basic types of reed beds**. The first being the Vertical Flow System. In this system, the water is applied on the surface of the reed bed with a pipe distribution system and flows vertically through the substrate where it is collected in a drainage system on the floor of the reed bed. This type of reed bed is typically utilized for the first stage of treatment and usually planted with the common reed *Phragmites australis*. The second type of wetland is named the Horizontal Flow System and the wastewater flows horizontally through the substrate below the surface. The horizontal flow reed beds are utilized as a secondary treatment and at least two or more such beds are recommended in series. For both types, pre-treatment (i.e. solids have to be removed from the wastewater stream) is essential to prevent clogging of the substrate surface and also the distribution piping. This is typically done using either septic tanks or anaerobic ponds.

With conventional treatment (anaerobic or aerobic digesters) not being cost-effective for the wine industry, effluent treatment is the exception rather than the rule. Winery effluent is normally irrigated on pastures or, in some cases, dumped directly into the nearest river. Since most wine cellars are small, the individual effect of effluent disposal practices on the environment is negligible.

Collectively, however, the industry does contribute to environmental degradation in drainage basins where wineries operate.

As a low-cost alternative treatment method, use of constructed wetlands may prove acceptable for winery effluents. Additional benefits may add to their attractiveness. These include minimal labour requirements, no chemical usage, very little maintenance, potential recreational use and provision of habitat for wildlife species (especially birds and indigenous flora) through the creation of an environment suited to them. Research has been conducted by the CSIR, the Water Research Commission and Winetech. All the research has indicated that positive results are achievable that can comply with the General Limit Values for effluent as required by the Department of Water Affairs.

BVi Consulting Engineers were commissioned in 2012 by the OWC Board of Directors to design and construct a pilot-scale reed bed treatment system to evaluate the potential for the treatment of the Upington cellar complex effluent. Said pilot-scale plant was completed in November 2012 and the plants are now being cultivated and established before commencement of treating of the effluent. The pilot plant has a design capacity to treat 2 000 liters of cellar effluent per day.

Photo 1: A photo of the pilot-scale plant being constructed at Erf 5412

The pilot plant consists of 2 above ground horizontal polypropylene tanks with a volume of 8000 liters each. They are to act as anaerobic reactors. The effluent from the tanks is periodically discharged by means of a siphon system on three number vertical flow reed beds. Each of the beds was filled with a different media combination to allow evaluation of the various media grading. The

vertical flow beds are operated sequentially in parallel and their effluent is discharged to 3 number horizontal subsurface flow reed beds which are operated in series.

It is envisaged that this treatment plant will now be monitored on a two weekly basis by analysing both influent and effluent as well as changing the inlet flow to determine the optimum design for the proposed full scale plant. Once an optimum size has been derived, it is the intention of Orange River Wine Cellars to replace the existing evaporation ponds with a reed bed treatment system which will firstly not cause the current odour nuisance and secondly, allow a large portion of the treated effluent to be re-used for either washwater or the irrigation of the cellar gardens with overflow going into the Upington sewage system.

a) Provide a detailed description of the listed activities associated with the project as applied for

NEMA Activities:

Listed activity as described in GN R.544, 545 and 546	Description of project activity
N/a	The proposed treatment system (reed bed) will have a much smaller footprint (<10ha) than the current evaporation pond system (±22 ha) and will be located within the current footprint of the evaporation ponds. A new return pipeline will have to be constructed, but the pipeline will be located next to the existing pipeline (feeding the treatment works) and the size (<0.2) and flow (much less than 120l/s) of this pipeline does not trigger any NEMA listed activities (2010).

NEM:WA Waste Licence Activities:

INDICATE THE NO. & DATE OF THE RELEVANT NOTICE:	ACTIVITY NUMBERS (AS LISTED IN THE WASTE MANAGEMENT ACTIVITY LIST) :	DESCRIBE EACH LISTED ACTIVITY:
Gazette No. 32368, Government Notice 718 (03 July 2009).	Category A – Activity Number 1	The storage, including the temporary storage, of general waste at a facility that has the capacity to store in excess of 100m^3 of general waste at any one time, excluding the storage of waste in lagoons. (Please note: This application is an application for the treatment of effluent. However, organic waste from the processes within the facilities, e.g. coal ash, is recycled but at times a temporary storage area is needed for ash which cannot be removed for recycling immediately.)
Gazette No. 32368, Government Notice 718 (03 July 2009).	Category A – Activity Number 12	The remediation of contaminated land. Note: The application is for the treatment of effluent. However, it might be determined that the evaporation practices had led to contamination of soil, which might then have to be remediated.
Gazette No. 32368, Government Notice 718, (03 July 2009)	Category A – Activity Number 19	The expansion of facilities of or changes to existing facilities for any process or activity, which requires an amendment of an existing permit or license or a new permit or license in terms of legislation governing the release of pollution, effluent or waste. This application is for the licencing of technology upgrade in treatment, changing from evaporation ponds to a reed bed treatment system with a much smaller footprint, located within the existing footprint.

2. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

Describe alternatives that are considered in this application as required by Regulation 22(2)(h) of GN R.543. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity (NOT PROJECT) could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

The determination of whether site or activity (including different processes, etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the, competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

The identification of alternatives should be in line with the Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004. Should the alternatives include different locations and lay-outs, the co-ordinates of the different alternatives must be provided. The co-ordinates should be in degrees, minutes and seconds. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

a) Site alternatives

No site alternatives were considered as this is the upgrade of an existing treatment system and the new treatment system (which will have a much smaller footprint) will be located within the existing evaporation pond footprint. The remainder of the evaporation pond treatment system might have to be remediated.

Alternative 1 (preferred alternative)		
Description	Lat (DDMMSS)	Long (DDMMSS)
Alternative 2		
Description	Lat (DDMMSS)	Long (DDMMSS)
Alternative 3		
Description	Lat (DDMMSS)	Long (DDMMSS)

In the case of linear activities: (N/A)

Alternative:	**Latitude (S):**	**Longitude (E):**
Alternative S1 (preferred)		
• Starting point of the activity		
• Middle/Additional point of the activity		
• End point of the activity		
Alternative S2 (if any)		
• Starting point of the activity		
• Middle/Additional point of the activity		
• End point of the activity		
Alternative S3 (if any)		
• Starting point of the activity		
• Middle/Additional point of the activity		
• End point of the activity		

For route alternatives that are longer than 500m, please provide an addendum with co-ordinates taken every 250 meters along the route for each alternative alignment.

In the case of an area being under application, please provide the co-ordinates of the corners of the site as indicated on the lay-out map provided in Appendix A.

b) Lay-out alternatives

Layout alternatives were not considered as it is related to each technology option. The technology option is being guided by the results from the pilot treatment study currently being done by BVi Engineers.

Alternative 1 (preferred alternative)		
Description	Lat (DDMMSS)	Long (DDMMSS)
Alternative 2		
Description	Lat (DDMMSS)	Long (DDMMSS)
Alternative 3		
Description	Lat (DDMMSS)	Long (DDMMSS)

c) Technology alternatives

Alternative 1 (preferred alternative)
Constructed wetlands (Reed beds) Reed beds or constructed wetlands are large areas of land inundated with water typically not deeper than 600 mm that support the growth of emergent plants such as cattail, bulrush, reeds and sedges. The most popular of these plants being the common reed or *Phragmites australis* hence the name "reed bed treatment system". The plants or more specifically their roots in combination with the growth media they are planted in act as natural biological filters. The aerobic zones around their roots are the habitat for a multitude of microorganisms that utilize the nutrients found in wastewater as food.

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There are two basic types of reed beds. The first being the **Vertical Flow System**. In this system, the water is applied on the surface of the reed bed with a pipe distribution system and flows vertically through the substrate where it is collected in a drainage system on the floor of the reed bed. This type of reed bed is typically utilized for the first stage of treatment and usually planted with the common reed *Phragmites australis*.

The second type of wetland is named the **Horizontal Flow System** and the wastewater flows horizontally through the substrate below the surface. The horizontal flow reed beds are utilized as a secondary treatment and at least two or more such beds are recommended in series.

For both types, pre-treatment (i.e. solids have to be removed from the wastewater stream) is essential to prevent clogging of the substrate surface and also the distribution piping. This is typically done using either septic tanks or anaerobic ponds.

With conventional treatment (anaerobic or aerobic digesters) not being cost-effective for the wine industry, effluent treatment is the exception rather than the rule. Winery effluent is normally irrigated on pastures or, in some cases, dumped directly into the nearest river. Since most wine cellars are small, the individual effect of effluent disposal practices on the environment is negligible. Collectively, however, the industry does contribute to environmental degradation in drainage basins where wineries operate.

As a low-cost alternative treatment method, use of constructed wetlands may prove acceptable for winery effluents. Additional benefits may add to their attractiveness. These include minimal labour requirements, no chemical usage, very little maintenance, potential recreational use and provision of habitat for wildlife species (especially birds and indigenous flora) through the creation of an environment suited to them. Research has been conducted by the CSIR, the Water Research Commission and Winetech. All the research has indicated that positive results are achievable that can comply with the General Limit Values for effluent as required by the Department of Water Affairs.

BVi Consulting Engineers were commissioned in 2012 by the OWC Board of Directors to design and construct a pilot-scale reed bed treatment system to evaluate the potential for the treatment of the Upington cellar complex effluent. Said pilot-scale plant was completed in November 2012 and the plants are now being cultivated and established before commencement of treating of the effluent. The pilot plant has a design capacity to treat 2 000 liters of cellar effluent per day.

The pilot plant consists of 2 above ground horizontal polypropylene tanks with a volume of 8000 liters each. They are to act as anaerobic reactors. The effluent from the tanks is periodically discharged by means of a siphon system on three number vertical flow reed beds. Each of the beds was filled with a different media combination to allow evaluation of the various media gradings. The vertical flow beds are operated sequentially in parallel and their effluent is discharged to 3 number horizontal subsurface flow reed beds which are operated in series.

It is envisaged that this treatment plant will now be monitored on a two weekly basis by analysing both influent and effluent as well as changing the inlet flow to determine the optimum design for the proposed full scale plant.

Once an optimum size has been derived, it is the intention of Orange River Wine Cellars to replace the existing evaporation ponds with a reed bed treatment system which will firstly not cause the current odour nuisance and secondly, allow a large portion of the treated effluent to be re-used for either washwater or the irrigation of the cellar gardens.

Alternative 2

Evaporation ponds (current treatment system)

Based on the projected flows and the net average daily evaporation rates, a series of evaporation ponds were developed on this piece of land located approximately 4km west of the wine cellar. The evaporation ponds cover an area of 22ha and were designed so that a single day's effluent is discharged onto a pan. Some 36 evaporation pans were provided which are then used sequentially. Evaporation in the Upington area is high and averages at about 120mm per month. This system worked fairly well in that the evaporation has exceeded the effluent volume for almost 20 years. The problem with this system is that it produces odour. Twenty years ago, this was not problematic, as the evaporation ponds where far from any residential areas. This has however changed and residential development has extended considerably the last 10 years to an extent that the residential area is now within 2km of the evaporation ponds. In addition, the reigning winds are

either north or north-west which now blows the odours directly to the residential areas. This has led to complaints and subsequently, the OWK / KWV have decided to investigate other possibilities. In addition to the above, legislation has changed to such an extent that this practice is now no longer acceptable for disposing of this effluent.

Although this practice is currently still being used, OWK/KWV has committed themselves to find a solution to legalize and improve their current practice. They have also started dosing Lime into the effluent in an effort to increase the pH. In addition, the have started dosing Effective Microorganisms in an effort to abate the odour problem. Both these actions are considered of interim nature, but have had a positive, if not permanent effect on the problem.

Alternative 3

Up-flow anaerobic sludge blanket reactor

Generally, when one has to deal with effluent which has a high organic load, the answer is to utilize an anaerobic process. Anaerobic bacteria utilize carbon based materials as food sources and produce methane, water and hydrogen sulphide as by-products. Investigations by BVi Consulting Engineers found that the UASB reactors have been used successfully at other large scale wineries/distilling plants in the Western Cape. A UASB reactor consists of a vertical tank into which the effluent is pumped. The UASB process uses an anaerobic process whilst forming a blanket of granular sludge which suspends in the tank. Wastewater flows upwards through the blanket and is processed (degraded) by the anaerobic microorganisms. The upward flow combined with the settling action of gravity suspends the blanket with the aid of flocculants. The blanket begins to reach maturity at around 3 months. Small sludge granules begin to form whose surface area is covered in aggregations of bacteria. In the absence of any support matrix, the flow conditions create a selective environment in which only those microorganisms, capable of attaching to each other, survive and proliferate. Eventually the aggregates form into dense compact biofilms referred to as "granules".

The UASB reactor is however very high level technology and requires a high initial capital investment and also a continued running operational expense. The technology needs constant monitoring when put into use to ensure that the sludge blanket is maintained, and not washed out (thereby losing the effect). The heat produced as a by-product of electricity generation can be reused to heat the digestion tanks rendering them more effective.

The blanketing of the sludge enables a dual solid and hydraulic (liquid) retention time in the digesters. Solids requiring a high degree of digestion can remain in the reactors for periods up to 90 days.[2] Sugars dissolved in the liquid waste stream can be converted into gas quickly in the liquid phase which can exit the system in less than a day.

This high initial investment can be played off against the fact that the process generates substantial amounts of methane gas which could be utilized as an energy source. KWV currently uses coal fired boilers in their distillery which could be replaced with gas burners running off methane. In addition, by using a gas engine driving a generator, electricity could be produced.

A UASB plant capable of treating the quantities of effluent found at the OWK/KWV however has a capital cost in excess of R15 million. The management of OWK/KWV, indicating that a project of this extent cannot be funded by their shareholders who are farmers.

Subsequently, this option was abandoned due to excessive capital cost and high running cost.

Alternative 4
Covered in-ground anaerobic reactor This process is again based on the actions of anaerobic bacteria and was developed for treatment of large volumes of organic waste. The CIGAR process was developed in New Zealand by a company called Waste Solutions. The acronym CIGAR stands for Covered In Ground Anaerobic Reactor. Such a system effectively comprises a reactor constructed by making an excavation in the soil, lining it with HDPE sheeting and also covering the surface with a floating plastic roof which will serve as a gas collector for the methane produced. Low pressure Roots-type blowers are used to then extract the methane gas under vacuum from the floating roof and then pumped to a gas storage tank. As with all anaerobic processes, they are not magic and always have by-products that need to be dealt with responsibly. Typically, there is always a highly enriched supernatant, stabilized sludge, etc. that still needs to be dealt with. In addition, this specific process requires large volumes of waste to be treated to make it cost effective. After telephonic and e-mail discussions with Waste Solutions, it was decided to abandon this option, again due to the economy thereof. Although it was considerably more economic than the UASB process, it still lacked sufficient economy of scale to make it worthwhile.

d) Other alternatives (e.g. scheduling, demand, input, scale and design alternatives)

Alternative 1 (preferred alternative)
Alternative 2
Alternative 3

e) No-go alternative

This alternative is the "*no-development alternative*". The no-go option will result in the status quo of the current evaporation pond system being maintained.

Evaporation in the Upington area is high and averages at about 120mm per month. This system worked fairly well in that the evaporation has exceeded the effluent volume for almost 20 years. The problem with this system is that it produces odor. Twenty years ago, this was not problematic, as the evaporation ponds where far from any residential areas.

This has however changed and residential development has extended considerably the last 10 years to an extent that the residential area is now within 2km of the evaporation ponds. In addition, the reigning winds are either north or north-west which now blows the odours directly to the residential areas. This has led to complaints and subsequently, the OWK / KWV have decided to investigate other possibilities. In addition to the above, legislation has changed to such an extent that this practice is now no longer acceptable for disposing of this effluent. In addition the evaporation ponds were never formally lined and the possibility of soil and or water pollution are real.

The "no-go" alternative is therefore not considered the 'best practical environmental option'.

Paragraphs 3 – 13 below should be completed for each alternative.

3. PHYSICAL SIZE OF THE ACTIVITY

a) Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Alternative:	**Size of the activity:**
Alternative A1[1] (preferred activity alternative)	<100 000 m²
Alternative A2 (if any)	220 000 m²
Alternative A3 (if any)	50 000 m²

or, for linear activities:

Alternative:	**Length of the activity:**
Alternative A1 (preferred activity alternative)	m
Alternative A2 (if any)	m
Alternative A3 (if any)	m

b) Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Alternative:	**Size of the site/servitude:**
Alternative A1 (preferred activity alternative)	600 000 m²
Alternative A2 (if any)	600 000 m²
Alternative A3 (if any)	600 000 m²

4. SITE ACCESS

Does ready access to the site exist?	YES
If NO, what is the distance over which a new access road will be built	N/A

Describe the type of access road planned:

There is an existing access road. No new roads need to be constructed.

N/A

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

[1] "Alternative A.." refer to activity, process, technology or other alternatives.

5. LOCALITY MAP

An A3 locality map must be attached to the back of this document, as Appendix A. The scale of the locality map must be relevant to the size of the development (at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map.). The map must indicate the following:

- an accurate indication of the project site position as well as the positions of the alternative sites, if any;
- indication of all the alternatives identified;
- closest town(s;)
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection).

6. LAYOUT/ROUTE PLAN

A detailed site or route plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix A to this document.

The site or route plans must indicate the following:

- the property boundaries and numbers of all the properties within 50 metres of the site;
- the current land use as well as the land use zoning of the site;
- the current land use as well as the land use zoning each of the properties adjoining the site or sites;
- the exact position of each listed activity applied for (including alternatives);
- servitude(s) indicating the purpose of the servitude;
- a legend; and
- a north arrow.

7. SENSITIVITY MAP

The layout/route plan as indicated above must be overlain with a sensitivity map that indicates all the sensitive areas associated with the site, including, but not limited to:

- watercourses;
- the 1:100 year flood line (where available or where it is required by DWA);
- ridges;
- cultural and historical features;
- areas with indigenous vegetation (even if it is degraded or infested with alien species); and
- critical biodiversity areas.

The sensitivity map must also cover areas within 100m of the site and must be attached in Appendix A.

8. SITE PHOTOGRAPHS

Colour photographs from the centre of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under Appendix B to this report. It must be supplemented with additional photographs of relevant features on the site, if applicable.

9. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of at least 1:200 as Appendix C for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

10. ACTIVITY MOTIVATION

Motivate and explain the need and desirability of the activity (including demand for the activity):

1. Is the activity permitted in terms of the property's existing land use rights?	YES	[redacted]	Please explain
The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years.			
2. Will the activity be in line with the following?			
(a) Provincial Spatial Development Framework (PSDF)	YES	[redacted]	Please explain
The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years and is considered to be in line with the provincial SDF.			
(b) Urban edge / Edge of Built environment for the area	[redacted]	NO	Please explain
The site is located outside the urban edge.			
(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	YES	NO	Please explain
The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years. The approval of this application will therefore not compromise the integrity of the municipal IDP and SDF.			

(d) Approved Structure Plan of the Municipality	YES		Please explain
The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years. The approval of this application will therefore not compromise the municipal structure plan.			
(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)	YES	NO	Please explain
The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years. According to the Draft Siyanda Environmental management Framework, the property (Erf 5410) is mapped as transformed. The approval of this application will therefore not compromise the integrity of the Siyanda EMF.			
(f) Any other Plans (e.g. Guide Plan)	YES	NO	Please explain
3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	YES		Please explain
The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years.			
4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	YES		Please explain
Residential development has extended considerably in the last 10 years to an extent that the residential area is now within 2km of the evaporation ponds. In addition, the reigning winds are either north or north-west which now blows the odours directly to the residential areas. This has led to numerous complaints.			
5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? (Confirmation by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES	NO	Please explain
N/a			

6. Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? (Comment by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES	[redacted]	Please explain
The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years. The approval of this application will therefore not compromise the integrity of the municipal infrastructure planning.			
7. Is this project part of a national programme to address an issue of national concern or importance?	YES	NO	Please explain
Only in the sense that possible soil and water contamination is a national concern.			
8. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	YES	[redacted]	Please explain
The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years. The approval of this application will therefore not compromise the land use.			
9. Is the development the best practicable environmental option for this land/site?	YES	[redacted]	Please explain
Yes, the upgrade is expected to have the following positive impacts: • The actual disturbed footprint will be much reduced (less than half of the current evaporation ponds). • Odour problems should be solved. • Possible soil and water contamination will be much better managed and the risk for pollution will be almost negligible. • Possible contaminated soils will be remediated. • Treated water will be re-used as washwater or for garden irrigation (against current evaporation).			
10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	YES	[redacted]	Please explain
Yes, the upgrade is expected to have the following positive impacts: • The actual disturbed footprint will be much reduced (less than half of the current evaporation ponds). • Odour problems should be solved. • Possible soil and water contamination will be much better managed and the risk for pollution will be almost negligible. • Possible contaminated soils will be remediated. Treated water will be re-used as washwater or for garden irrigation (against current evaporation).			

11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	YES	NO	Please explain
N/A. The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years. The approval of this application will therefore not compromise the land use			
12. Will any person's rights be negatively affected by the proposed activity/ies?	YES	NO	Please explain
The proposed activity will be for the benefit of the community, and it is therefore not considered to negatively affect any person's rights.			
13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?	YES	NO	Please explain
The site is located outside the urban edge.			
14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?	YES	NO	Please explain
No. The activity is the upgrade and changing of the existing evaporation pond system into a reed bed treatment system, and will be located within the same footprint used for the current evaporation pond system on the same property (Erf 5410) purchased for this specific purpose and used for this purpose for more than 20 years. The activity is to localised and small to impact on any of the 17 Strategic Integrated Projects.			
15. What will the benefits be to society in general and to the local communities?			Please explain
The activity will not only improve the effluent treatment and quality of the existing works, but additional temporary employment opportunities could be created during the construction phase.			
16. Any other need and desirability considerations related to the proposed activity?			Please explain
17. How does the project fit into the National Development Plan for 2030?			Please explain
According to the National Development Plan for 2030, before 2030, all South Africans will have affordable access to sufficient safe water and hygienic sanitation to live healthy and dignified lives. The proposed activity will help ensure this for the community.			

18. Please describe how the general objectives of Integrated Environmental Management as set out in section 23 of NEMA have been taken into account.

The general objectives of Integrated Environmental Management have been taken into account through the following:

- The actual and potential impacts of the activity on the environment, socio-economic conditions and cultural heritage have been identified, predicted and evaluated, as well as the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impact, maximizing benefits and promoting compliance with the principles of environmental management.
- The effects of the activity on the environment have been considered before actions taken in connection with them.
- Adequate and appropriate opportunity for public participation was ensured through the public participation process.
- The environmental attributes have been considered in the management and decision-making of the activity

19. Please describe how the principles of environmental management as set out in section 2 of NEMA have been taken into account.

The principles of environmental management as set out in section 2 of NEMA have been taken into account. The principles pertinent to this activity include:

- People and their needs have been placed at the forefront while serving their physical, psychological, developmental, cultural and social interests.
- Development must be socially, environmentally and economically sustainable. Where disturbance of ecosystems, loss of biodiversity, pollution and degradation, and landscapes and sites that constitute the nation's cultural heritage cannot be avoided, are minimised and remedied. Although the activity has little to no impact on these, they have been considered, and mitigation measures have been put in place. This is dealt with in the EMP (**Appendix G**)
- Where waste cannot be avoided, it is minimised and remedied through the implementation and adherence of EMP.
- The use of non-renewable natural resources is responsible and equitable.
- The negative impacts on the environment and on people's environmental rights have been anticipated and prevented, and where they cannot be prevented, are minimised and remedied.
- The interests, needs and values of all interested and affected parties have been taken into account in any decisions through the Public Participation Process.
- The social, economic and environmental impacts of the activity have been considered, assessed and evaluated, including the disadvantages and benefits.
- The effects of decisions on all aspects of the environment and all people in the environment have been taken into account, by pursuing what is considered the best practicable environmental option.

11. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
National Water Act (Act 36 of 1998)	Section 21(e): engaging in a controlled activity	Department of Water Affairs	In Progress

12. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase? YES
If YES, what estimated quantity will be produced per month? m³

How will the construction solid waste be disposed of (describe)?

Minimal amounts of construction waste are expected. Excavated soil will be used as fill and remediation. Any excess construction waste will be disposed of at the nearest licenced waste disposal site in Upington

Where will the construction solid waste be disposed of (describe)?

At the nearest licenced waste disposal site.

Will the activity produce solid waste during its operational phase? YES
If YES, what estimated quantity will be produced per month? 2-4 m³
How will the solid waste be disposed of (describe)?

Sedimentation sludge from the pre-treatment works are pumped and disposed by the Municipality (a service for which KWV/OWK pay and which is already in place to service the current pre-treatment works). This practice will continue.

If the solid waste will be disposed of into a municipal waste stream, indicate which registered landfill site will be used.

Upington Waste Disposal site

Where will the solid waste be disposed of if it does not feed into a municipal waste stream (describe)?

N/A

If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the NEM:WA? NO
If YES, inform the competent authority and request a change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

Is the activity that is being applied for a solid waste handling or treatment facility? NO
If YES, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

b) Liquid effluent

N/A. This application is for the upgrade of an existing effluent treatment facility

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	YES	NO
If YES, what estimated quantity will be produced per month?		m^3
Will the activity produce any effluent that will be treated and/or disposed of on site?	YES	NO

If YES, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility?	YES	NO

If YES, provide the particulars of the facility:

Facility name:			
Contact person:			
Postal address:			
Postal code:			
Telephone:		**Cell:**	
E-mail:		**Fax:**	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

The proposed activity is the upgrade of the existing effluent treatment facility, which will ensure more optimal treatment of waste water, better pollution control and re-use of treated wastewater.

c) Emissions into the atmosphere

Will the activity release emissions into the atmosphere other that exhaust emissions and dust associated with construction phase activities?	[redacted]	NO
If YES, is it controlled by any legislation of any sphere of government?	YES	NO

If YES, the applicant must consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If NO, describe the emissions in terms of type and concentration:

N/A

d) Waste permit

Will any aspect of the activity produce waste that will require a waste permit in terms of the NEM:WA?	YES	[redacted]

If YES, please submit evidence that an application for a waste permit has been submitted to the competent authority: **This licence application.**

e) Generation of noise

Will the activity generate noise?		NO
If YES, is it controlled by any legislation of any sphere of government?	YES	NO

If YES, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
If NO, describe the noise in terms of type and level:

N/A

13. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(es):

Municipal	Water board	Groundwater	River, stream, dam or lake	Other	The activity will not use water

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month:		N/A litres
Does the activity require a water use authorisation (general authorisation or water use license) from the Department of Water Affairs?	YES	NO

Licence application for Section 21(e) – engaging in a controlled activity

If YES, please provide proof that the application has been submitted to the Department of Water Affairs **(Application will be made once the final treat works design is finalised).**

14. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

Constructed wetlands have distinct advantages over other means of treating wastewater in that they are not dependent on external energy or chemical inputs and require very little maintenance. Their lifespan can reach anything up to 80 years and in addition they are scenically attractive and provide a habitat for a wide variety of plants, birds, reptiles and invertebrates.

Reed beds generally provide an effluent much better than an oxidation pond system, and better or similar to that of a conventional treatment system and are especially suited to fluctuating flows. Reed beds can be constructed with unskilled labour and are devoid of high tech equipment and therefore can be considered a low maintenance option.

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

Constructed wetlands have distinct advantages over other means of treating wastewater in that they are not dependent on external energy or chemical inputs and require very little maintenance.

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

1. For linear activities (pipelines, etc) as well as activities that cover very large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section B and indicate the area, which is covered by each copy No. on the Site Plan.

Section B Copy No. (e.g. A): [ ]

2. Paragraphs 1 - 6 below must be completed for each alternative.

3. Has a specialist been consulted to assist with the completion of this section? YES | NO

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed and attach it in Appendix I. All specialist reports must be contained in Appendix D.

Property description/physical address:

Province	**Northern Cape**
District Municipality	**Siyanda District Municipality**
Local Municipality	**//Khara Hais Local Municipality**
Ward Number(s)	
Farm name and number	**Erf 5410 Upington**
Portion number	
SG Code	**C02800070000541000000**

Where a large number of properties are involved (e.g. linear activities), please attach a full list to this application including the same information as indicated above.

Current land-use zoning as per local municipality IDP/records:

Industrial Zone III (Refer to Appendix J1).

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to, to this application.

Is a change of land-use or a consent use application required? [redacted] | NO

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative S1:

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S2 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S3 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

2. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site:

2.1 Ridgeline		2.4 Closed valley		2.7 Undulating plain / low hills	X
2.2 Plateau		2.5 Open valley		2.8 Dune	
2.3 Side slope of hill/mountain		2.6 Plain		2.9 Seafront	

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following?

	Alternative S1:	Alternative S2 (if any):	Alternative S3 (if any):
Shallow water table (less than 1.5m deep)	NO	NO	NO
Dolomite, sinkhole or doline areas	NO	NO	NO
Seasonally wet soils (often close to water bodies)	NO	NO	NO
Unstable rocky slopes or steep slopes with loose soil	NO	NO	NO
Dispersive soils (soils that dissolve in water)	NO	NO	NO
Soils with high clay content (clay fraction more than 40%)	NO	NO	NO
Any other unstable soil or geological feature	NO	NO	NO
An area sensitive to erosion	NO	NO	NO

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted.

4. GROUNDCOVER

Indicate the types of groundcover present on the site. The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Natural veld - good condition[E]	Natural veld with scattered aliens[E]	Natural veld with heavy alien infestation[E]	Veld dominated by alien species[E]	Gardens
Sport field	Cultivated land	Paved surface	Building or other structure	Bare soil

If any of the boxes marked with an "E "is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

Summary of Biodiversity Assessment

Please refer to the Biodiversity assessment of Erf 5410 (PB Consult, 10 March 2013) for a full description of the biodiversity features encountered.

In accordance with the 2006 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation types is expected on the sites, namely Kalahari Karroid Shrubland, which has been classified as Least Threatened according to the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011). The Erf which is approximately 60 ha in size have been bought by KWV to establish their wastewater treatment facility (or evaporation ponds). Off the site approximately 65 – 70% can be described as transformed (evaporation ponds). The remaining natural veld can also be divided into two units depending on the condition of the veld. To the northwest (on the small kopje or butt) the vegetation is still relatively undisturbed and in good condition, while to the south and southeast (lower lying areas) the remaining natural veld has been impacted to a much larger degree, some of which was originally disturbed during the development of the evaporation ponds (refer to Figure 3 underneath).

Figure 3: Google image demonstrating the extent of the evaporation ponds and the remaining natural veld

No species protected in terms of the National Forests Act (NFA) of 1998 (Act 84 of 1998), which provides for the protection of forests as well as specific tree species (GN 71 6 of 7 September 2012), have been encountered.

However, 7 species protected in terms of the Northern Cape Nature Conservation Act 9 of 2009 (NCNCA), which also provides for the sustainable utilization of wild animals, aquatic biota and plants, were observed. The most notable species under these are a number of Boscia foetida (False Sheppard's Tree) which are marked with blue reference points on Figure 3 above.

It is important to note that none of the protected species needs to be impacted and that none of the remaining natural veld needs to be impacted. It is proposed that the new treatment works are located within the existing highly disturbed or transformed area marked in Figure 3 above. The footprint of the new works (<10ha) are expected to be much smaller than that of the current site (>22ha).

Draft Siyanda EMP

According to the Draft Siyanda Environmental Management Framework the proposed site falls within the following categories according to the various maps.

- **Conservation priority areas:** According to Map 12a the site falls within an area (vegetation type) regarded as having a High (3) conservation priority, but according to Map 12b, the site does not fall within a proposed conservation area.
- **Landcover:** According to Map 13 of the Draft EMF, it would seem as if the proposed site falls within the area marked as shrubland.
- **Sensitivity Index:** According to Map 14 of the Draft EMF, the proposed site falls within an area identified as of low environmental sensitivity (2) in an index which starts at Transformed and then are given values of 0-8 (8 being of high environmental sensitivity).
- **Control Zones:** According to Map 15, the proposed site location falls within a control zone 3 area, which is regarded as areas of potential high to very high vegetation conservation areas.

THUS ACCORDING THE SIYANDA EMF, KALAHARI KARROID SHRUBLAND IS CONSIDERED A VEGETATION TYPE WITH HIGH CONSERVATION VALUE; HOWEVER, THIS SPECIFIC LOCATION IS NOT PRESENTLY SEEN AS A SENSITIVE SITE.

5. SURFACE WATER

Indicate the surface water present on and or adjacent to the site and alternative sites?

Perennial River		NO	UNSURE
Non-Perennial River		NO	UNSURE
Permanent Wetland		NO	UNSURE
Seasonal Wetland		NO	UNSURE
Artificial Wetland		NO	UNSURE
Estuarine / Lagoonal wetland		NO	UNSURE

If any of the boxes marked YES or UNSURE is ticked, please provide a description of the relevant watercourse.

6. LAND USE CHARACTER OF SURROUNDING AREA

Indicate land uses and/or prominent features that currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

Natural area	Dam or reservoir	Polo fields
Low density residential	Hospital/medical centre	Filling station [H]
Medium density residential	School	Landfill or waste treatment site
High density residential	Tertiary education facility	Plantation
Informal residential [A]	Church	Agriculture
Retail commercial & warehousing	Old age home	River, stream or wetland
Light industrial	Sewage treatment plant [A]	Nature conservation area
Medium industrial [AN]	Train station or shunting yard [N]	Mountain, koppie or ridge
Heavy industrial [AN]	Railway line [N]	Museum
Power station	Major road (4 lanes or more) [N]	Historical building
Office/consulting room	Airport [N]	Protected Area
Military or police base/station/compound	Harbour	Graveyard
Spoil heap or slimes dam [A]	Sport facilities	Archaeological site
Quarry, sand or borrow pit	Golf course	Other land uses (describe)

If any of the boxes marked with an "N "are ticked, how will this impact / be impacted upon by the proposed activity?

A railway line runs approximately 250 m to the south of the current treatment works, but the proposed activity will have no additional impact on the operation of the railway. In fact the smaller footprint and better odour control is expected to have a positive impact.

The N10 to Namibia runs approximately 250 m north of the current treatment works, but the proposed activity will have no additional impact on the operation of this road. In fact the smaller footprint and better odour control is expected to have a positive impact.

If any of the boxes marked with an "An" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

N/A

If any of the boxes marked with an "H" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

N/A

Does the proposed site (including any alternative sites) fall within any of the following:

Critical Biodiversity Area (as per provincial conservation plan)	[redacted]	NO
Core area of a protected area?		NO
Buffer area of a protected area?		NO
Planned expansion area of an existing protected area?		NO
Existing offset area associated with a previous Environmental Authorisation?		NO
Buffer area of the SKA?		NO

If the answer to any of these questions was YES, a map indicating the affected area must be included in Appendix A.

7. CULTURAL/HISTORICAL FEATURES

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including Archaeological or paleontological sites, on or close (within 20m) to the site? If YES, explain:	YES [redacted]
	Uncertain

If uncertain, conduct a specialist investigation by a recognised specialist in the field (archaeology or palaeontology) to establish whether there is such a feature(s) present on or close to the site. Briefly explain the findings of the specialist:

According to the Heritage Assessment **(Appendix D3),** in terms of the built environment, the area has no significance, as there are no old buildings, structures, or features, old equipment, public memorial or monuments in the proposed footprint area.

The proposed upgrading will take place within an existing footprint area covering about 40ha in extent. It is estimated that more than 90% of the site is already very severely degraded and has been dramatically transformed.

In terms of Section 38 (1) (c) (iii) of the National Heritage Resources Act 1999 (Act 25 of 1999), an AIA of the proposed project is required if the footprint area of the development is more than 5000m².

The aim of the study is to identify and map archaeological heritage that may be impacted by the proposed project, to assess the significance of the potential impacts and to propose measures to mitigate the impacts.

Twenty-two artefacts were counted and mapped with a hand held GPS unit. These, comprised three Early Stone Age implements, including two large cores, and nine Middle Stone Age flakes, blades, cores and flaked chunks. One double sided hammerstone was also found, while the remainder of the lithics comprised chunks and retouched and/or utilized flakes, of which some may be Later Stone Age. No formal tools such as handaxes, points, scrapers or adzes, and no organic remains such as pottery or ostrich eggshell were found.

The very small numbers and isolated context in which they were encountered means that the archaeological remains on Erf 5410 have been rated as having low (Grade 3C) significance.

The results of the study indicate that the proposed development will not have an impact of great significance on these and potentially other archaeological remains.

The following recommendations are made:

1. No further archaeological mitigation is required.
2. In the unlikely event of any unmarked human burials/remains or ostrich eggshell water flask caches being exposed during construction activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resources Agency (Att Ms Katie Smuts 021 462 4502). Burials, etc. must not be removed or disturbed until inspected by the archaeologist

Will any building or structure older than 60 years be affected in any way?	[redacted]	NO
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?		NO

If YES, please provide proof that this permit application has been submitted to SAHRA or the relevant provincial authority.

8. SOCIO-ECONOMIC CHARACTER

a) Local Municipality

Please provide details on the socio-economic character of the local municipality in which the proposed site(s) are situated.

Level of unemployment:

According to the //Khara Hais Spatial Development Framework 2009, it is recognized that poverty remains the core obstacle to a stable and prosperous future in South Africa. This applies to //Khara Hais as well. Despite commendable efforts of government, and state-supported efforts, poverty continues to be a chronic problem for much of South Africa's population. There problems are also evident in //Khara Hais.

The Labour Market27 constitutes 63% of the total population of //Khara Hais (47 843). Only 24% of the Labour Market is employed, with the unemployment rate at 13%. The *not economically active28* people constitute 26% of the Labour Market. The unemployment rate of 13% could therefore be somewhat misleading due to the fact that people not seeking work, which can be classified as unemployed people, are not included.

Economic profile of local municipality:

According to the //Khara Hais Spatial Development Framework 2009, according to the 2001 Census data the Tertiary Sector provides more than 50% of the job opportunities in //Khara Hais. The Community, Social and Personal Services employs most people in the Municipality (i.e. 23%) followed closely by the Wholesale and Retail Trade sector, which employs 18% of the employed people.

Agriculture and mining account for 14% and the secondary sector (construction, manufacturing etc.) account for 13% of employment opportunities in the municipality

Level of education:

According to the //Khara Hais Spatial Development Framework 2009, it is imperative that the illiteracy and functional level of communities be addressed. Functional illiteracy is indicative of an inability to understand abstract information and usually occurs when a person has completed less than seven years of formal education and at least passed grade seven. 16% of the population of the Municipality is functionally illiterate while 7% are completely illiterate. This is directly connected to low income levels and will push the HDI further down if this is not attended to. A total of 19.31% of the population has some secondary education, while only 11.65% have completed Grade 12.

A third of the population in //Khara Hais is under the age of 15 years. This section of the population will become economically active within the next 5 to 10 years and education will be a key requirement to ensure a good quality of life. The 2008 Socio-Economic Survey indicates that approximately 25% of the population has an educational level of between Grades 8–10, while 24% has between Grades 11-12 and only about 4% has any form of tertiary education. These percentages, especially those that have completed Grade 12 have increased significantly since 2005, indicating a growth in the average educational level.

b) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	To be determined from results from the pilot study.
What is the expected yearly income that will be generated by or as a result of the activity?	N/A. No direct income expected but savings on Municipal water use is expected.
Will the activity contribute to service infrastructure?	YES
Is the activity a public amenity?	NO
How many new employment opportunities will be created in the development and construction phase of the activity/ies?	To be determined
What is the expected value of the employment opportunities during the development and construction phase?	Will be determined from the design.
What percentage of this will accrue to previously disadvantaged individuals?	To be determined
How many permanent new employment opportunities will be created during the operational phase of the activity?	0
What is the expected current value of the employment opportunities during the first 10 years?	N/a
What percentage of this will accrue to previously disadvantaged individuals?	N/a

9. BIODIVERSITY

Please note: The Department may request specialist input/studies depending on the nature of the biodiversity occurring on the site and potential impact(s) of the proposed activity/ies. To assist with the identification of the biodiversity occurring on site and the ecosystem status consult http://bgis.sanbi.org or BGIShelp@sanbi.org. Information is also available on compact disc (cd) from the Biodiversity-GIS Unit, Ph (021) 799 8698. This information may be updated from time to time and it is the applicant/ EAP's responsibility to ensure that the latest version is used. A map of the relevant biodiversity information (including an indication of the habitat conditions as per (b) below) and must be provided as an overlay map to the property/site plan as Appendix D to this report.

a) Indicate the applicable biodiversity planning categories of all areas on site and indicate the reason(s) provided in the biodiversity plan for the selection of the specific area as part of the specific category)

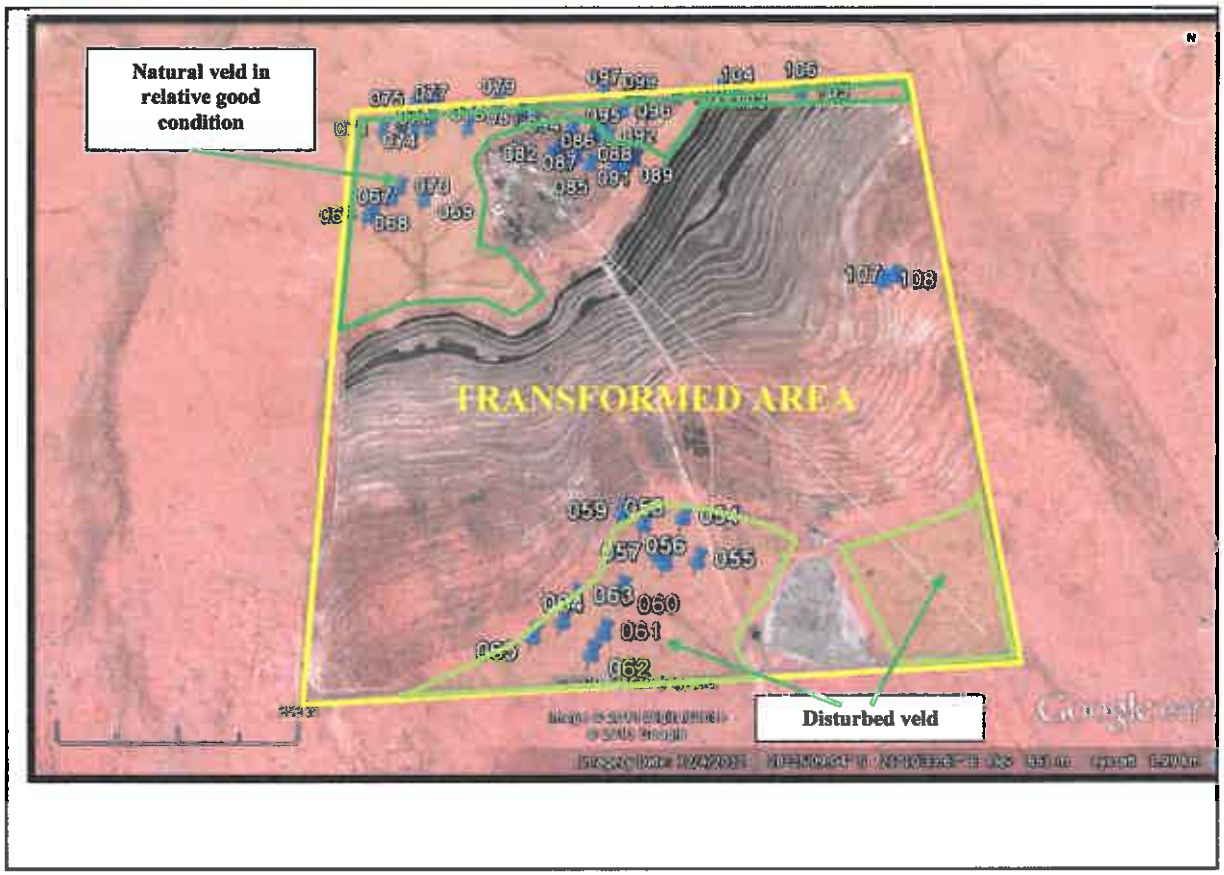
Systematic Biodiversity Planning Category				If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan
Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)	Other Natural Area (ONA)	No Natural Area Remaining (NNR)	No fine-scale mapping is as yet available for this area and as a result no critical biodiversity areas or biodiversity support areas has been promulgated for this area. Refer to the biodiversity assessment, Appendix D2

b) Indicate and describe the habitat condition on site

Habitat Condition	Percentage of habitat condition class (adding up to 100%)	Description and additional Comments and Observations (including additional insight into condition, e.g. poor land management practises, presence of quarries, grazing, harvesting regimes etc).
Natural	10-15%	According to the Biodiversity Assessment (Appendix D2) the remaining natural veld can also be divided into two units depending on the condition of the veld. To the northwest (on the small kopje or butt) the vegetation is still relatively undisturbed and in good condition, while to the south and southeast (lower lying areas) the remaining natural veld has been impacted to a much larger degree, some of which was originally disturbed during the development of the evaporation ponds (refer to Figure 3 underneath).)
Near Natural (includes areas with low to moderate level of alien invasive plants)	%	
Degraded (includes areas heavily invaded by alien plants)	15-20%	The remaining natural veld can also be divided into two units depending on the condition of the veld. To the northwest (on the small kopje or butt) the vegetation is still relatively undisturbed and in good condition, while to the south and southeast (lower lying areas) the remaining natural veld has been impacted to a much larger degree, some of which was originally disturbed during the development of the evaporation ponds (refer to Figure 3 underneath).
Transformed (includes cultivation, dams, urban, plantation, roads, etc)	60-70%	Off the site approximately 65 – 70% can be described as transformed (evaporation ponds).

The Erf which is approximately 60 ha in size have been bought by KWV to establish their wastewater treatment facility (or evaporation ponds). Off the site approximately 65 – 70% can be described as transformed (evaporation ponds). The remaining natural veld can also be divided into two units depending on the condition of the veld. To the northwest (on the small kopje or butt) the vegetation is still relatively undisturbed and in good condition, while to the south and southeast (lower lying areas) the remaining natural veld has been impacted to a much larger degree, some of which was originally disturbed during the development of the evaporation ponds (refer to Figure 3 underneath).

Figure 4: Google image demonstrating the extent of the evaporation ponds and the remaining natural veld



c) Complete the table to indicate:

(i) the type of vegetation, including its ecosystem status, present on the site; and

(ii) whether an aquatic ecosystem is present on site.

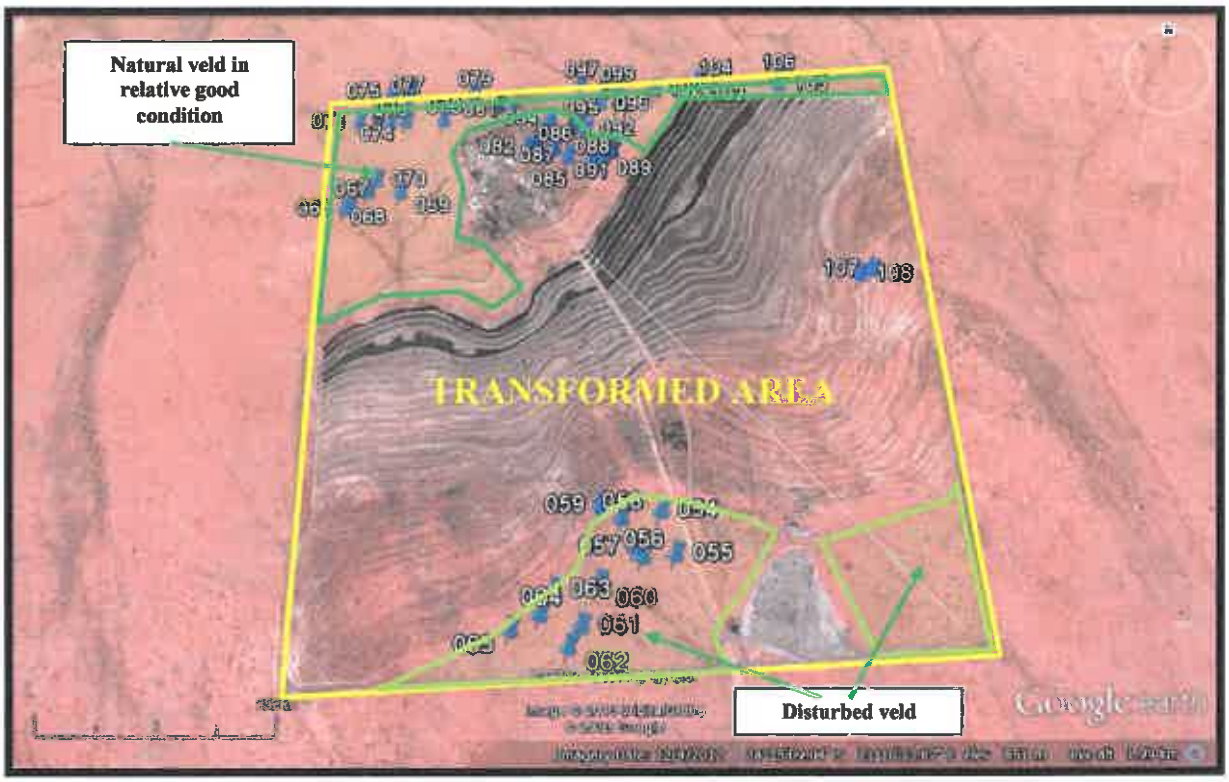
Terrestrial Ecosystems		Aquatic Ecosystems						
Ecosystem threat status as per the National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	Critical	Wetland (including rivers, depressions, channelled and unchanneled wetlands, flats, seeps pans, and artificial wetlands)			Estuary		Coastline	
	Endangered							
	Vulnerable							
	Least Threatened	YES	NO	UNSURE	YES	NO	YES	NO

d) Please provide a description of the vegetation type and/or aquatic ecosystem present on site, including any important biodiversity features/information identified on site (e.g. threatened species and special habitats)

According to the Biodiversity Assessment (**Appendix D2**), and in accordance with the 2006 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation types is expected on the sites, namely Kalahari Karroid Shrubland, which has been classified as Least Threatened according to the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011). The Erf which is approximately 60 ha in size have been bought by KWV to establish their wastewater treatment facility (or evaporation ponds). Off the site approximately 65 – 70% can be described as transformed (evaporation ponds). The remaining natural veld can also be divided into two units depending on the condition of the veld. To the northwest (on the small kopje or butt) the vegetation is still relatively undisturbed and in good condition, while to the south and southeast (lower lying areas) the remaining natural veld has been impacted to a much larger degree, some of which was originally disturbed during the development of the evaporation ponds (refer to Figure

3 underneath).

Figure 5: Google image demonstrating the extent of the evaporation ponds and the remaining natural veld



No species protected in terms of the National Forests Act (NFA) of 1998 (Act 84 of 1998), which provides for the protection of forests as well as specific tree species (GN 71 6 of 7 September 2012), have been encountered.

Photo 2: Overview of the relatively undisturbed vegetation encountered on top of the small kopje to the north of the site

However, 7 species protected in terms of the Northern Cape Nature Conservation Act 9 of 2009 (NCNCA), which also provides for the sustainable utilization of wild animals, aquatic biota and plants, were observed. The most notable species under these are a number of *Boscia foetida* (False Sheppard's Tree) which are marked with blue reference points on Figure 3 above.

It is important to note that none of the protected species needs to be impacted and that none of the remaining natural veld needs to be impacted. It is proposed that the new treatment works are located within the existing highly disturbed or transformed area marked in Figure 3 above. The footprint of the new works (<10ha) are expected to be much smaller than that of the current site (>22ha).

Photo 3: Overview of the more disturbed vegetation encountered along the southern portion of the site

Draft Siyanda EMP

According to the Draft Siyanda Environmental Management Framework the proposed site falls within the following categories according to the various maps.

- **Conservation priority areas:** According to Map 12a the site falls within an area (vegetation type) regarded as having a High (3) conservation priority, but according to Map 12b, the site does not fall within a proposed conservation area.
- **Landcover:** According to Map 13 of the Draft EMF, it would seem as if the proposed site falls within the area marked as shrubland.
- **Sensitivity Index:** According to Map 14 of the Draft EMF, the proposed site falls within an area identified as of low environmental sensitivity (2) in an index which starts at Transformed and then are given values of 0-8 (8 being of high environmental sensitivity).
- **Control Zones:** According to Map 15, the proposed site location falls within a control zone 3 area, which is regarded as areas of potential high to very high vegetation conservation areas.

THUS ACCORDING THE SIYANDA EMF, KALAHARI KARROID SHRUBLAND IS CONSIDERED A VEGETATION TYPE WITH HIGH CONSERVATION VALUE; HOWEVER, THIS SPECIFIC LOCATION IS NOT PRESENTLY SEEN AS A SENSITIVE SITE.

The following mitigation measures were proposed:

General

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and the Biodiversity study recommendations as well as any other conditions which might be required by the Department of Environmental Affairs.

- An integrated waste management system must be implemented during the construction phase.
- All rubble and rubbish (if applicable) must be collected and removed from the site to a suitable registered waste disposal site.
- All alien vegetation should be removed from the larger property.

Other site specific mitigation recommendations

- The proposed treatment works should utilise the existing footprint and thus the existing disturbed areas as much as possible. In doing this the impact on natural veld and protected species is minimised (Refer to Figure 3 above).
- Permits must be obtained for the removal of any protected species which cannot be avoided.
- Only existing access roads should be used for access to the terrain. Access roads must be clearly demarcated and access must be tightly controlled (deviations may not be allowed).
- Indiscriminate clearing of areas must be avoided (all remaining areas to remain as natural as possible).
- Soils contaminated as a result of the current evaporation pond treatment system must be rehabilitated and used as base material for the construction of the new treatment work (especially if constructed wetland treatment is implemented).
- All topsoil (in areas with natural veld) must be removed and stored separately for re-use for rehabilitation purposes. The topsoil and vegetation should be replaced over the disturbed soil to provide a source of seed and a seed bed to encourage re-growth of the species removed during construction.
- Once the construction is completed all further movement must be confined to the access tracks to allow the vegetation to re-establish over the excavated areas.
- Adequate measures must be implemented to ensure against erosion.

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT AND NOTICE

Publication name	Die Volksblad – 12 December 2012 Die Gemsbok – 14 December 2012	
Date published	Die Volksblad – 12 December 2012 Die Gemsbok – 14 December 2012	
Site notice position Entrance to Erf 5410 Erf 5412 Pearl Asa Kafee Khulumani Cash store	**Latitude**	**Longitude**
	28° 25' 20.4"	21° 10' 34.4"
	28° 26' 21.6"	21° 12' 16.8"
	28° 26' 11.7"	21° 12' 34.1"
	28° 26' 03.6"	21° 12' 29.6"
Date placed	05 December 2012	

Include proof of the placement of the relevant advertisements and notices in Appendix E1.

2. DETERMINATION OF APPROPRIATE MEASURES

Provide details of the measures taken to include all potential I&APs as required by Regulation 54(2)(e) and 54(7) of GN R.543.

Key stakeholders (other than organs of state) identified in terms of Regulation 54(2)(b) of GN R.543:

Title, Name and Surname	Affiliation/ key stakeholder status	Contact details (tel number or e-mail address)
Mr. Ernest Oliver	KWV (Landowner) & Applicant	olivere@kwv.co.za
Mr. Altus Theron	OWK (in control of land)	altus@owk.co.za
Mr. P.J. Viviers	!!Khara Hais Local Municipality	054 – 337 7021
Mr. D Ngxanga	Siyanda District Municipality	054 – 337 2800
Mr. M Andreas	Municipal Ward Councillor	054 – 337 7021

Include proof that the key stakeholder received written notification of the proposed activities as Appendix E2. This proof may include any of the following:

- e-mail delivery reports;
- registered mail receipts;
- courier waybills;
- signed acknowledgements of receipt; and/or
- or any other proof as agreed upon by the competent authority.

3. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summary of main issues raised by I&APs	Summary of response from EAP

No comments were received during the initial round of public participation

4. COMMENTS AND RESPONSE REPORT

The practitioner must record all comments received from I&APs and respond to each comment before the Draft BAR is submitted. The comments and responses must be captured in a comments and response report as prescribed in the EIA regulations and be attached to the Final BAR as Appendix E3.

5. AUTHORITY PARTICIPATION

Authorities and organs of state identified as key stakeholders:

Authority/Organ of State	Contact person (Title, Name and Surname)	Tel No	Fax No	e-mail	Postal address
Department of Water Affairs	Me. Nozi Mazwi	+27 (053) 836 7600		MazwiR@dwa.gov.za	Private Bag X6101 Kimberley 8300
Department of Roads and Public Works	Mr K Nogwili	(053)839 2241	(053)839 2291		P O Box 3132 Kimberley 8300
Department of Agriculture and Land Reform	Mr W Mothibi	(053)838 9102			Private Bag X5018 Kimberley 8300
Department of Environment and Nature Conservation	Me. Anga Yaphi	+27 (54) 3322885		ayaphi@ncpg.gov.za	206 Umbra Building Upington 8801
Department of Agriculture, Forestry and Fisheries	Ms Jacoline Mans	+27 (54) 338 5909	+27 (54) 334 0030	jacolinema@daff.gov.za	P.O. Box 2782 Upington 8800
SAHRA	Kathryn Smuts	021 462 4502	021 462 4509	ksmuts@sahra.org.za	PO Box 4637, Cape Town 8000

Include proof that the Authorities and Organs of State received written notification of the proposed activities as appendix E4.

In the case of renewable energy projects, Eskom and the SKA Project Office must be included in the list of Organs of State.

6. CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for any activities (linear or other) where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that sub-regulation to the extent and in the manner as may be agreed to by the competent authority.

Proof of any such agreement must be provided, where applicable. Application for any deviation from the regulations relating to the public participation process must be submitted prior to the commencement of the public participation process.

A list of registered I&APs must be included as appendix E5.

Copies of any correspondence and minutes of any meetings held must be included in Appendix E6.

SECTION D: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2010, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

Provide a summary and anticipated significance of the potential direct, indirect and cumulative impacts that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed. This impact assessment must be applied to all the identified alternatives to the activities identified in Section A(2) of this report.

Activity	Impact summary	Significance	Proposed mitigation
Alternative 1 (preferred alternative)			
Construction and operation	**Direct impacts:** • Impact on threatened or protected ecosystems. • Impact on threated or protected species. • Impact on loss of ecological processes, ecosystem connectivity and local biodiversity.	***Very low to positive*** ***Very low to positive*** ***Very low to positive***	• The vegetation type has been classified as Least Threatened during the latest National Spatial Biodiversity Assessment. • According to the draft Siyanda EMF, Kalahari Karroid Shrubland is considered a vegetation type with high conservation value; however, this specific site is not considered to be located within a sensitive area or considered for future conservation. • The proposed upgraded should be placed within the footprint of the existing evaporation pond system, but placed to avoid any of the identified protected species. In doing this the impact might even be positive, since the footprint should be much reduced. • Indiscriminate clearing of areas must be avoided (all construction related activities must be contained within the existing footprint). • All efforts must be made avoid protected species (there is no reason that any protected species should be impacted). • Only existing access roads should be used for access to the terrain. Access roads must be clearly demarcated and access must be tightly controlled (deviations may not be allowed). • The remaining evaporation pond footprint (not used for the construction of the new reed bed treatment system must be remediated and rehabilitated.

Activity	Impact summary	Significance	Proposed mitigation
	Indirect impacts: • Soil contamination as a result of the new treatment method • Pollution as a result of poorly treated effluent and waste. • Soil contamination as a result of poor remediation of the existing evaporation pond system.	***Low*** ***Low*** ***Medium***	• The reed bed treatment systems must be suitably lined to prevent soil and water contamination. • The proposed upgraded should be placed within the footprint of the existing evaporation pond system, but placed to avoid any of the identified protected species. In doing this the impact might even be positive, since the footprint should be much reduced. • Indiscriminate clearing of areas must be avoided (all construction related activities must be contained within the existing footprint). • The remaining evaporation pond footprint (not used for the construction of the new reed bed treatment system must be remediated and rehabilitated.
	Cumulative impacts: • Cumulative	***Considered to be positive***	• The suspected soil and possible water pollution resulting from the using of unlined evaporation ponds will be negated in future. • SA is a water scarce country and the re-use of treated effluent will be a significant better option than evaporation and will have a reduction of water usage within the KWV/OWK complex.
Alternative 2 The impacts associated with all of the remainder impacts will be very similar to that described above. • However, the direct impact may be even lower since the footprint will most likely be even smaller. • But, the construction cost and the operational and maintenance cost will be much higher; and • It will have an added negative impact in that it will be dependent on electricity for its operation.			
	Direct impacts:		•
	Indirect impacts:		
	Cumulative impacts:		
Alternative 3			
	Direct impacts:		
	Indirect impacts:		
	Cumulative impacts:		

Activity	Impact summary	Significance	Proposed mitigation
No-go option			
	Direct impacts: • Loss of water that can be re-used if suitably treated. • Continual soil pollution as a result of using unlined evaporation ponds. • Possible water pollution as a result of using unlined evaporation ponds.	***Medium*** ***Medium*** ***Low***	• A resent pilot soil study done by Dr. Raath (a soil scientist) showed that the soils are contaminated in the immediate vicinity of the current evaporation ponds. However, it also shows that the indications of pollutants have not spread very far in the surrounding soils and are most probably only associated with the direct footprint of the evaporation ponds and its immediate surroundings. • The current evaporation pond system will continue to operate, which will lead to further soil pollution as a result of the ponds not being lined. This will lead to potential environmental pollution and may even lead to water pollution.
Continue with the current treatment system without any upgrade	***Indirect impacts:*** • Loss of water that can be re-used if suitably treated. • Continual soil pollution as a result of using unlined evaporation ponds. • Possible water pollution as a result of using unlined evaporation ponds.	**Same as above**	**Same as above**
	Cumulative impacts: • Continual soil and water pollution as a result of using an unlined facility. • Continual waste of a scarce water resource (treated water)		

A complete impact assessment in terms of Regulation 22(2)(i) of GN R.543 must be included as Appendix F.

2. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Alternative A (preferred alternative)

Refer to Appendix F

Alternative B

Alternative C

No-go alternative (compulsory)

According to the biodiversity assessment (Appendix D2), the "No-Go alternative" does not signify significant biodiversity gain or loss especially on a regional basis. However, the proposed activity entails a better treatment system, better pollution prevention measures, a smaller physical footprint, the remediation of contaminated land and the re-use of a valuable resource (water).

The No-Go option will mean the current status quo will remain and there will be no possibility of improvement of treatment and the possible positive impact on the surrounding environment. The current effluent treatment practices will not be improved and continual pollution issues (which will further increase over time) will remain.

Over the short and long term the proposed project is likely to have a positive environmental impact, while the No-Go option will remain a continual source of environmental pollution.

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?	YES	[redacted]

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment).

The information contained in this study should be sufficient to advise that the proposed upgrade have all the possibilities of having a positive impact (improvement) on the environment in relation to the current practices.

- A pilot study was commissioned by the client in order to determine the possible soil pollution that may have resulted as a result of the 20 years of evaporation practice (Dr. P Raath, March 2013). This gives a very good indication of the possible remediation issues, but further chemical analysis of the soil and sludge within the existing evaporation ponds will be needed in order to advise positive remediation.

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application.

- **All** construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and the Biodiversity study recommendations as well as any other conditions which might be required by the Department of Environmental Affairs.
- An integrated waste management system must be implemented during the construction phase.
- All rubble and rubbish (if applicable) must be collected and removed from the site to a suitable registered waste disposal site.
- All alien vegetation should be removed from the larger property.
- The reed bed treatment systems must be suitably lined to prevent soil and water contamination.
- The proposed upgraded should be placed within the footprint of the existing evaporation pond system, but placed to avoid any of the identified protected species. In doing this the impact might even be positive, since the footprint should be much reduced.
- Indiscriminate clearing of areas must be avoided (all construction related activities must be contained within the existing footprint).
- The remaining evaporation pond footprint (not used for the construction of the new reed bed treatment system must be remediated and rehabilitated.
- Permits must be obtained for the removal of any protected species which cannot be avoided.
- Only existing access roads should be used for access to the terrain. Access roads must be clearly demarcated and access must be tightly controlled (deviations may not be allowed).
- No additional areas with remaining natural veld (even disturbed natural veld) should be further impacted.
- The area used for the temporary storage of coal ash should be lined and shape to ensure that all possible leakage are contained.

Is an EMPr attached?	YES	[redacted]

The EMPr must be attached as Appendix G.

The details of the EAP who compiled the BAR and the expertise of the EAP to perform the Basic Assessment process must be included as Appendix H.

If any specialist reports were used during the compilation of this BAR, please attach the declaration of interest for each specialist in Appendix I.

Any other information relevant to this application and not previously included must be attached in Appendix J.

P.J.J. Botes

NAME OF EAP

SIGNATURE OF EAP

2013/8/20.

DATE

SECTION F: APPENDIXES

The following appendixes must be attached:

Appendix A: Maps

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Specialist reports (including terms of reference)

Appendix E: Public Participation

Appendix F: Impact Assessment

Appendix G: Environmental Management Programme (EMPr)

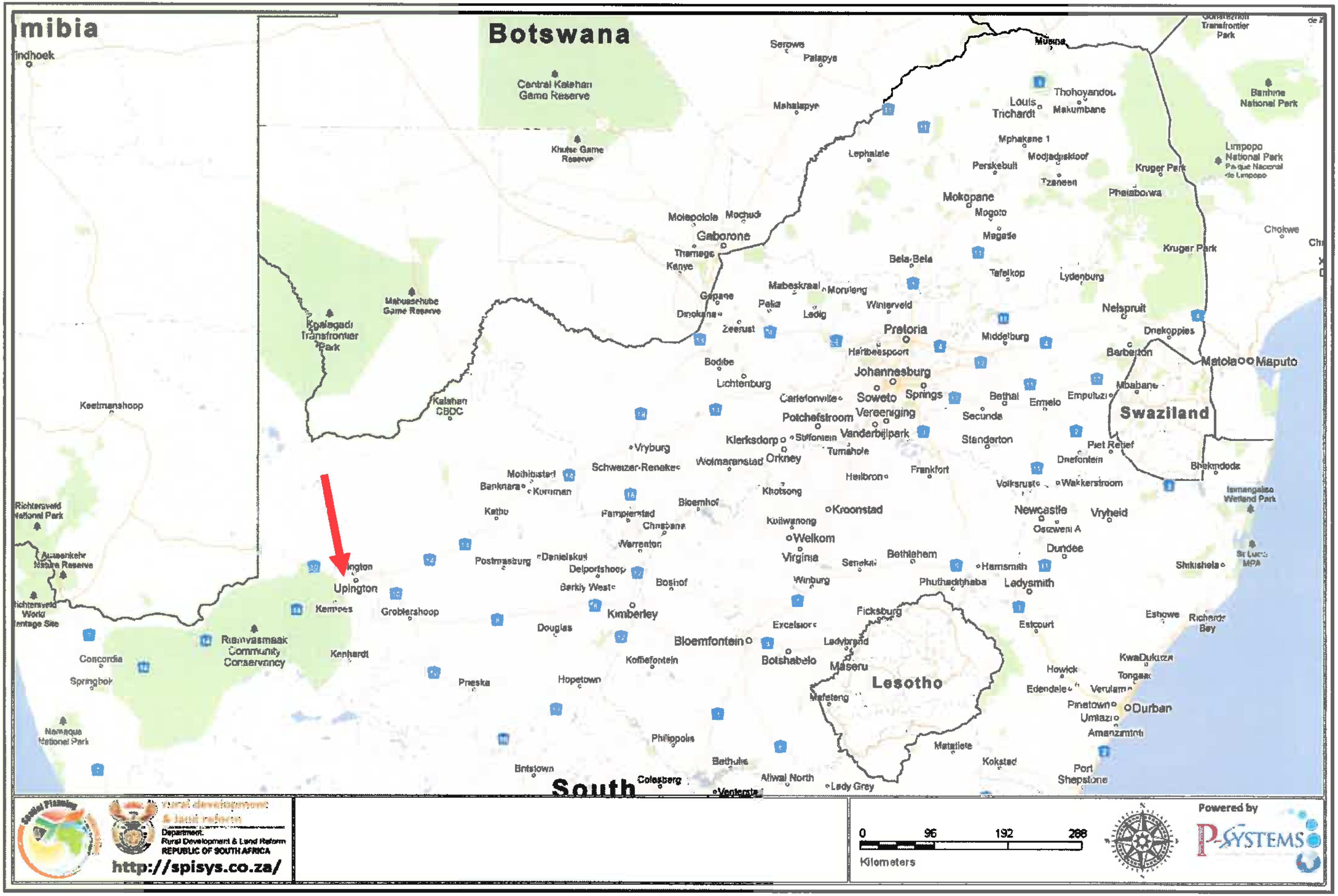
Appendix H: Details of EAP and expertise

Appendix I: Specialist's declaration of interest

Appendix J: Additional Information

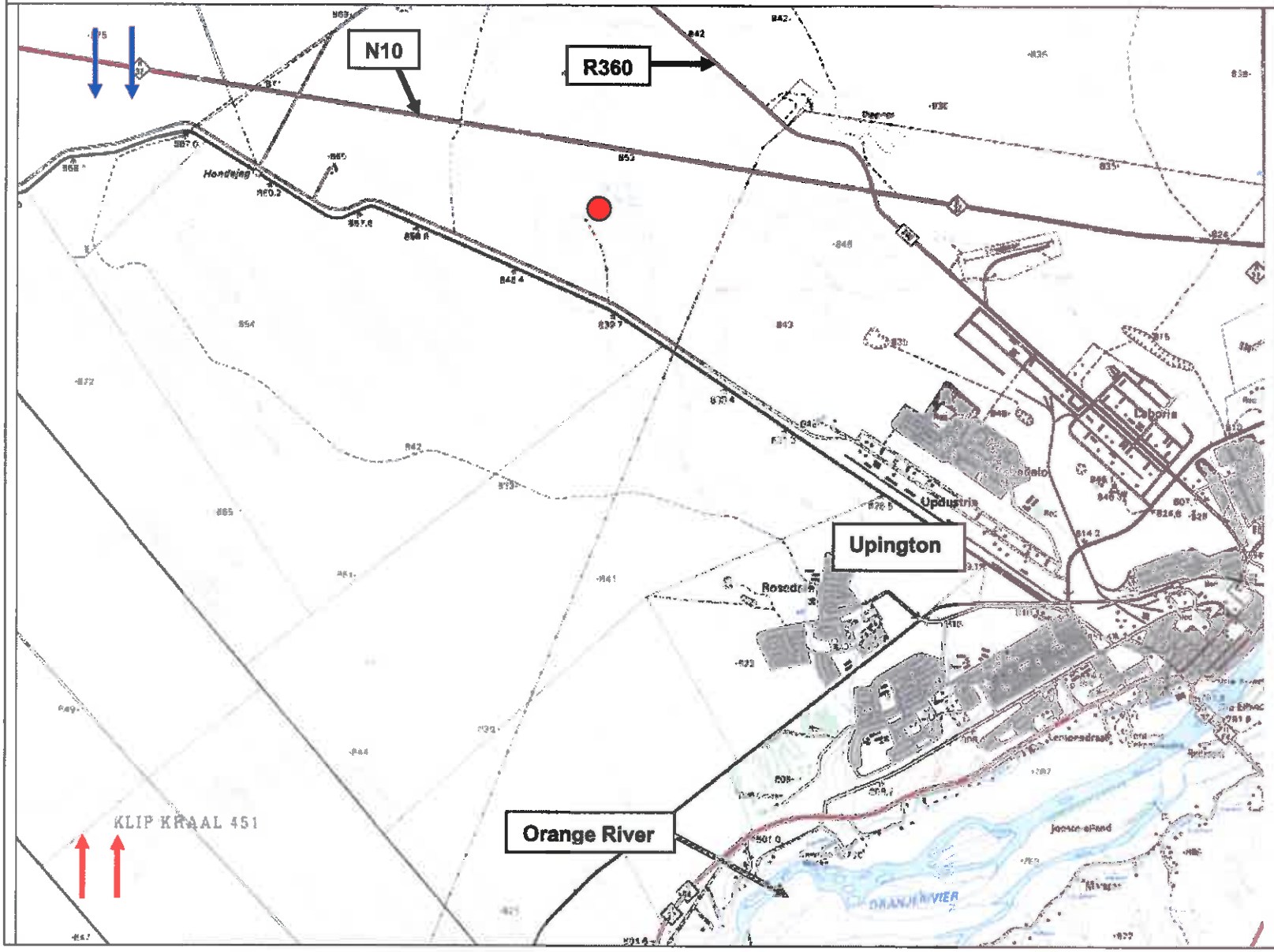
Appendix A

Maps



Botswana
Central Kalahari Game Reserve
Khutse Game Reserve
Serowe
Palapye
Mahalapye
Molepolole
Mochudi
Gaborone
Thamaga
Kanye
Gaphane
Dinokana
Zeerust
Mabeskraal
Moruleng
Peka
Ledig
Winterveld
Pretoria
Hartbeespoort
Johannesburg
Soweto
Springs
Carletonville
Potchefstroom
Vereeniging
Vanderbijlpark
Klerksdorp
Stilfontein
Tumahole
Orkney
Wolmaransstad
Lichtenburg
Bodibe
Vryburg
Schweizer-Reneke
Mothibistad
Bankhara
Kuruman
Kathu
Postmasburg
Danielskuil
Delportshoop
Barkly West
Kimberley
Boshof
Bloemhof
Pampierstad
Christiana
Warrenton
Douglas
Groblershoop
Upington
Keimoes
Kenhardt
Prieska
Hopetown
Britstown
Colesberg
Philippolis
Bethulie
Koffiefontein
Bloemfontein
Botshabelo
Excelsior
Ladybrand
Maseru
Lesotho
Mafeteng
Ficksburg
Senekal
Bethlehem
Phuthaditjhaba
Harrismith
Ladysmith
Winburg
Virginia
Welkom
Kroonstad
Kutlwanong
Khotsong
Heilbron
Frankfort
Standerton
Secunda
Bethal
Ermelo
Middelburg
Empuluzi
Mbabane
Swaziland
Piet Retief
Dirkiesdorp
Volksrust
Wakkerstroom
Newcastle
Osizweni A
Vryheid
Dundee
Estcourt
Howick
Edendale
Pietermaritzburg
Verulam
Durban
Umlazi
Amanzimtoti
Port Shepstone
Kokstad
Matatiele
Lady Grey
Aliwal North
Venterstad
KwaDukuza
Tongaat
Eshowe
Richards Bay
Shikishela
St Lucia MPA
Isimangaliso Wetland Park
Bhekindode
Matola
Maputo
Barberton
Driekoppies
Nelspruit
Lydenburg
Kruger Park
Phalaborwa
Tzaneen
Modjadjiskloof
Thohoyandou
Makumbane
Louis Trichardt
Musina
Mphakane 1
Perskebult
Mokopane
Mogoto
Magatle
Tafelkop
Bela-Bela
Lephalale
Limpopo National Park
Parque Nacional do Limpopo
Banhine National Park
Chokwe
Kalahari CBDC
Mabuasehube Game Reserve
Kgalagadi Transfrontier Park
Riemvasmaak Community Conservancy
Keetmanshoop
Windhoek
Richtersveld National Park
Ausenkehr Nature Reserve
Richtersveld World Heritage Site
Concordia
Springbok
Namaqua National Park
South
0
96
192
288
Kilometers
Powered by
P-SYSTEMS
Department: Rural Development & Land Reform
REPUBLIC OF SOUTH AFRICA
http://spisys.co.za/

KWV UPINGTON EFFLUENT MANAGEMENT FACILITY



SITE CO-ORDINATES

28° 25' 06.66" S
21° 10' 34.11" E

THE SITE

PREVAILING WIND DIRECTION

Nov – April

May – Oct

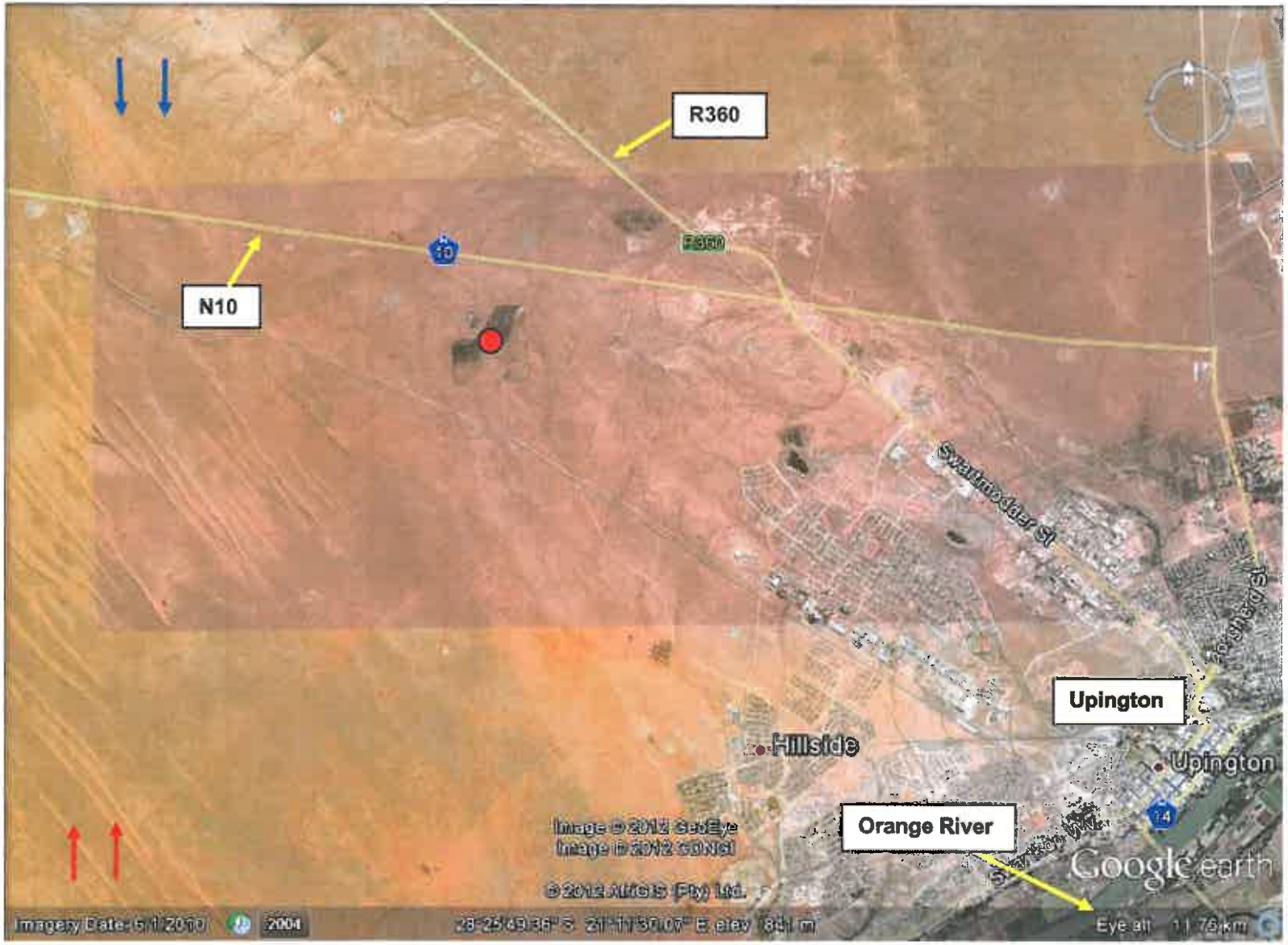
N

ENVIRO AFRICA REF:
0328

SEPTEMBER 2012

EnviroAfrica cc

KWV UPINGTON EFFLUENT MANAGEMENT FACILITY



SITE CO-ORDINATES

28° 25' 06.66" S
21° 10' 34.11" E

THE SITE

PREVAILING WIND DIRECTION

Nov – April

May – Oct

N

ENVIRO AFRICA REF:

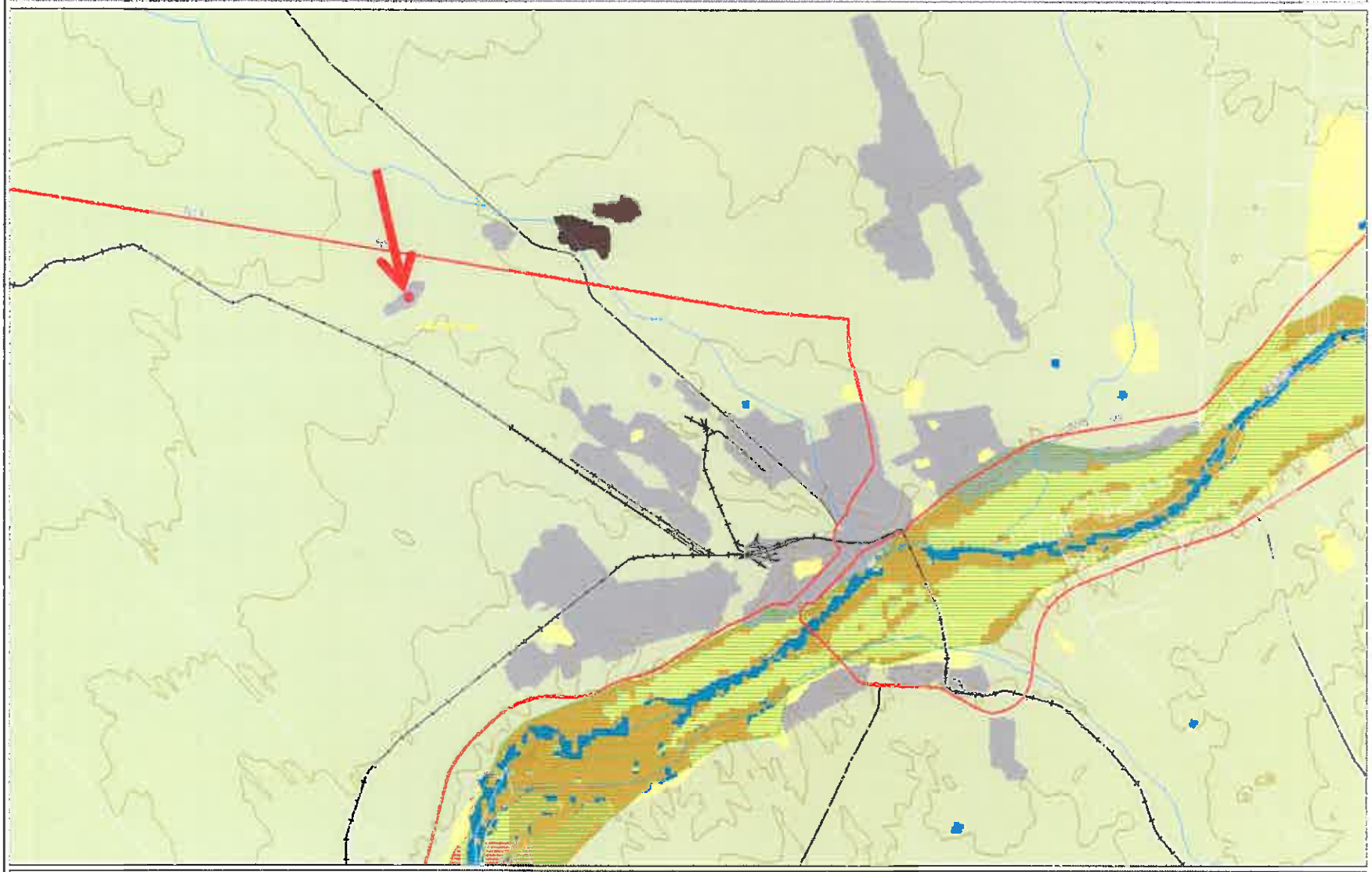
0328

SEPTEMBER 2012

EnviroAfrica cc

SANBI

KWV / OWK Effluent Management Facility



Legend

- Local municipalities
- Farm boundaries
- National roads
- Secondary roads
  - ARTERIAL ROUTE
  - MAIN ROAD
  - SECONDARY ROAD
- Railways
- Contours north
- Contours south
- Rivers
- Formal land-based (NBA 2011)
- Informal land-based (NPAES)
- Marine - MPA (NBA 2011)
- CBA aquatic
  - CBA aquatic (type 1)
  - CBA aquatic (type 2)
  - Ecological Support Areas aquatic
- CBA terrestrial
  - CBA terrestrial (type 1)
  - CBA terrestrial (type 2)
  - Ecological Support Areas terrestrial
- Remaining extent
  - Critically Endangered
  - Endangered
  - Vulnerable
- National Landcover
  - Cultivated
  - Degraded
  - Mines
  - Natural
  - Plantations
  - Urban Built-up
  - Waterbodies

1:67 667

3.4 0 1.72 3.4 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Notes

National Landcover of SA

Appendix B

Site photographs

Site photographs

Aerial image of the site, including photograph locations and directions.

Photographs

Photo 1: Taken from position 1, looking west, showing the area beneath the evaporation ponds

Photo 2. Taken from position 1, looking east. Showing the area underneath the evaporation ponds

Photo 3: Taken from position 2, looking north-west onto the existing evaporation ponds

Photo 4: Taken from position 3, showing the lower down existing pond system

Photo 5: Taken from position 4, showing the upper pond system

Photo 6: Taken from position 5, showing the natural veld to the north west of the ponds

Photo 7: Taken from position 6, showing the current state of the oxidation pond system

Photo 8. Taken from position 7, looking east along the top of the pond system

Photo 9: Taken from position 7, looking south over the upper ponds

Photo 10: Taken from position 8, looking north east over the upper pond system

Photo11: Taken from position 8, looking south east over the existing pond system

Photo 12: Taken from position 8, south east over site.

Photo 13: Taken from position 9, looking north-west over the proposed site for the oxidation ponds, and the area of pooling from the overflow from the existing pond system.

Photo 14: Taken from position 9, looking north-west over the proposed site for the oxidation ponds, and the area of pooling from the overflow from the existing pond system.

Appendix C

Facility Illustrations

Proposed Facility Illustrations

To be added once desighn is finilised, Underneaht some photos of the pilot project.

Appendix D

Specialists Reports

APPENDIX D:

1) **Engineering options investigated**
2) **Biodiversity & Botanical Scan**
3) **Archaeological Impact Assessment**
4) **Soil impact report**

APPENDIX D (1)

Engineering options investigated

ORANGE RIVER WINE CELLARS / KWV DISTILLERY EFFLUENT: TREATMENT OPTIONS INVESTIGATED

Date: 10 April 2013

BACKGROUND TO THE PROJECT

The Orange River Wine Cellars is a cooperative wine cellar established in Upington in 1965. Over the years the intake tonnage has increased from a meagre 5000 tons per annum to some 180 000 tons per annum. The cellar complex in Upington now comprises a modern wine cellar, a brandy distillery owned by KWV and a grape juice concentrate plant. As is commonly known, wineries and disstilleries are notorius for the quality of their effluent and at this complex it is no different. Typically, the combined effluent from the three processing plants equates to an average volume of 1 350m^3 per day or some 40 000m^3 per month. An analysis of the effluent has indicated that it has a chemical oxygen demand varying between 8 000mg/l to 10 000mg/l with high concentrations of Total Suspended Solids and Total Dissolved Solids. Typically the COD of winery effluent comprises some 91% of ethanol and a other organic components such as acetic acid and phenols.

These constituents are notoriusly difficult to treat and the analysis results indicate that the effluent is at the upper limit for aerobic process treatment and at the lower limit of anaerobic process treatment, making it extremely difficult to select a suitable process train for this effluent.

Given the above, BVi, in consultation with the client have investigated several options which are briefly described below.

OPTION 1 : EVAPORATION PONDS (current treatment option)

In the mid 1980's OWK made a capital investment and purchased a piece of land from the local authority with the aim of providing evaporation ponds for the treatment of the winery effluent. This was required, as the local authority declined to accept their effluent into the municipal sewage system as it could be detrimental to the activated sludge process at the municipal wastewater treatment plant. The piece of land aquired is approximately 36ha in size.

Based on the projected flows and the nett average daily evaporation rates, a series of evaporation ponds were developed on this piece of land located approximately 4km west of the wine cellar. The evaporation ponds cover an area of 22ha and were designed so that a single day's effluent is discharged onto a pan. Some 36 evaporation pans were provided which are then used sequentially. Evaporation in the Upington area is highn and averages at about 120mm per month. This system worked fairly well in that the evaporation has exceeded the effluent volume for almost 20 years. The problem with this system is that it produces odour. Twenty years ago, this was not problematic, as the evaporation ponds where far from any residential areas. This has however changed and residential development has extended considerably the last 10 years to an extent that the residential area is now within 2km of the evaporation ponds. In addition, the reigning winds are either north or north-west which now

blows the odours directly to the residential areas. This has led to complaints and subsequently, the OWK / KWV have decided to investigate other possibilities. In addition to the above, legislation has changed to such an extent that this practice is now no longer acceptable for disposing of this effluent.

Although this practice is currently still being used, OWK/KWV have committed themselves to find a solution to legalize and improve their current practice. They have also started dosing Lime into the effluent in an effort to increase the pH. In addition, the have started dosing Effective Microorganisms in an effort to abate the oudour problem. Both these actions are considered of interim nature, but have had a positive, if not permanent effect on the problem.

OPTION 2: UPFLOW ANAEROBIC SLUDGE BLANKET REACTOR

Generally, when one has to deal with effluent which has a high organic load, the answer is to utilize an anaerobic process. Anaeraobic bacteria utlize carbon based materials as food sources and produce methane, water and hydrogen sulfide as byproducts. Investigations by BVi Consulting Engineers found that the UASB reactors have been used successfully at other large scale wineries/distilling plants in the Western Cape. A UASB reactor consists of a vertical tank into which the effluent is pumped. The UASB process uses an anaerobic process whilst forming a blanket of granular sludge which suspends in the tank. Wastewater flows upwards through the blanket and is processed (degraded) by the anaerobic microorganisms. The upward flow combined with the settling action of gravity suspends the blanket with the aid of flocculants. The blanket begins to reach maturity at around 3 months. Small sludge granules begin to form whose surface area is covered in aggregations of bacteria. In the absence of any support matrix, the flow conditions creates a selective environment in which only those microorganisms, capable of attaching to each other, survive and proliferate. Eventually the aggregates form into dense compact biofilms referred to as "granules".

The UASB reactor is however very high level technology and requires a high initial capital investment and also a continued running operational expense. The technology needs constant monitoring when put into use to ensure that the sludge blanket is maintained, and not washed out (thereby losing the effect). The heat produced as a by-product of electricity generation can be reused to heat the digestion tanks rendering them more effective.

The blanketing of the sludge enables a dual solid and hydraulic (liquid) retention time in the digesters. Solids requiring a high degree of digestion can remain in the reactors for periods up to 90 days.[2] Sugars dissolved in the liquid waste stream can be converted into gas quickly in the liquid phase which can exit the system in less than a day.

This high initial investment can be played off against the fact that the process generates substantial amounts of methane gas which could be utilized as an energy source. KWV currently uses coal fired boilers in their distillery which could be replaced with gas burners running off methane. In addition, by using a gas engine driving a generator, electricity could be produced.

A UASB plant capable of treating the quantities of effluent found at the OWK/KWV however has a capital cost in excess of R15 million. The management of OWK/KWV were indigant, indicating that there was no way in which they could take a project of this extent to their shareholders who are farmers. The shareholders were already battling to farm profitably and there was no way that an investment of this nature would be approved.

Subsequently, this option was abandoned due to excessive capital cost and high running cost.

OPTION 3: COVERED IN-GROUND ANAEROBIC REACTOR

This process is again based on the actions of anaerobic bacteria and was developed for treatment of large volumes of organic waste. The CIGAR process was developed in New Zealand by a company called Waste Solutions. The acronym CIGAR stands for Covered In Ground Anaerobic Reactor. Such a system effectively comprises a reactor constructed by making an excavation in the soil, lining it with HDPE sheeting and also covering the surface with a floating plastic roof which will serve as a gas collector for the methane produced. Low pressure Roots-type blowers are used to then extract the methane gas under vacuum from the floating roof and then pumped to a gas storage tank.

As with all anaerobic processes, they are not magic and always have byproducts that need to be dealt with responsably. Typically, there is always a highly enriched supernatant, stabilized sludge, etc that still needs to be dealt with. In addition, this specific process requires large volumes of waste to be treated to make it cost effective. After telephonic and e-mail discussions with Waste Solutions, it was decided to abandon this option, again due to the economy thereof. Although it was considerbly more economic than the UASB process, it still lacked sufficient economy of scale to make it worthwhile.

OPTION 4: CONSTRUCTED WETLANDS (REEDBEDS)

Reed beds or constructed wetlands are large areas of land inundated with water typically not deeper than 600 mm that support the growth of emergent plants such as cattail, bulrush, reeds and sedges. The most popular of these plants being the common reed or phragmites australis hence the name "reed bed treatment system". The plants or more specifically their roots in combination with the growth media they are planted in act as natural biological filters. The aerobic zones around their roots are the habitat for a multitude of microorganisms that utilize the nutrients found in wastewater as food.

Typically reed beds are shallow basins filled with a growth medium such as soil, sand or gravel which has an impervious layer that retains the water and prevents contamination of the natural ground below. The media is then planted with distinct plant communities such as reeds, sedges, bulrushes, etc.

Constructed wetlands have distinct advantages over other means of treating wastewater in that they are not dependent on external energy or chemical inputs and require very little maintenance. Their lifespan can reach anything up to 80 years and in addition they are scenically attractive and provide a habitat for a wide variety of plants, birds, reptiles and invertebrates.

Reed beds generally provide an effluent much better than an oxidation pond system, and better or similar to that of a conventional treatment system and are especially suited to fluctuating flows. Reed beds can be constructed with unskilled labor and are devoid of high tech equipment and therefore can be considered a low maintenance option.

The water purification function of reed beds is dependent on four principle components: the vegetation, the water column, substrate and the associated microbial populations. The only function of the vegetation is to provide additional environments/habitat for the microbial populations. The stems of the plants and the falling leaves in the water column obstruct flow and facilitate sedimentation and increase surface area. Therefore the choice of vegetation is critical as most terrestrial plants cannot survive in waterlogged soils due to the depletion of oxygen which is normally associated with flooding. Aquatic plants have specialized stems, which enable them to conduct atmospheric gases such as oxygen down into their roots. The oxygen is exuded out of their root hairs forming an aerobic rhizosphere around every root hair while the rest of the surface volume remains anaerobic. Within the rhizosphere large populations of common aerobic and anaerobic bacteria thrive and aid the biological breakdown of the organic compounds found in wastewater.

The vegetation only take up a fraction of the available nutrients found in the wastewater, their primary role being to increase the amount of aerobic environment for the microbial populations found in the water column and below the water/substrate interface. Suspended solids in the wastewater are aerobically composted in the above substrate layer of straw and plant debris formed by the dead leaves and stems. By this means, constructed wetlands are able to remove organic compounds (measured as Chemical Oxygen Demand), suspended solids and nitrogen. The removal of phosphorous is possible through adsorption by the substrate. The selection of specialized substrate is however important to remove significant amounts of this element.

There are two basic types of reed beds. The first being the Vertical Flow System. In this system, the water is applied on the surface of the reed bed with a pipe distribution system and flows vertically through the substrate where it is collected in a drainage system on the floor of the reed bed. This type of reed bed is typically utilized for the first stage of treatment and usually planted with the common reed Phragmites australis.

The second type of wetland is named the Horizontal Flow System and the wastewater flows horizontally through the substrate below the surface. The horizontal flow reed beds are utilized as a secondary treatment and at least two or more such beds are recommended in series.

For both types, pretreatment (i.e. solids have to be removed from the wastewater stream) is essential to prevent clogging of the substrate surface and also the distribution piping. This is typically done using either septic tanks or anaerobic ponds.

With conventional treatment (anaerobic or aerobic digesters) not being cost-effective for the wine industry, effluent treatment is the exception rather than the rule. Winery effluent is normally irrigated on pastures or, in some cases, dumped directly into the nearest river. Since most wine cellars are small, the individual effect of effluent disposal practices on the environment is negligible. Collectively, however, the industry does contribute to environmental degradation in drainage basins where wineries operate.

As a low-cost alternative treatment method, use of constructed wetlands may prove acceptable for winery effluents. Additional benefits may add to their attractiveness. These include minimal labour requirements, no chemical usage, very little maintenance, potential recreational use and provision of habitat for wildlife species (especially birds and indigenous flora) through the creation of an environment suited to them. Research has been conducted by the CSIR, the Water Research Commission and Winetech. All the research has indicated that positive results are achievable that can comply with the General Limit Values for effluent as required by the Department of Water Affairs.

BVi Consulting Engineers were commissioned in 2012 by the OWC Board of Directors to design and construct a pilot-scale reed bed treatment system to evaluate the potential for the treatment of the Upington cellar complex effluent. Said pilot-scale plant was completed in November 2012 and the plants are now being cultivated and established before commencement of treating of the effluent. The pilot plant has a design capacity to treat 2 000 liters of cellar effluent per day.

The pilot plant consists of 2 above ground horizontal polypropylene tanks with a volume of 8000 liters each. They are to act as anaerobic reactors. The effluent from the tanks is periodically discharged by means of a siphon system on three number vertical flow reed beds. Each of the beds were filled with a different media combination to allow evaluation of the various media gradings. The vertical flow beds are operated sequentially in parallel and their effluent is discharged to 3 number horizontal subsurface flow reed beds which are operated in series.

It is envisaged that this treatment plant will now be monitored on a two weekly basis by analyzing both influent and effluent as well as changing the inlet flow to determine the optimum design for the proposed full scale plant.

Once an optimum size has been derived, it is the intention of Orange River Wine Cellars to replace the existing evaporation ponds with a reed bed treatment system which will firstly not cause the current odour nuisance and secondly, allow a large portion of the treated effluent to be re-used for either washwater or the irrigation of the cellar gardens.

APPENDIX D (2)

Biodiversity & Botanical Scan

KWV EFFLUENT MANAGEMENT FACILITY

Proposed upgrade of the KWV evaporation pond system at Upington

BIODIVERSITY & BOTANICAL SCAN

A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required).

March 10, 2013

PREPARED BY: PB Consult

PREPARED FOR: ENVIROAFRICA CC

Peet Botes (Pr.Sci.Nat: 400184/05) Registered Professional Environmental and Ecological Scientist
Cell: 082 921 5949; Fax 086 514 8595; Email: pbconsult@vodamail.co.za; 22 Bultekant Street, Bredasdorp, 7280.

INDEPENDENCE & CONDITIONS

PB Consult is an independent consultant and has no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and PB Consult have no interest in secondary or downstream development as a result of the authorization of this proposed project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. PB Consult reserve the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALITFICATIONS & EXPERIENCE OF THE AUTHOR

Mr. Peet Botes holds a BSc. (Hons.) degree in Plant Ecology from the University of Stellenbosch (Nature Conservation III & IV as extra subjects). Since qualifying with his degree, he had worked for more than 20 years in the environmental management field, first at the Overberg Test Range (a Division of Denel) managing the environmental department of OTB and being responsible for developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve). In 2005 he joined Enviroscientific, an independent environmental consultancy specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity en environmental legal compliance audits. During 2010 he joined EnviroAfrica in order to move back to the biodiversity aspects of environmental management. Experience with EnviroAfrica includes EIA applications, biodiversity assessment, botanical assessment, environmental compliance audits and environmental control work.

Yours sincerely,

P.J.J. Botes
Professional Environmental and Ecological Scientist

SUMMARY - MAIN CONCLUSIONS

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BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING
Geology & soils	Geology & soils vary only slightly in the larger study area, with deeper sandy soils found over most of the area.	No special features have been encountered (e.g. true quartz patches or broken veld) and the impact on geology and soils is expected to be very localised and low. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible. Impact = very low
Land use and cover	Natural veld utilised for stock grazing.	The property is sparsely used by the local inhabitants. The impact on land use and cover is expected to be very low and localised. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible.
Vegetation types	Kalahari Karroid Shrubland	This vegetation type is considered "Least threatened", but the remaining natural veld shows good connectivity with the surrounding areas. According to the draft Siyanda EMF, the vegetation is of high conservation priority, but does not fall within a proposed conservation area and as such the locality is of low environmental significance. Impact low. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible.
Conservation priority areas.	In terms of the draft Siyanda EMF	According to the EMF the site does not fall within a proposed conservation area. Impact low/localised. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible.
Sensitivity index	In terms of the draft Siyanda EMF	According to the EMF, the proposed site falls within an area identified as of very low environmental sensitivity (1). Impact low and localised. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible.
Protected plant species	A number of protected species (Refer to Table 3), in terms of the NCNCA was observed.	Protected species was mostly associated with the remaining natural veld to the north and south of the existing evaporation ponds. Non species protected in terms of the NFA was observed, but a number of species protected in terms of the NCNCA was observed in the above mentioned areas. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible. However, if the footprint is to be enlarged, placement must be carefully considered. Impact low to medium (depending on the footprint).
Fauna & Avi-fauna	The site is used for live-stock grazing and is in close proximity to constant human activity.	Although natural fauna and avi-fauna may still be present, it is expected that it would be limited to avi-fauna, insects and maybe some reptile's species (proximity to the urban edge and the current land-use). The activity is not expected to have a significant impact on fauna or avi-fauna. Impact low.
Rivers & wetlands	No river or wetland areas were observed within the site.	No river or wetland system is expected to be impacted directly by the proposed upgrade. The impact on rivers is thus considered **negligible**.
Invasive alien infestation	A number of *Prosopis* as well as single *Nicotiana* individuals was observed	All invasive alien species should be removed in the immediate vicinity of the existing and the new treatment works during the construction phase. If implemented the impact can be regarded as positive.

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1. INTRODUCTION

The KWV Upington Distillery is situated on Erf 5412 (Upington), right next to OWK Wines. The KWV / OWK complex in Upington comprises a brandy distillery owned by KWV and a modern wine cellar and grape juice concentrate plant owned by OWK. In the mid 1980's KWV made a capital investment and purchased a piece of land (Erf 5410) from the local authority with the aim of providing evaporation ponds for the treatment of effluent. This was required, as the local authority declined to accept their effluent into the municipal sewage system as it could be detrimental to the activated sludge process at the municipal wastewater treatment plant. All wastewater from both KWV and OWK are disposed on Erf 5410 (Upington).

Since 1981 KWV and OWK has been disposing their industrial effluent into large evaporation ponds on Erf 5410 in accordance with the conditions set out in Exemption 838 B, issued by the Department of Water Affairs in terms of section 21(4)(e) of the Water Act (Act 54 of 1956). Recently the volumes of industrial effluent that are disposed at Erf 5410 had increased to such an extent that it does not anymore conform to the conditions of Exemption 838 B. With the implementation of the new NEM:WA (Act 59 of 2008) waste act, it was determined that the facility will have to apply for a Waste Licence in terms of Category B of the "List of Waste Management activities that have, or are likely to have, a detrimental effect on the environment".

KWV / OWK had appointed BVi Engineers to investigate options for wastewater treatment with the aim of upgrading and improving the treatment system in order to ensure legal compliance and also the possibility of treating the wastewater to irrigation standards (as opposed to evaporation). EnviroAfrica was appointed to facilitate the environmental impact assessment. Since the property and its immediate surrounding areas are still covered by some areas of remaining natural veld, a Biodiversity Scan of the proposed location was commissioned in order to evaluate the environmental impact(s) of the proposed project and to establish whether further and more in depth studies would be required. Since the need for the upgrade is very apparent and urgent this biodiversity study will mainly aim to minimise the environmental impact through correct placement.

The desktop study and site visit revealed the following possible environmental issues:

- The area surrounding the existing evaporation pond system is still covered by natural veld in relative good condition and with good connectivity (Kalahari Karroid Shrubland – "Least Threatened" but poorly protected).
- No seasonal streams / drainage lines were encountered in the vicinity of the site.
- A number of protected plant species in terms of the Northern Cape Nature Conservation Act (Act 9 of 2009) or NCNCA has been observed.
- Large portions of the existing site can be described as degraded as a result of the existing treatment facility and associated activities.

1.1 TERMS OF REFERENCE

EnviroAfrica (Pty) Ltd was appointed by BVi Consulting Engineers (Upington) as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment (EIA) Process for the proposed development. PB Consult was appointed by EnviroAfrica to conduct a Biodiversity Scan of the proposed site.

PB Consult was appointed within the following terms of reference:

- Complete a Biodiversity Scan of the proposed site in order to determine whether any significant features will be impacted as a result of the proposed development.
- Make recommendations on impact minimisation should it be required
-
- Consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

2. APPLICABLE LEGISLATION

Constitution of the Republic of South Africa (1996): of special relevance in terms of environment is section 24

Conservation of Agricultural Resources Act 43 of 1983 (CARA): supports conservation of natural agricultural resources (soil, water, plant biodiversity) by maintaining the production potential of the land and combating/preventing erosion; for example, by controlling or eradicating declared weeds and invader plants.

Hazardous Substances Act 15 of 1973: to control substances that may cause injury, ill-health, or death through their toxic, corrosive, irritant, strongly sensitizing or flammable nature, or by the generation of pressure

National Environmental Management Act 107 of 1998 (as amended): replaces the Environmental Conservation Act (ECA) and establishes principles for decision-making on matters affecting the environment, and for matters connected therewith.

- **Environmental Impact Assessment Regulations** (R543 of 2010): procedures to be followed for application to conduct a listed activity.

National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA): replaces the Atmospheric Pollution Prevention Act (No. 45 of 1965).

National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA): supports conservation of plant and animal biodiversity, including the soil and water upon which it depends.

- **National list of ecosystems that are threatened and in need of protection** (GN 1002 of 9 December 2011).

National Environmental Management: Protected Areas Act 57 of 2003 (as amended Act 31 of 2004) (NEMPAA): To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes.

National Environmental Management: Waste Act 59 of 2008 (NEMWA): To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

- **List of Waste Management Activities that have, or are likely to have a detrimental effect on the environment** (GN 718 of 3 July 2009): Identifies activities in respect of which a waste management license is required.

National Forests Act 84 of 1998 (as amended): supports sustainable forest management and the restructuring of the forestry sector.

- **List of protected tree species** (GN 716 of 7 September 2012)

National Heritage Resources Act 25 of 1999: supports an integrated and interactive system for the management of national heritage resources, including supports soil, water and animal and plant biodiversity.

National Veld and Forest Fire Act 101 of 1998 (NVFFA): protects soil, water and plant life through the prevention and combating of veld, forest, and mountain fires

National Water Act 36 of 1998 (NWA): promotes the protection, use, development, conservation, management, and control of water resources in a sustainable and equitable manner.

Northern Cape Nature Conservation Act 9 of 2009 (NCNCA): To provide for the sustainable utilization of wild animals, aquatic biota and plants.

2.1 NORTHERN CAPE NATURE CONSERVATION ACT 9 OF 2009

On the 12th of December 2011, the new Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect, which also provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the act give extensive lists of specially protected and protected fauna and flora species in accordance with this act. The NCNCA is a very important Act in that it put a whole new emphasis on a number of species not previously protected in terms of legislation.

It also put a new emphasis on the importance of species, even within vegetation classified as "Least Threatened" (in accordance with GN 1002 of 9 December 20011, promulgated in terms of the National Environmental Management Biodiversity Act 10 of 2004). Thus even though a project may be located within a vegetation type or habitat previously not considered under immediate threat, special care must still be taken to ensure that listed species (fauna & flora) are managed correctly.

3. DEFINITIONS & ABBREVIATIONS

3.1 DEFINITIONS

Construction: means the period of the project during which the actual works are carried out, deemed to include site establishment, site preparation, the works, maintenance period and decommissioning.

Construction site: means the area influenced and affected by the construction activities or under the control of the Contractor often referred to as "the Site".

Contaminated water: means water contaminated by the Contractor's activities, *e.g.* concrete water and runoff from plant/ personnel wash areas.

Environment: means the surroundings within which humans exist and that are made up of:

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part of the combination of the above two bullets and the interrelationships between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being

Environmental Aspect: any element of any construction activity, product or services that can interact with the environment.

Environmental Control Officer: a suitably qualified environmental agent responsible for overseeing the environmental aspects of the Construction phase of the EMP.

Environmental Impact: any change to the environment, whether adverse or beneficial, wholly or partially resulting from any construction activity, product or services.

No-Go Area(s): an area of such (environmental/aesthetical) importance that no person or activity are allowed within a designated boundary surrounding this area.

Owner: the owner, or dedicated person, responsible for the management of the property on which the proposed activity will be performed.

Solid waste: means all solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Precautionary principle: means the basic principle, that when in doubt or having insufficient or unreliable information on which to base a decision, to then limit activities in order to minimise any possible environmental impact.

Watercourse: in this report the author uses a very simplified classification system to define the difference between rivers, streams or a drainage lines encountered in the Northern Cape.

- River: A river is a natural watercourse with a riverbed wider than 3m, usually freshwater, flowing toward an ocean, a lake, a sea or another river. In a few cases, a river simply flows into the ground or dries up completely before reaching another body of water. The flow could be seasonal or permanent.
- Stream: A small river or natural watercourse with a riverbed of less than 3 m, usually freshwater, flowing toward an ocean, a lake, a sea or another river. In a few cases, a river simply flows into the

ground or dries up completely before reaching another body of water. The flow could be seasonal or permanent.

- Drainage line: A very small and poorly defined watercourse, mostly on relatively flat areas, which only flows for a short period after heavy rains, usually feeding into a stream or river or dries up completely before reaching another body of water.

3.2 ABBREVIATIONS

BGIS	Biodiversity Geographical Information System
CARA	Conservation of Agricultural Resources Act 43 of 1983
CBA	Critical Biodiversity Areas (Municipal)
DAFF	Department of Agriculture Forestry and Fisheries
DEA	Department of Environmental Affairs
DENC	Department of Environment and Nature Conservation (Northern Cape Province)
EAP	Environmental assessment practitioner
EIA	Environmental impact assessment
EMF	(Municipal) Environmental Management Framework
EMP	Environmental management plan
NCNCA	Northern Cape Nature Conservation Act 9 of 2009
NEMA	National Environmental Management Act, Act 107 of 1998
NEMAQA	National Environmental Management Air Quality Act 39 of 2004
NEMBA	National Environmental Management Biodiversity Act, Act 10 of 2004
NEMPAA	National Environmental Management Protected Areas Act 57 of 2003
NEMWA	National Environmental Management Waste Act 59 of 2008
NFA	National Forests Act 84 of 1998
NSBA	National Spatial Biodiversity Assessment
NVFFA	National Veld and Forest Fire Act 101 of 1998
NWA	National Water Act 36 of 1998
SABIF	South African Biodiversity Information Facility
SANBI	South African National Biodiversity Institute
SIBIS	SANBI's Integrated Biodiversity Information System
SKEP	Succulent Karoo Ecosystem Project
WWTW	Wastewater Treatment Works

4. REFERENCES

Acocks, J.P.H. 1953. Veld types of South Africa. *Mem. Bot. Surv. .S. Afr.* No. 28: 1-192.

Alias, D. & Milton S. 2003. A collation and overview of research information on *Boscia albitrunca* (shepherd's tree) and identification of relevant research gaps to inform protection of the species. Research report done for the Department of Water affairs and Forestry. 18th August 2003.

BVi. 2013. Orange River Wine Cellars / KWV Distillery Effluent: Treatment options investigated Unpublished report (U10236C) prepared by BVi Consulting Engineers (Upington) for the OWK / KWV. April 2013.

De Villiers C.C., Driver, A., Brownlie, S., Clark, B., Day, E.G., Euston-Brown, D.I.W., Helme, N.A., Holmes, P.M., Job, N. & Rebelo, A.B. 2005. Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape. Fynbos Forum, c/o Botanical Society of South Africa: Conservation Unit, Kirstenbosch, Cape Town.

Forsyth, G.G., FJ Kruger, F.J., & Le Maitre, D.C. 2010: National veldfire risk assessment: analysis of exposure of social, economic and environmental assets to veldfire hazards in South Africa. CSIR Report No: CSIR/NRE/ECO/ER/2010/0023/C. March 2010.

Government Notice No 1002, 9 December 2011. National list of Ecosystems that are threatened and in need of protections. In terms of section 52(1)(a) of the National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004).

Low, A.B. & Rebelo, A.(T.)G. (eds) 1996. *Vegetation of South Africa, Lesotho and Swaziland.* Dept. of Environmental Affairs and Tourism, Pretoria.

Mucina, L. & Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

SANBI. 2006. South African National Botanical Institute: Biodiversity GIS Home. http://bgis.sanbi.org (as updated)

SANBI. 2013. Red List of South African Plants version 2013.1. Downloaded from Redlist.sanbi.org.

Seymour, C. & Milton, S. 2003: A collation and overview of research information on *Acacia erioloba* (Camelthorn) and identification of relevant research gaps to inform protection of the species. Research report done for the Department of Water affairs and Forestry. 31st August 2003.

Siyanda Draft EMF Report. 2008. Draft Environmental Framework report for the Siyanda District Municipality. A joined project between Siyanda District Municipality, Department of Tourism, Environment and Conservation, Department of Environmental Affairs and Tourism, Northern Cape. In association with MetroGIS & Mosakong Management. 2008.

Van Rooyen, M.W., Van Rooyen, N.; Bothma, J. du P. & Van Den Berg, H. M. 2008. Landscapes in the Kalahari Gemsbok National Park, South Africa. Koedoe [online]. 2008, vol.50, n.1, pp. 99-112. ISSN 0075-6458.

5. PROJECT DESCRIBTION

Consideration is been given to the upgrading of the existing effluent management system, which will also potentially change the end-use from evaporation to beneficial irrigation. The upgrading will entail the following:

- Closing and decommissioning of the current evaporation pond system.
- Construction of a suitable treatment system in order to treat the effluent from the various facilities to such an extent that it can be considered for beneficial irrigation (SA being a water scarce land).

Please note that the existing infrastructure (pipeline and pumping facilities) will be used to transfer the pre-treated wastewater from the KWV / OWK complex to the Effluent Treatment Facility (ETF).

Some 90% of the effluents that will be treated at the proposed effluent facility are generated by the Orange River Wine Cellars (OWK) and grape juice concentrate facility. Only approximately 10% of the effluent comes from the KWV distillery. OWK is a cooperative wine cellar established in Upington in 1965. Over the years the intake tonnage has increased from a meagre 5000 tons per annum to some 180 000 tons per annum. The KWV / OWK complex in Upington now comprises a brandy distillery owned by KWV and a modern wine cellar and grape juice concentrate plant owned by OWK. All wastewater from both KWV and OWK are disposed on Erf 5410 (Upington).

As is commonly known, wineries and distilleries are notorious for the quality of their effluent and at this complex it is no different. Typically, the combined effluent from the three processing plants equates to an average volume of 1 350m3 per day or some 40 000m3 per month. An analysis of the effluent has indicated that it has a chemical oxygen demand varying between 8 000mg/l to 10 000mg/l with high concentrations of Total Suspended Solids and Total Dissolved Solids. Typically the COD of winery effluent comprises some 91% of ethanol and other organic components such as acetic acid and phenols.

These constituents are notoriously difficult to treat and the analysis results indicate that the effluent is at the upper limit for aerobic process treatment and at the lower limit of anaerobic process treatment, making it extremely difficult to select a suitable process train for this effluent.

Given the above, BVi, in consultation with the client have investigated several options which are briefly described below.

5.1 METHODS

Desktop studies were conducted, coupled by a physical site visit during September and December 2012. The timing of the site visit was reasonable in that essentially all perennial plants were identifiable and although it is likely that a few species may have been missed, the author is confident that a fairly good understanding of the biodiversity status in the area was obtained.

The survey was conducted by walking through the site and examining, marking and photographing any area of interest (Refer to Figure 1 underneath). Confidence in the findings is high. During the site visit the author endeavoured to identify and locate all significant biodiversity features, including rivers, streams or wetlands,

special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

Figure 1: Google image indicating the route walked during the site visit as well as GPS reference points taken

A number of the protected plant species were encountered in the areas surrounding the site as well as to the south and north of the existing transformed areas within the site. The surrounding veld showed the same species distribution as encountered in the remaining natural veld (not the disturbed areas) surrounding the existing facility.

6. DESCRIPTION OF ENVIRONMENT

The aim of this description is to put the study area in perspective with regards to all probable significant biodiversity features which might be encountered within the study area. The study area has been taken as the proposed site and its immediate surroundings. During the desktop study significant biodiversity features associated with the larger surroundings was identified, and were taken into account. The desktop portion of the study also informs as to the biodiversity status as classified in the National Spatial Biodiversity Assessment (2004) as well as in the recent National list of ecosystems that are threatened and in need of protection (GN 1002, December 2011), promulgated in terms of the National Environmental Management Biodiversity Act (NEM: BA), Act 10 of 2004. It also aims to take Municipal Environmental Management Frameworks (EMF's) and Municipal Critical Biodiversity Areas (CBA's) into account where applicable.

6.1 LOCATION & LAYOUT

The KWV Distillery and OWK Grape Juice Concentrate Facility are both located just off Industria Road in the industrial area of Upington (Erf 5412, Upington). The existing effluent treatment facility is located on Erf 5410 (Upington), approximately 4 km west-northwest of Erf 5412 (Refer to Figure 2-4).

Figure 2: General location of the town within South Africa

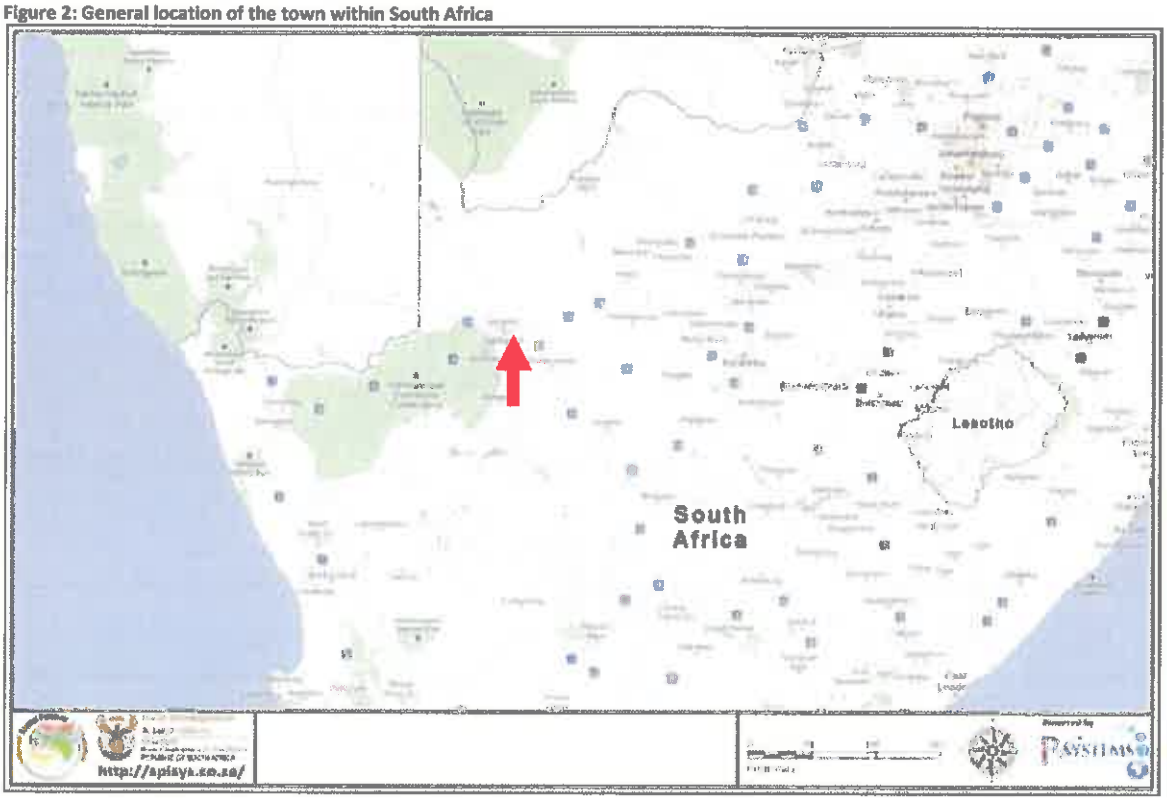


Table 1: GPS coordinates for the treatment facility

DESCRIPTION	LATITUDE AND LONGITUDE
KWV / OWK Complex (Erf 5412)	S28 26 27.7 E21 12 21.4
KWV Effluent facility (Erf 5410)	S28 25 02.6 E21 10 32.0

The N10 is located just north of the existing effluent facility (450-500m), while the Upington westward railway is located just south of the facility (300-350m).

Figure 3: Location map indicating Erf 5412 (KWV / OWK complex) and the effluent facility Erf 5410

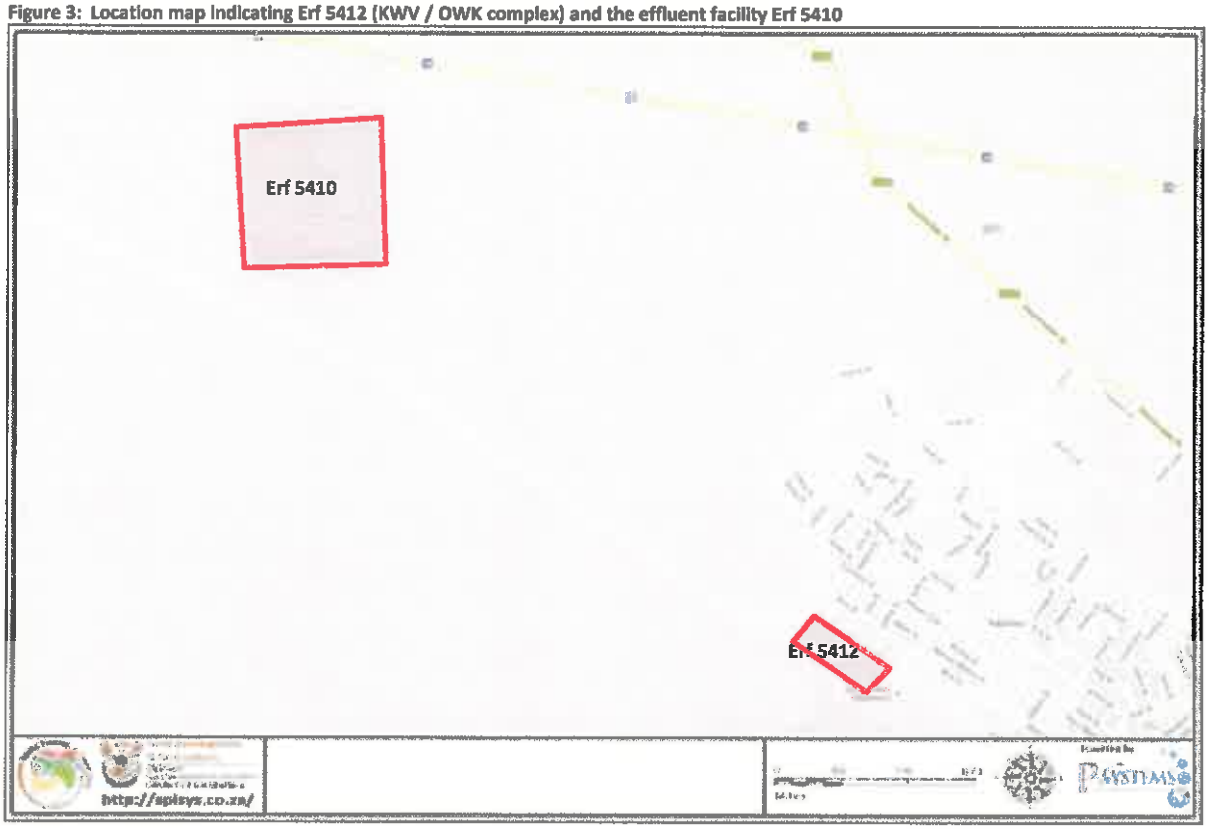
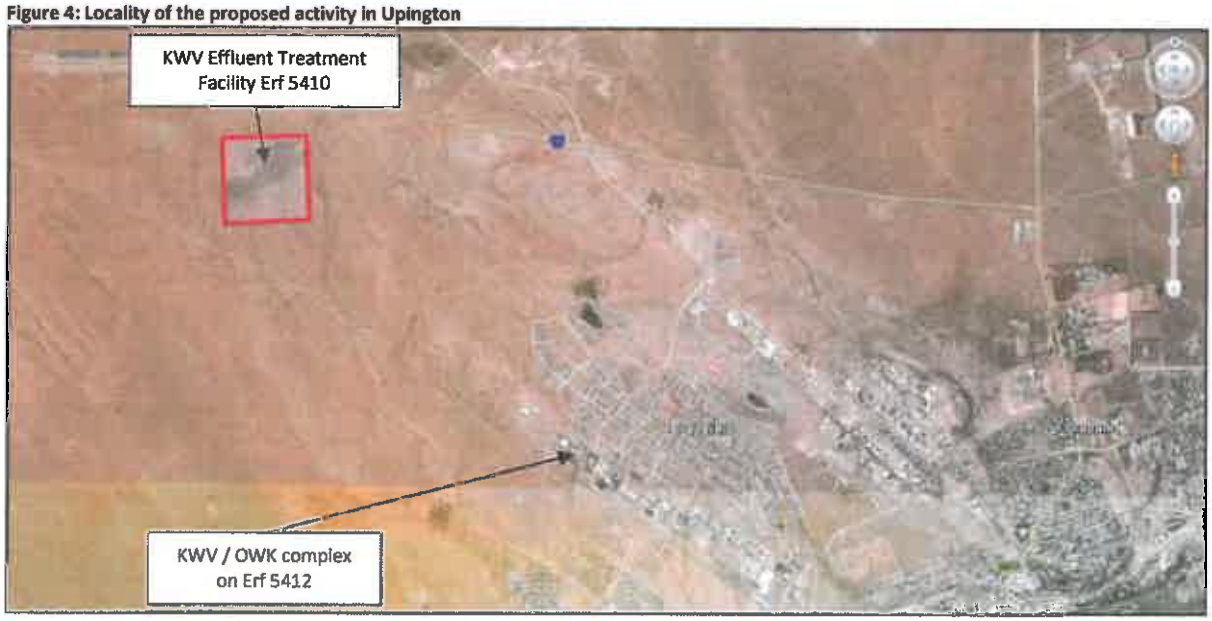


Figure 4: Locality of the proposed activity in Upington



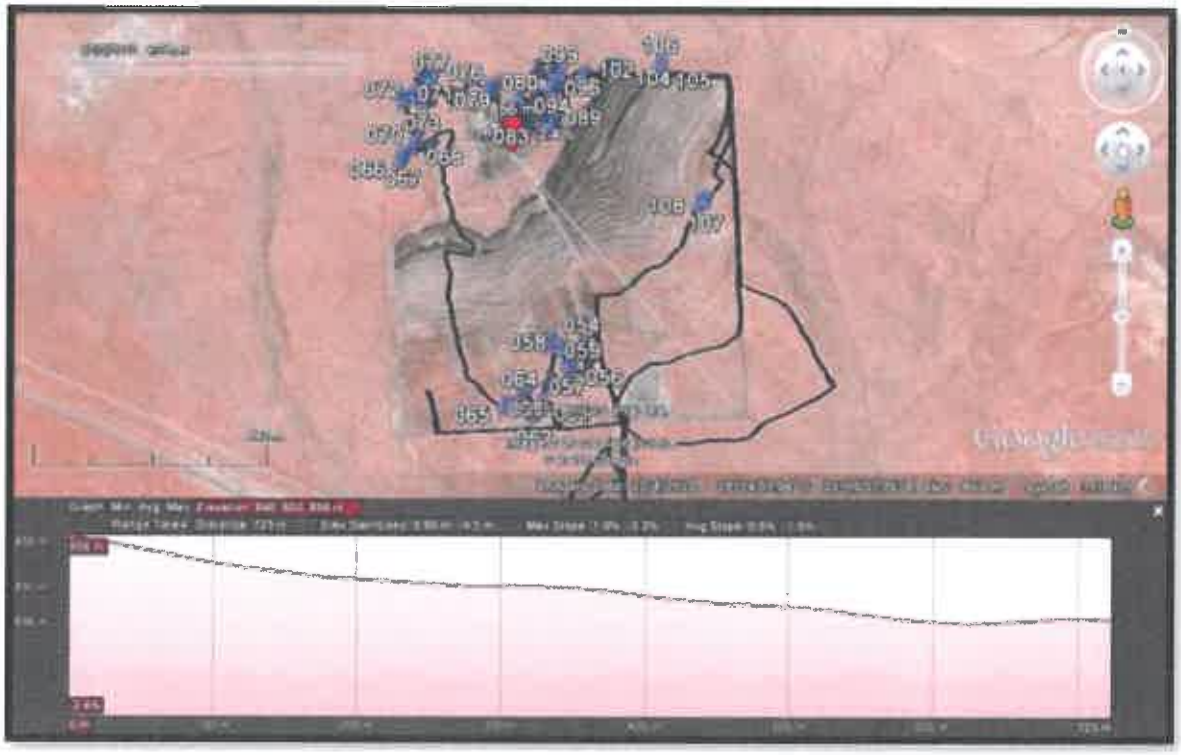
Erf 5410 is approximately 60.0197 ha in size.

6.2 TOPOGRAPHY

The existing KWV Effluent Management Facility (Evaporation pond system) is located on Erf 4512 within the Upington commonage. The topography of the site is relatively flat, but the site itself has a definite small elevation or butt towards its north western side of the Erf. From this butt the site slopes from the northwest to the southeast (towards the direction of Upington), and also from towards the west, south and north. Although no rivers or wetlands were observed on the site, small drainage lines are still located to the east and west of the existing site. These drainage lines are seasonal and did not support any permanent streams.

The average slope from the butt towards Upington is 0.5% with a fall in elevation of approximately 9 metres over a distance of more than 700 m (Refer to Figure 5).

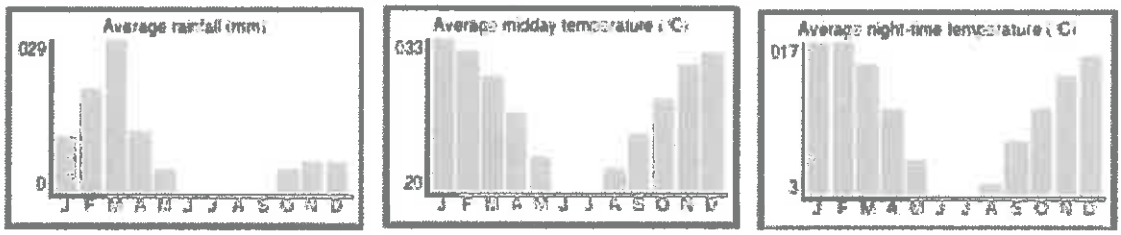
Figure 5: Google image indicating the slope of the site (northwest towards southeast)



6.3 CLIMATE

All regions with a rainfall of less than 400 mm per year are regarded as arid. Upington normally receives about 94 mm of rain per year, with most rainfall occurring mainly during autumn. The chart below (lower left) shows the average rainfall values for Upington per month. It receives the lowest rainfall (0mm) in June and the highest (29mm) in March. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Upington range from 19.8°C in June to 33°C in January. The region is the coldest during July when the mercury drops to 2.8°C on average during the night. Consult the chart below (lower right) for an indication of the monthly variation of average minimum daily temperatures. (www.saexplorer.co.za).

Figure 6: Average rainfall, temperature and night-time temperatures for Upington (www.saexplorer.co.za)

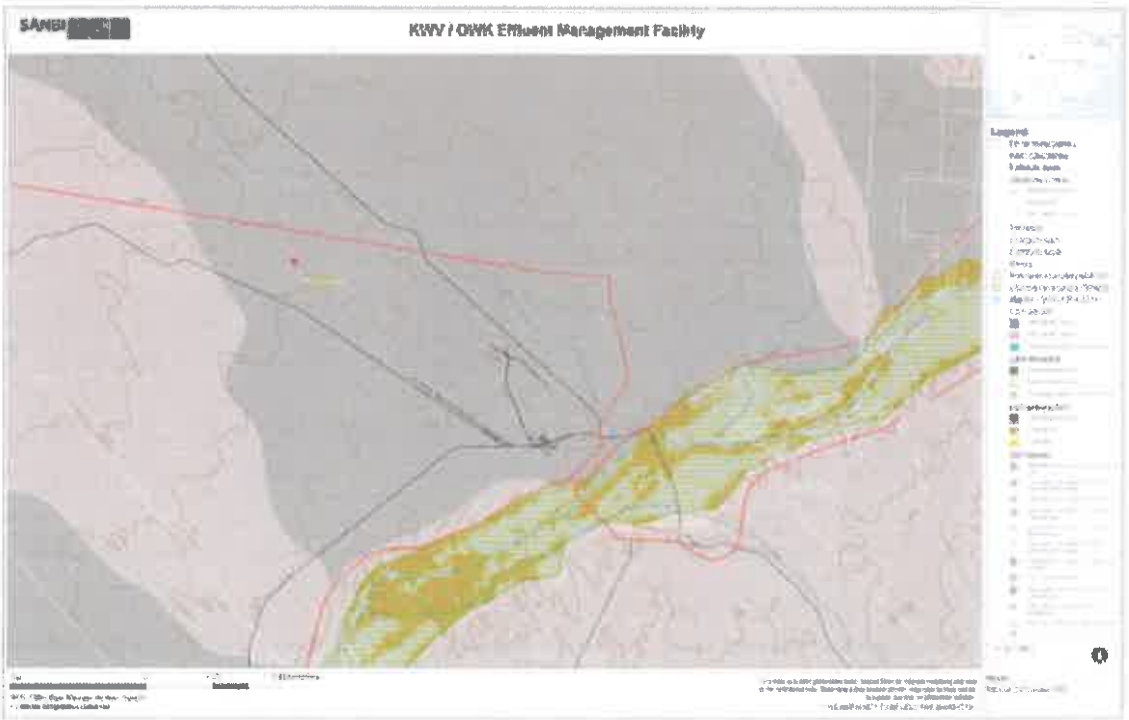


6.4 GEOLOGY & SOILS

According to Mucina and Rutherford (2006) and the SANBI Biodiversity Geographical Information System, the geology and soils for this area is described as covered by Cenozoic Kalahari Group sands and small patches also on calcrete outcrops and screes on scarps of inter-mittent rivers (mekgacha). In places Dwyka Group tillites out-crop. The soils are deep (>300 mm), red-yellow, apedal, freely drained, with a high base status, typical of Ae land type.

No special soils or geology features (e.g. quartz patches or broken veld), which could support special botanical features, were observed during the site visit (or are expected).

Figure 7: Soil class map of South Africa indicating the soils in the area on which the KWV effluent facility is located



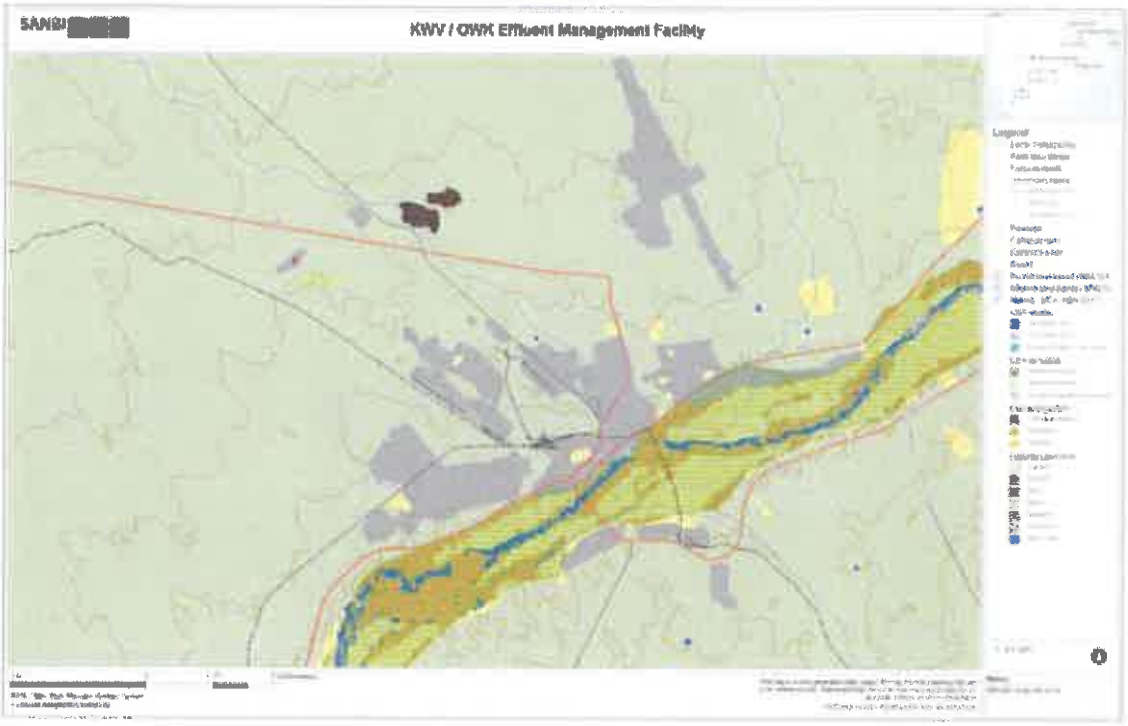
6.5 LANDUSE AND COVER

The existing WWTW and the proposed extension are surrounded by commonage land, sometimes utilised as grazing, but ritual initiation is also commonly observed on the property (Refer to Figure 8). No signs of agriculture usage had been observed, and apart from some illegal dumping observed towards the town no

other land uses were observed. The effluent facility itself is been indicated as urban build up or mostly transformed land.

Natural vegetation forms a uniform shrub layer cover over most of the surrounding area.

Figure 8: Landcover map showing the location of the KWV Effluent facility



6.6 BROAD SCALE VEGETATION TYPES EXPECTED

In accordance with the 2006 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation types is expected on the sites, namely Kalahari Karroid Shrubland (Pink Figure 9).

According to the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011) Kalahari Karroid Shrubland are classified as "Least Threatened".

Table 2: Vegetation status according to the 2004 National Spatial Biodiversity Assessment

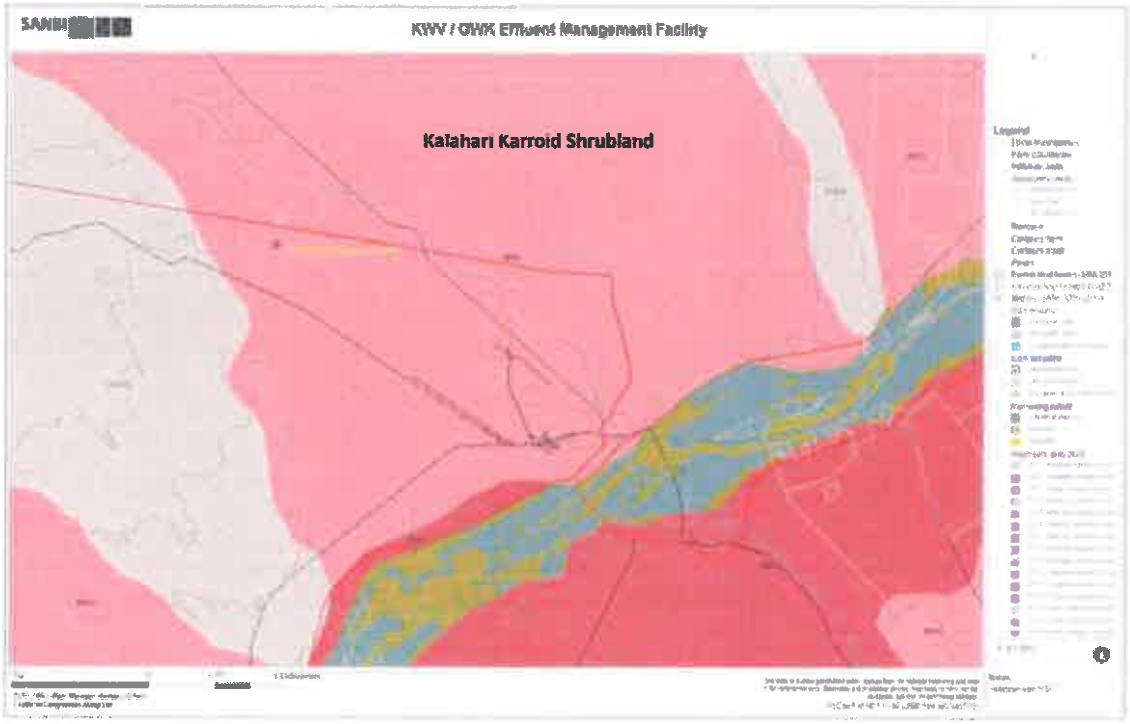
VEGETATION TYPE	NATIONAL STATUS 2011	REMAINING	CONSERVATION TARGET	FORMALLY CONSERVED
Kalahari Karroid Shrubland	Least Threatened	99.2 %	21 %	0.1 %

6.6.1 Kalahari Karroid Shrubland

The vegetation type is described as low Karroid shrubland on flat, gravel plains. Karoo elements meet here with northern floristic elements, indicating a transition to the Kalahari region and sandy soils.

Important taxa includes the Small Tree: *Acacia mellifera, Parkinsonia africana* and *Boscia foetida*; Tall Shrubs: *Rhigozum trichotomum*; Low Shrubs: *Hermannia spinosa, Limeum aethiopicum, Phaeoptilum spinosum, Aizoon schellenbergii, Aptosimum albomarginatum, A. lineare, A. marlothii, A spinescens, Barleria rigida, Hermannia modesta, Indigorera heterotricha, Monechma genistifolium, Tephrosia dregeana* etc.; Herbs: *Dicoma capensis, Chamaesyce inaequilatera, Amaranthus praetermissus, Barleria lichtensteiniana, Cucumis africanus, Geigeria ornativa, Hermannia abrotanoides, Monsonia umbellate, Sesamum capense* etc.; Succulent Herbs: *Giseka africana, G. pharnacioides and Trianthema parvifolia;* Graminoids: *Aristida adcensionis, Enneapogon desvauxii, Eragrostis annulata, E. homomalla, E. porosa, Schmidtia kalahariensis, Stipagrostis anomala, S. ciliata, S. uniplumis and Tragus racemosus*.

Figure 9: Vegetation map of SA, Lesotho and Swaziland (2006)



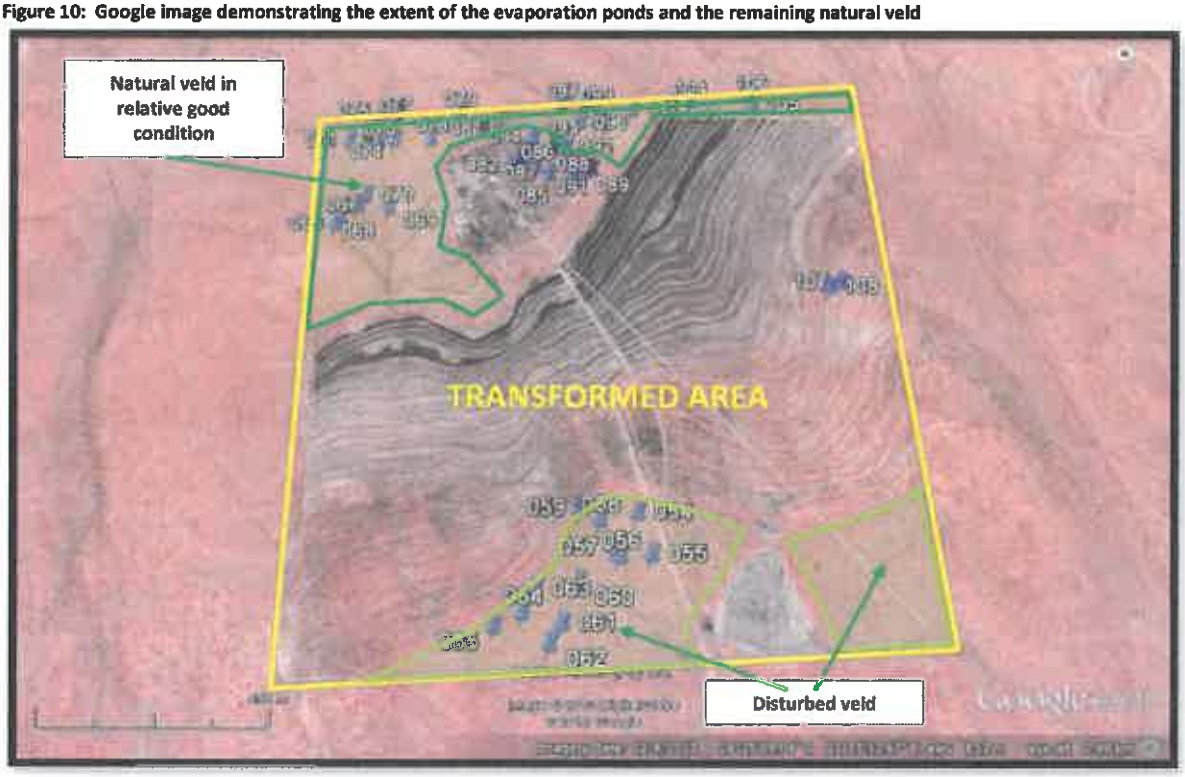
6.7 VEGETATION ENCOUNTERED

The following is a discussion of the vegetation and other significant environmental features encountered on site. The author did not attempt to identify all species but rather concentrated on identifying and marking protected plant species or any other biodiversity feature of significance. According to the vegetation map of South Africa (Figure 9), the vegetation expected should be Kalahari Karroid Shrubland. The vegetation and species composition encountered conformed to this vegetation type.

In the description of the vegetation in this document the site refer to Erf 5410, a large portion of which is mostly transformed as a result of the construction footprint of the existing evaporation ponds. The Erf which is approximately 60 ha in size have been bought by KWV to establish their wastewater treatment facility (or

evaporation ponds). Off the site approximately 65 – 70% can be described as transformed (evaporation ponds). The remaining natural veld can also be divided into two units depending on the condition of the veld. To the northwest (on the small kopje or butt) the vegetation is still relatively undisturbed and in good condition, while to the south and southeast (lower lying areas) the remaining natural veld has been impacted to a much larger degree, some of which was originally disturbed during the development of the evaporation ponds. Noteworthy is that although shallow calcrete is present almost over the whole site, the kopje shows much more signs of calcrete outcrops, while the slightly lower lying areas (as to be expected) show signs of slightly deeper sands (and the calcrete below ground level).

Figure 10: Google image demonstrating the extent of the evaporation ponds and the remaining natural veld



Also noteworthy was the number of *Boscia foetida* individuals encountered. The GPS markers in Figure 10 above all indicate the location of *Boscia foetida* plants within the site.

The vegetation on the higher lying kopje or butt represented a low dry shrubland with a fairly uniform vegetatio cover consisting mostly of low hardy shrubs including the following species (Refer to Photo 1): *Acacia mellifera, A. albomarginatum, Aptosimum spinescens, Blepharis mitrata, Boscia albitrunca, Codon royenii, Euphorbia decepta, Geigeria filifolia, Hermannia* species, *Ornithoglossum* species, *Salsola tuberculata, Sarcacaulon crassicaule, Rhigozum trigotomum* and *Zygophyllum* species. Grass species were also relatively common.

Photo 1: Overview of the relatively undisturbed vegetation encountered on top of the small kopje to the north of the site

The more disturbed vegetation along the southern parts of the site represented a sligtly more open shrubland, in places dominated by a slightly higher species composition which included: *Kleinia longiflora, Psilocaulon coriarium, Thesium liniatum* and *Salsola tuberculata*. Other species included: *Acacia mellifera, Boscia Albitrunca, Adenium oleifolium, Asparagus* cf. *africanus, Galenia africana, Geigeria filifolia, Lycium cinereum, Monechma genistifolium, Parkinsonia africana, Tribulus terestris* and *Zygophyllum* species (many of these species being actual pioneer species or indicating disturbance).

Photo 2: Overview of the more disturbed vegetation encountered along the southern portion of the site

Prosopis grandulosa, Cynodon dactylon, Salsola kali and *Nicotiana glauca* was almost totally associated with heavily disturbed areas in and around the evaporation ponds.

Table 3: List of species encountered on site (excluding grass species) and their conservation status (if applicable)

SPECIES NAME	FAMILY	STATUS
Acacia mellifera	FABACEAE	
Adenium oleifolium	**APOCYNACEAE**	**All species are protected in terms of Schedule 2 of the NCNCA**
Aptosimum albomarginatum	SCROPHULARIACEAE	
Aptosimum spinescens	SCROPHULARIACEAE	
Asparagus cf. africanus	ASPARAGACEAE	
Blepharis mitrata	ACANTHACEAE	
Boscia foetida	**CAPPARCEAE**	**All *Boscia* species protected in terms of Schedule 2 of the NCNCA**
Codon royenii	BORAGINACEAE	
Euphorbia decepta	**EUPHORBIACEAE**	**All *Euphorbia* species are protected in terms of Schedule 2 of the NCNCA**
Galenia africana	**AIZOACEAE**	**All species are protected in terms of the NCNCA**
Geigeria filifolia	ASTERACEAE	
Hermannia cf. abrotanoides	STERCULIACEAE	
Kleinia longiflora	ASTERACEAE	
Lycium cinereum	SOLANACEAE	
Monechma genistifolium	ACANTHACEAE	
Nicotiana glauca	SOLANACEAE	**Category 1 invader**
***Ornithoglossum* species**	**HYACINTHACEAE**	**All species are protected in terms of the NCNCA**
Parkinsonia africana	FABACEAE	
Prosopis grandulosa	FABACEAE	**Category 2 invader**
Psilocaulon coriarium	**AIZOACEAE**	**All Aizoaceae species are protected in terms of Schedule 2 of the NCNCA**
Rhigozum trichotomum	BIGNONIACEAE	
Salsola tuberculata	AMARANTHACEAE	
Salsola kali	AMARANTHACEAE	
Sarcocaulon crassicaule	**MESEMBRYANTHEMACEAE**	**All species are protected in terms of Schedule 2 of the NCNCA**
Thesium lineatum	SANTALACEAEA	
Tribulus terrestris	ZYGOPHYLLACEAE	
Zygophyllum cf. lichtensteinianum	ZYGOPHYLLACEAE	

6.8 SIGNIFICANT AND/OR PROTECTED PLANT SPECIES

Please note that this study never intended to be full botanical assessment. However, a scan of significant species was done during the site visit, and even though the author does not claim that all species encountered were identified, all efforts were made to do just that.

The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species (GN 71 6 of 7 September 2012). Three tree species on the NFA may have a geographical distribution that may overlap the broader study area (Refer to Table 4).

- **None of these species were encountered on site.**

Table 4: NFA protected tree species with a geographical distribution that may overlap the broader study area

SPECIES NAME	COMMON NAME	TREE NO.	DISTRIBUTION
Acacia erioloba	Camel Thorn Kameeldoring	168	In dry woodlands next to water courses, in arid areas with underground water and on deep Kalahari sand
Boscia albitrunca	Shepherds-tree Witgat/Matopie	130	Occurs in semi-desert and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils.
Acacia haematoxylon	Grey Camel Thorn Vaalkameeldoring	169	In bushveld, usually on deep Kalahari sand between dunes or along dry watercourses.

In addition to the NFA the Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, which also provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the act give extensive lists of specially protected and protected fauna and flora species in accordance with this act.

- **A number of species listed in terms of the NCNCA were encountered on site (Refer to Table 3).**

Noteworthy is that all of the listed individual plants was encountered to the southwest and north of the existing evaporation pond footprints.

6.9 FINE-SCALE MAPPING (CBA'S)

Although a draft version of the Siyanda District Municipal, Environmental Management Framework (EMF) is available it has not been approved or published. No fine-scale mapping is as yet available for this area and as a result no critical biodiversity areas or biodiversity support areas has been promulgated for this area.

However, the proposed priorities for conservation in the Siyanda District is depicted on Maps 12a (Refer Figure 15) and 12b within this document, based on local occurrence, the national conservation target, the national ecosystem status and the national protection level of the vegetation types. A proposal is made for the prioritisation of vegetation types in the Siyanda District. The landcover of the Siyanda district reflects the results of the 2000 national landcover determination and is depicted on Map 13 from which it is evident that most of the area is in a natural state and the most significant spatial impact on the environment has come from mining which occupies an area of almost 7% of the total area. A sensitivity index is shown on Map 14 of the Draft EMP. The main factors that were used to compile the index include the following:

- The erosion potential of soil where soils with a high erosion potential were awarded a sensitivity of 1;
- The conservation priority of veld types for veld types with a medium conservation priority were awarded a sensitivity count of 1 those with a high conservation priority were awarded a count of 2 and those with a very high conservation priority were awarded a count of 3;

- Topographical areas with a high variance in shape and form were awarded a sensitivity count of 1;
- All watercourses, drainage lines and pans (including a 32m buffer on either side) were awarded a sensitivity count of 2; and
- All transformed areas were awarded a sensitivity count of -1.

Environmental control zones are depicted on Map 15 of the EMF. The purpose of environmental control zones is to indicate areas that require a specific type or regime of control due to unique environmental elements that occur in these areas. It may or may not be linked to the application of EIA legislation and should be dealt with at a more strategic level where it should serve as a guide for decision-making and planning.

6.9.1 Summary of findings according to the EMF

According to the Draft Siyanda Environmental Management Framework the proposed site falls within the following categories according to the various maps.

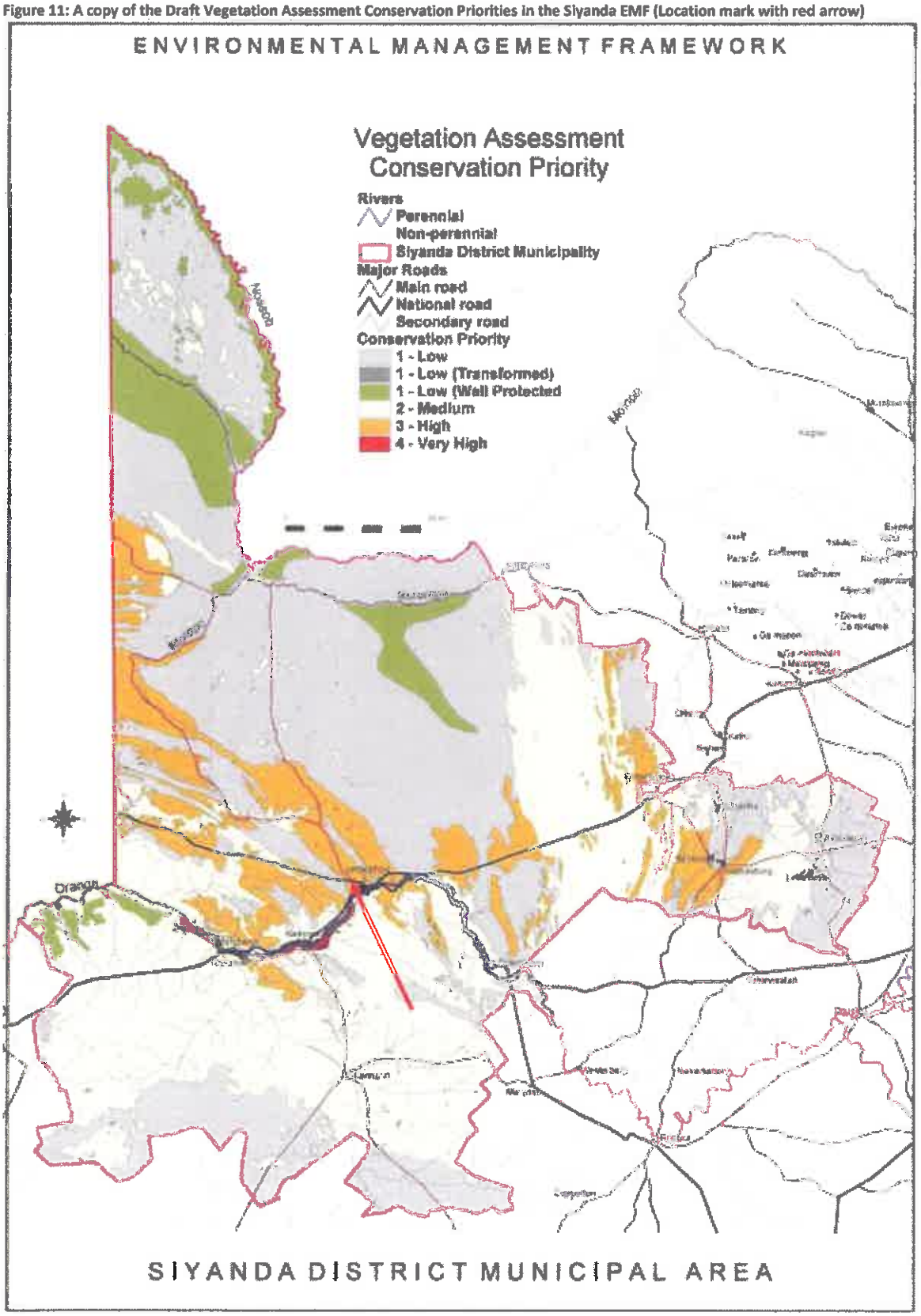
Conservation priority areas: According to Map 12a the site falls within an area (vegetation type) regarded as having a High (3) conservation priority. According to Map 12b, the site does not fall within a proposed conservation area.

Landcover: According to Map 13 of the Draft EMF, it would seem as if the proposed site falls within the area marked as shrubland.

Sensitivity Index: According to Map 14 of the Draft EMF, the proposed site falls within an area identified as of low environmental sensitivity (2) in an index which starts at Transformed and then are given values of 0-8 (8 being of high environmental sensitivity).

Control Zones: According to Map 15, the proposed site location falls within a control zone 3 area, which is regarded as areas of potential high to very high vegetation conservation areas.

Figure 11: A copy of the Draft Vegetation Assessment Conservation Priorities in the Siyanda EMF (Location mark with red arrow)



6.9.2 *Key Environmental issues identified in the EMF*

The following are considered to be the main environmental issues that may cause negative impacts and have to be addressed in the EMF:

- The conservation of the remaining Lower Gariep Alluvial Vegetation along the Orange River;
- the protection of vegetative groundcover across the area against overgrazing and other activities such as 4x4 and quad bike driving;
- the effect that inappropriate irrigation may have on the salination of soil in places;
- the provision of services, especially water to small populations in remote areas that may be unsustainable over the long term;
- the extensive use of firewood for cooking and heating that may be a threat to especially the protected Camel Thorn trees in places; and
- the rehabilitation of mining areas, especially along scenic routes that may have potential for further tourism development.

6.10 FAUNA AND AVI-FAUNA

Although natural fauna and avi-fauna may still be present, it is expected that it would be limited to avi-fauna, insects and maybe some reptile's species. Because of the proximity to the town of Upington and the current land-use it is not expected that game will be encountered in the vicinity of the site (none has been observed).

Mammals: The site falls within the distribution range of approximately 50 mammal species indicating moderate diversity. Human activity in the area is medium-high and it is highly unlikely that a fair representation of these mammals will be found on the property. Even though the impact will be permanent, it is highly unlikely that it will pose a significant impact on mammal species and as a result the impact is deemed negligible.

Reptiles: The site falls within the distribution range of approximately 30 reptile species, indicating low diversity. As a result of the open planes on site the reptile composition is likely to be dominated by species which inhabit open areas, such as snakes, lizards and geckos. Human activity in the area is medium-high and it is highly unlikely that large numbers of these species will be present on site. As such, the impact on reptiles should be negligible.

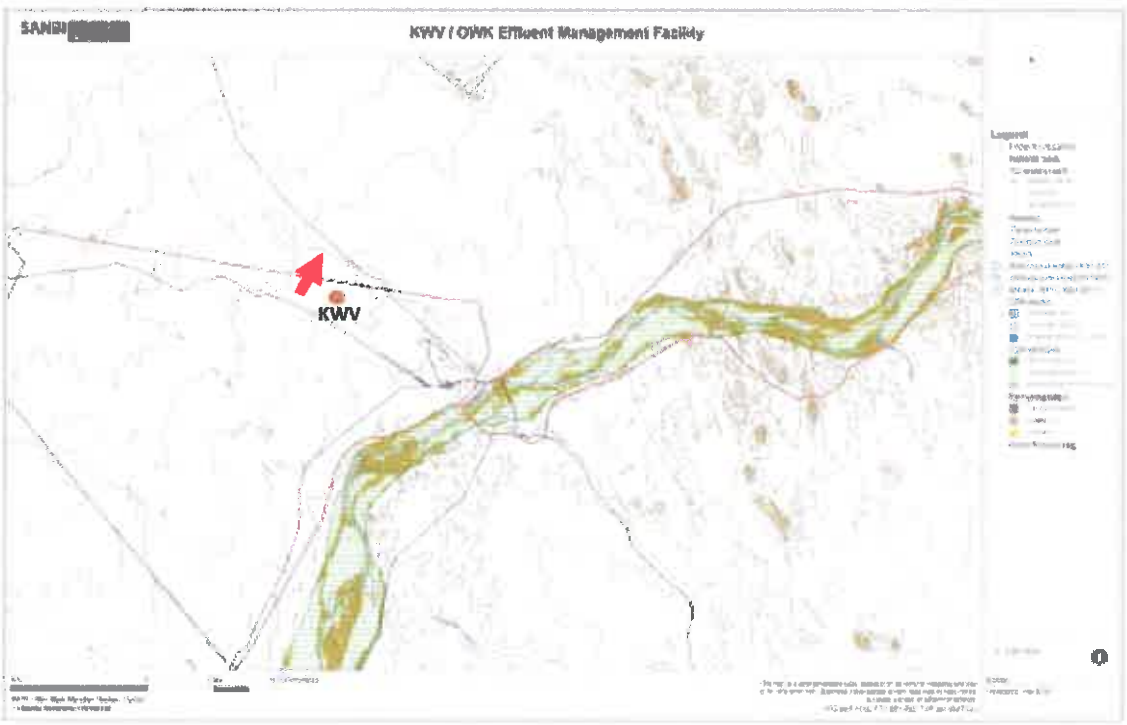
Amphibians: The site falls within the distribution range of approximately 10 amphibian species. However, no suitable breeding places were observed on the proposed site and it is highly unlikely that the proposed development will have any significant impact on amphibian species. In addition, most amphibians require perennial water and will thus not be affected at all.

Avi-fauna: The site falls within the distribution range of approximately 200 bird species known from the broad area. But because of the medium-high human activity it is not expected that a fair representation of these species will be encountered on site or its immediate vicinity. Apart from the possible impact on trees the proposed activity is not expected to have a significant impact on avi-fauna. However, it remains important that all larger indigenous trees must be protected wherever possible in order to minimise the possible impact (although localised) on bird species.

6.11 RIVERS AND WETLANDS

Rivers maintain unique biotic resources and provide critical water supplies to people. South Africa's limited supplies of fresh water and irreplaceable biodiversity are very vulnerable to human mismanagement. Multiple environmental stressors, such as agricultural runoff, pollution and invasive species, threaten rivers that serve the world's population. River corridors are important channels for plant and animal species movement, because they link different valleys and mountain ranges. They are also important as a source of water for human use. Vegetation on riverbanks needs to be maintained in order for rivers themselves to remain healthy, thus the focus is not just on rivers themselves but on riverine corridors.

Figure 12: Biodiversity map indicating important river systems for the Upington area, using available BGIS data



With the exception of the Orange River all the rivers in the Siyanda District Municipal area are non-perennial rivers and the last recordings of flows in the lower reaches of the Molopo and Kuruman Rivers were in 1933 and again in the 1974/5 and 1975/6 season. The topography of this whole area is relatively flat with a slight slope from the treatment facility towards the southeast (in the direction of Upington). The Orange River itself is approximately 7 km south of the facility.

No rivers or wetland (other than those resulting from the treatment facility) were encountered on the treatment facility (Erf 4510). The east and west of the facility smaller drainage lines is present, but they will not be impacted by the proposed development. The Biodiversity Wetland information maps shows the nearest river to the effluent facility as a non-perennial tributary to the Orange River, which runs approximately 1.5 km northeast of the facility (to the north of the N10) (Refer to Figure 12).

6.12 INVASIVE ALIEN INFESTATION

Most probably because of the aridity of the area, invasive alien rates are generally very low for most of this area. Problem areas are usually associated with river systems and other wetland areas. On the proposed site a number of *Prosopis grandulosa* trees (a category 2 invader) were observed next to the wetter areas associated with the evaporation ponds. In addition single individuals of *Nicotiana glauca* (a category 1 invader) were also observed. According to regulation 15 and 16 of CARA all category 1 plants are prohibited plants no longer to be tolerated on land or on water surfaces. Their harmfulness outweighs any useful properties they may have.

Photo 3: *Nicotiana glauca* encountered on site

Photo 4: *Prosopis grandulosa* next to water

All *Prosopis* and *Nicotiana* species must be removed.

7. VELD FIRE RISK

Kalahari Karroid Shrubland is part of the Nama Karoo Biome (Mucina & Rutherford, 2006) which is not prone to veldfires. The purpose of the revised fire risk classification is to serve as a national framework for implementing the National Veld and Forest Fire Act, and to provide a basis for setting priorities for veldfire management interventions such as the promotion of and support to Fire Protection Associations. In the fire-ecology types and municipalities with High to Extreme fire risk, comprehensive risk management strategies are needed. The site is near Upington in an arid shrubland vegetation type. According the revised veldfire risk classification of March 2010 (Forsyth, 2010) in terms of the National Veld and Forest Fire Act 101 of 1998, the site is located in an area classified as a "Low Fire Risk" area. Although, the fire risk is not considered high or extreme it is still important that during construction and operation the site must adhere to all the requirements of the local Fire Protection Association (FPA) if applicable, or must adhere to responsible fire prevention and control measures.

7.1 SIGNIFICANT BIODIVERSITY FEATURES ENCOUNTERED

The table underneath gives a summary of biodiversity features encountered during the site visit and a short discussion of their possible significance in terms of regional biodiversity targets.

Table 5: Summary of biodiversity features encountered and their possible significance

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING
Geology & soils	Geology & soils vary only slightly in the larger study area, with deeper sandy soils found over most of the area.	No special features have been encountered (e.g. true quartz patches or broken veld) and the impact on geology and soils is expected to be very localised and low. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible. Impact = very low
Land use and cover	Natural veld utilised for stock grazing.	The property is sparsely used by the local inhabitants. The impact on land use and cover is expected to be very low and localised. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible.
Vegetation types	Kalahari Karroid Shrubland	This vegetation type is considered "Least threatened", but the remaining natural veld shows good connectivity with the surrounding areas. According to the draft Siyanda EMF, the vegetation is of high conservation priority, but does not fall within a proposed conservation area and as such the locality is of low environmental significance. Impact low. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible.
Conservation priority areas.	In terms of the draft Siyanda EMF	According to the EMF the site does not fall within a proposed conservation area. Impact low/localised. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible.
Sensitivity index	In terms of the draft Siyanda EMF	According to the EMF, the proposed site falls within an area identified as of very low environmental sensitivity (1). Impact low and localised. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible.
Protected plant species	A number of protected species (Refer to Table 3), in terms of the NCNCA was observed.	Protected species was mostly associated with the remaining natural veld to the north and south of the existing evaporation ponds. Non species protected in terms of the NFA was observed, but a number of species protected in terms of the NCNCA was observed in the above mentioned areas. If the proposed treatment system could be located on the current evaporation ponds footprint, the impact would be negligible. However, if the footprint is to be enlarged, placement must be carefully considered. Impact low to medium (depending on the footprint).
Fauna & Avi-fauna	The site is used for live-stock grazing and is in close proximity to constant human activity.	Although natural fauna and avi-fauna may still be present, it is expected that it would be limited to avi-fauna, insects and maybe some reptile's species (proximity to the urban edge and the current land-use). The activity is not expected to have a significant impact on fauna or avi-fauna. Impact low.
Rivers & wetlands	No river or wetland areas were observed within the site.	No river or wetland system is expected to be impacted directly by the proposed upgrade. The impact on rivers is thus considered **negligible**.
Invasive alien infestation	A number of *Prosopis* as well as single *Nicotiana* individuals was observed	All invasive alien species should be removed in the immediate vicinity of the existing and the new treatment works during the construction phase. If implemented the impact can be regarded as positive.

8. BIODIVERSITY ASSESSMENT

Biological diversity, or biodiversity, refers to the variety of life on Earth. As defined by the United Nations Convention on Biological Diversity, it includes diversity of ecosystems, species and genes, and the ecological processes that support them. Natural diversity in ecosystems provides essential economic benefits and services to human society—such as food, clothing, shelter, fuel and medicines—as well as ecological, recreational, cultural and aesthetic values, and thus plays an important role in sustainable development. Biodiversity is under threat in many areas of the world. Concern about global biodiversity loss has emerged as a prominent and widespread public issue.

The objective of this study was to evaluate the biological diversity associated with the study area in order to identify significant environmental features which should be avoided during development activities and or to evaluate short and long term impact and possible mitigation actions in context of the proposed development.

As such the report aim to evaluate the biological diversity of the area using the Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al.*, 2005), with emphasis on:

- Significant ecosystems
    - Threatened or protected ecosystems
    - Special habitats
    - Corridors and or conservancy networks
- Significant species
    - Threatened or endangered species
    - Protected species

8.1 NATURE OF THE IMPACT

The extension of the WWTW might include the enlargement of the existing evaporation pond footprint, which will lead to a permanent impact on the local environment. However, the impact will be localized ant could be placed within an area already disturbed. Significant impacts will be mainly associated with impacts on the natural veld (including possible impact on provincially protected plant species).

8.1.1 *Parameters of the impact*

Extent of the impact:	Very Localised
Duration of the impact:	Permanent
Probability or likelihood:	The probability or likelihood that the impact will occur if the project is approved is possible, but will depend on the size and location of the new proposed treatment works.

Severity of the impact: The severity of the impact is considered to be low-medium depending on the impact minimisation actions implemented.

8.1.2 Possible issues / impacts associated with construction

The following possible environmental impacts were identified while doing the site visit and discussing the project with the engineers and land-owners:

- The possible impact on protected plant species as described in the "List of protected tree species" (GN 716 of 2012) and the "Protected Species" list (Schedule 1 & 2 of the NC Nature Conservation Act 9 of 2009).
- Rehabilitation of contaminated soils.
- Temporary storage areas.
- Waste management and control.

8.2 Evaluation of Significant Impacts

8.2.1 Threatened or protected ecosystems

The site visit confirmed that the vegetation conforms to Kalahari Karroid Shrubland, which is classified as "Least Threatened" in accordance with the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011). According to the Draft Siyanda Environmental Management Framework the proposed site falls within the following categories according to the various maps:

Conservation priority areas: According to Map 12a the site falls within an area (vegetation type) regarded as having a High (3) conservation priority. According to Map 12b, the site does not fall within a proposed conservation area.

Landcover: According to Map 13 of the Draft EMF, it would seem as if the proposed site falls within the area marked as shrubland.

Sensitivity Index: According to Map 14 of the Draft EMF, the proposed site falls within an area identified as of low environmental sensitivity (2) in an index which starts at Transformed and then are given values of 0-8 (8 being of high environmental sensitivity).

Control Zones: According to Map 15, the proposed site location falls within a control zone 3 area, which is regarded as areas of potential high to very high vegetation conservation areas.

The impact on threatened or protected ecosystems is thus rated as low.

Mitigation:

- The proposed treatment works should utilise the existing footprint and thus the existing disturbed areas as much as possible. In doing this the impact on natural veld and protected species is minimised.
- All efforts must be made to minimise the impact on protected species encountered on site.
- Permits must be obtained for the removal of any protected species which cannot be avoided.

8.2.2 *Special habitats*

The vegetation itself is not considered to belong to a threatened or protected ecosystem. No special habitats, were encountered on site (e.g. quartz patches or broken veld), which could sustain significant smaller ecosystems. Better treatment and beneficial irrigation can only improve the current pollution risk. The possible enlargement of the footprint may impact directly on small portions of remaining natural veld. However, the possible positive spinoffs (pollution prevention) should far outweigh the small impact on natural veld.

Taking the above into account the **impact is rated as very low**.

8.2.3 *Corridors and or conservancy networks*

Looking at the larger site and its surroundings it shows excellent connectivity with remaining natural veld in almost all directions. Corridors and natural veld networks are still relative unscathed (apart from road networks).

The localised impact of the project makes it highly unlikely that it will have a significant effect on corridors or conservancy networks. **The impact is thus rated as low**.

8.2.4 *Threatened or endangered species*

No threatened or endangered species were recorded during the site visit, however, this does not rule out their presence as they may be subject to seasonable rainfall and may not have been observable during the time of the site visit, since the composition of the vegetation layers will fluctuates with seasonal rainfall (Van Rooyen *et. all*, 1984, *vide* Mucina & Rutherford, 2006). However, it must be noted that the vegetation type is considered "Least Threatened" and that this classification is based on plant species diversity and turnover as well as habitat transformation. The number of species per broad geographical levels for the Nama-Karoo biome is relative low (Van Rooyen, 1988, *vide* Mucina & Rutherford, 2006). It is therefore very unlikely that any red data species will be confined to the proposed site alone.

Taking the above into account it is highly unlikely that the proposed project will have a significant or long term effect on threatened or endangered species. **The impact is thus rated as low**.

8.2.5 *Protected species*

No protected tree species in terms of the National Forests Act of 1998 (Act 84 of 1998) have been observed. But a number of provincially protected species in terms of the Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) have been observed (Refer to Paragraph 6.8). However, almost all of these species were recorded to the north and south of the current treatment area. The impact on protected species can this be mostly negated through correct placement of the new works, utilising the existing footprint, which is already degraded.

Taking the above into account it is possible that the proposed project will have an impact protected species, but the impact can be much reduced through correct placement. **The impact is thus rated as low-medium** (which can be reduced with mitigation).

Mitigation:

- The proposed treatment works should utilise the existing footprint and thus the existing disturbed areas as much as possible. In doing this the impact on natural veld and protected species is minimised.
- All efforts must be made to minimise the impact on protected species encountered on site.
- Permits must be obtained for the removal of any protected species which cannot be avoided.

8.2.6 *Direct impacts*

As the name suggest, direct impacts refers to those impacts with a direct impact on biodiversity features and in this case were considered the potentially most significant associated impacts (some of which have already been discussed above).

- Direct loss of vegetation type and associated habitat due to construction and operational activities.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities. (Refer to page 25).
- Loss of local biodiversity and threatened plant species (Refer to page 26)
- Loss of ecosystem connectivity (Refer to page 27)

The impact will be permanent, but very small scale (localised). In addition, the vegetation itself is not considered to belong to a threatened or protected ecosystem. No special habitats were encountered on site. However, the possible positive spinoffs (pollution prevention) should far outweigh the small impact on natural veld.

Taking the above into account the direct impact on the environment is **rated as low-medium, which can be reduced to low** with mitigation.

Mitigation: The following is some mitigation which will minimise the impact of the solar plant location and operation.

- The proposed treatment works should utilise the existing footprint and thus the existing disturbed areas as much as possible. In doing this the impact on natural veld and protected species is minimised.
- Permits must be obtained for the removal of any protected species which cannot be avoided.
- Only existing access roads should be used for access to the terrain. Access roads must be clearly demarcated and access must be tightly controlled (deviations may not be allowed).
- Indiscriminate clearing of areas must be avoided (all remaining areas to remain as natural as possible).
- Soils contaminated as a result of the current evaporation pond treatment system must be rehabilitated and used as base material for the construction of the new treatment work (especially if constructed wetland treatment is implemented).
- Once the construction is completed all further movement must be confined to the access tracks to allow the vegetation to re-establish over the excavated areas.

8.2.7 Indirect impacts

Indirect impacts are impacts that are not a direct result of the main activity, but are impacts still associated or resulting from the main activity. The following possible indirect impacts were associated with the proposed project:

- The possible impact on protected plant species as described in the "List of protected tree species" (GN 716 of 2012) and the "Protected Species" list (Schedule 2 of the NC Nature Conservation Act 9 of 2009).
- Pollution as a result of poorly treated effluent.
- Temporary storage areas (e.g. pipe's and fittings and concrete mixing material).
- Waste management

It is very likely that the proposed project will have indirect impacts. It is considered that indirect impacts will have a similar impact as direct impacts, which will lead to a cumulative effect on the environment. However, the upgrade will also lead to improved effluent treatment and thus a lower pollution risk. In addition construction related impacts can be much reduced through good environmental control during construction. **On its own the impact is considered to be low** (better pollution management might even lead to environmental improvement).

Mitigation:

- Appoint a suitably experience ECO during the construction phase of the project.

8.2.8 *Cumulative impacts*

In order to comprehend the cumulative impact, one has to understand to what extent the proposed activity will contribute to the cumulative loss of ecological function and other biodiversity features on a regional basis. The vegetation is classified as "Least Threatened", No special habitats were encountered on site (e.g. quartz patches or broken veld), which could sustain significant smaller ecosystems. According to the Draft EMF for Siyanda the site falls within an area regarded as having a high conservation priority, but does not fall within a proposed conservation area. In addition it is rated as having a very low environmental sensitivity and is regarded as a low control zone. The possible positive spinoffs should outweigh the possible small impact on natural vegetation.

The proposed project will thus have a permanent, but localised impact. **On the whole the cumulative impact is considered to be low-medium**. With the implementation of impact minimisation actions the impact could even be reduced to **low**.

8.3 THE NO-GO OPTION

The "No-Go alternative" does not signify significant biodiversity gain or loss especially on a regional basis. However, it will ensure that none of the potential impacts above occur. The current status quo will remain and there will be no direct impact (even temporarily) on the vegetation, protected species or river corridors. However, during the last years, significant development has taken place in terms of the KWV and OWK facilities and flows in excess of the original intent are regularly experienced. There is also no proof that the evaporation ponds is lined or contained and even recent soil studies done my Dr. P Raath shows little significant soil contamination away from the evaporation ponds, the soils within the evaporation ponds had been contaminated and the possibility of polluting the lower lying areas is real. In addition, in a water scares country like South Africa, evaporation is not considered the best re-use of a water resource.

The No-Go option will mean that the current unacceptable effluent treatment practices will not be improved. As a result continual pollution issues (which will further increase over time) will remain, with possible health risks as well.

Over the long term the proposed project is likely to have a positive environmental impact, while the No-Go option will lead to environmental pollution and health risks.

9. RECOMMENDATIONS & IMPACT MINIMIZATION

The No-Go option will mean that the current unacceptable effluent treatment practices will not be improved and pollution and health risks will increase, while the proposed project is likely to have a positive environmental impact over the long term. Because of the identified need for improved treatment it is highly unlikely that the "No-Go" option will be an option.

Other locations may be looked at, but ultimately the need for an upgraded or enlarged treatment system remains. Even though the impact will be permanent, it will also be localised and is situated within a vegetation type not considered by either National Spatial Biodiversity Indicators or by local environmental planning initiatives (Siyanda Draft EMF, 2008) as a sensitive area. However, various provincially protected species in terms of NCNCA was encountered within the larger site, but by utilising the existing degraded footprint the impact on any protected species could be negated. Various impact minimisation recommendations are given in this report, which will reduce the cumulative impact of the proposed development to a very large degree. The major impact minimisation recommendation is associated with placement of any new facilities or treatment infrastructure.

Having evaluated and discussed the various biodiversity aspects associated with the project it is clear that the most significant impacts associated with the project will be:

- The possible localised loss of natural vegetation (which can be minimised through correct placement).
- The possible impact on protected plant species (which again can be minimised through correct placement).
- Prevention of pollution (and health risks) as a result of treatment within design capacity.

It is, however, considered highly unlikely that the proposed project will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity

With the available information to the author's disposal it is recommended that project be approved since it is not associated with irreversible environmental impact, provided that mitigation is adequately addresses.

9.1 IMPACT MINIMIZATION

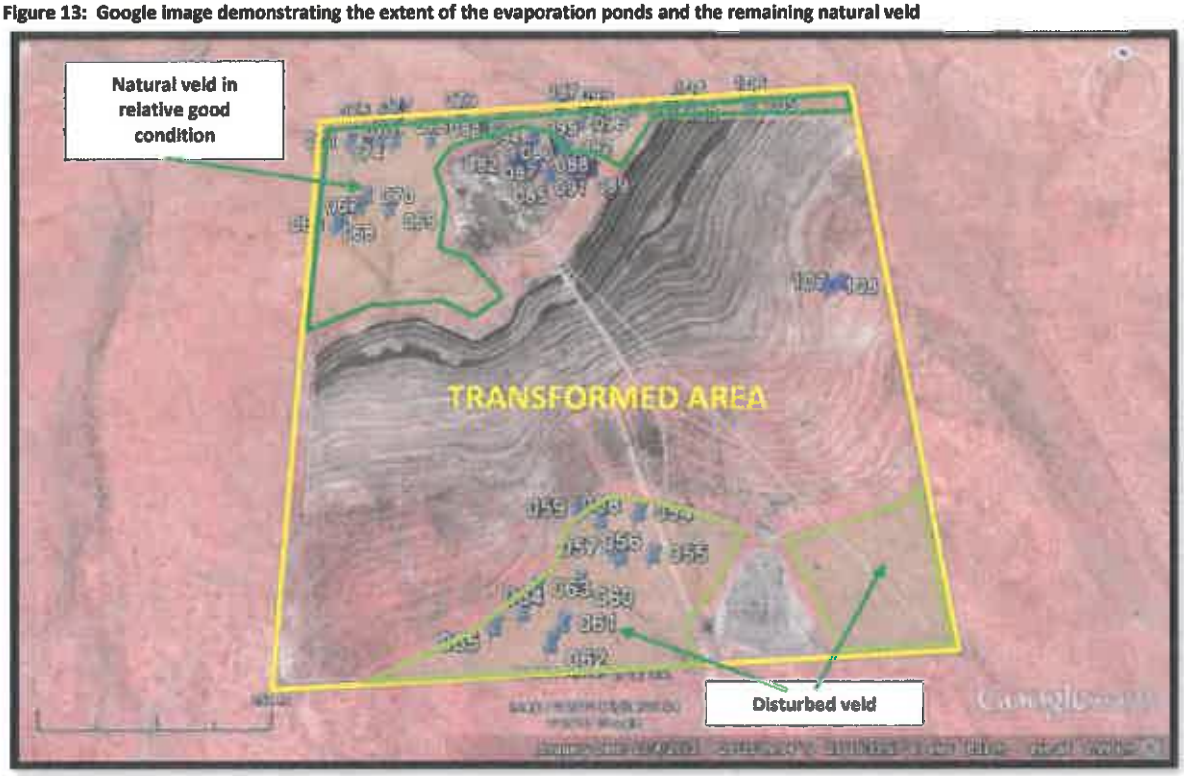
9.1.1 General

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and the Biodiversity study recommendations as well as any other conditions which might be required by the Department of Environmental Affairs.
- An integrated waste management system must be implemented during the construction phase.
- All rubble and rubbish (if applicable) must be collected and removed from the site to a suitable registered waste disposal site.
- All alien vegetation should be removed from the larger property.

9.1.2 Other site specific mitigation recommendations

- The proposed treatment works should utilise the existing footprint and thus the existing disturbed areas as much as possible. In doing this the impact on natural veld and protected species is minimised (Refer to Figure 13 underneath).
- Permits must be obtained for the removal of any protected species which cannot be avoided.
- Only existing access roads should be used for access to the terrain. Access roads must be clearly demarcated and access must be tightly controlled (deviations may not be allowed).
- Indiscriminate clearing of areas must be avoided (all remaining areas to remain as natural as possible).
- Soils contaminated as a result of the current evaporation pond treatment system must be rehabilitated and used as base material for the construction of the new treatment work (especially if constructed wetland treatment is implemented).
- All topsoil (in areas with natural veld) must be removed and stored separately for re-use for rehabilitation purposes. The topsoil and vegetation should be replaced over the disturbed soil to provide a source of seed and a seed bed to encourage re-growth of the species removed during construction.
- Once the construction is completed all further movement must be confined to the access tracks to allow the vegetation to re-establish over the excavated areas.
- Adequate measures must be implemented to ensure against erosion.

Figure 13: Google image demonstrating the extent of the evaporation ponds and the remaining natural veld



APPENDIX D (3)

Archaeological Impact Assessment

ARCHAEOLOGICAL IMPACT ASSESSMENT THE PROPOSED UPGRADING OF THE KWV UPINGTON EFFLUENT MANAGEMENT FACILITY NORTHERN CAPE PROVINCE

Prepared for:

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On behalf of:

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FEBRUARY
2013

Executive summary

ACRM was commissioned to conduct an Archaeological Impact Assessment for the proposed upgrading of the KWV Upington Effluent Management Facility, on Erf 5410 in Upington, in the Northern Cape.

The existing facility is located about 3kms north of the Upington industrial area and about 7kms west of the airport. The facility currently treats industrial effluent generated from the KWV and OWK winery operations. Volumes of effluent have recently increased which do not conform to standards set aside by the Department of Water Affairs.

The proposed development therefore entails upgrading the existing system with the aim of treating the waste water to irrigation standards (as opposed to evaporation). Various scenarios are being explored, including reed bed treatment.

The proposed upgrading will take place within an existing footprint area covering about 40ha in extent. It is estimated that more than 90% of the site is already very severely degraded and has been dramatically transformed.

In terms of Section 38 (1) (c) (iii) of the National Heritage Resources Act 1999 (Act 25 of 1999), an AIA of the proposed project is required if the footprint area of the development is more than 5000m².

The AIA forms part of the Environmental Impact Assessment (EIA) process that is being conducted by EnviroAfrica cc.

The aim of the study is to identify and map archaeological heritage that may be impacted by the proposed project, to assess the significance of the potential impacts and to propose measures to mitigate the impacts.

A fairly random foot survey of the relatively undisturbed portions of the site was undertaken and the following observations were made:

Twenty-two artefacts were counted and mapped with a hand held GPS unit. These, comprised three Early Stone Age implements, including two large cores, and nine Middle Stone Age flakes, blades, cores and flaked chunks. One double sided hammerstone was also found, while the remainder of the lithics comprised chunks and retouched and/or utilized flakes, of which some may be Later Stone Age. No formal tools such as handaxes, points, scrapers or adzes, and no organic remains such as pottery or ostrich eggshell were found.

The very small numbers and isolated context in which they were encountered means that the archaeological remains on Erf 5410 have been rated as having low (Grade 3C) significance.

The results of the study indicate that the proposed development will not have an impact of great significance on these and potentially other archaeological remains.

The following recommendations are made:

1. No further archaeological mitigation is required.

2. In the unlikely event of any unmarked human burials/remains or ostrich eggshell water flask caches being exposed during construction activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resources Agency (Att Ms Katie Smuts 021 462 4502). Burials, etc. must not be removed or disturbed until inspected by the archaeologist.

Table of Contents

1. INTRODUCTION

ACRM was requested to conduct an Archaeological Impact Assessment (AIA) for the proposed upgrading of the KWV Upington Effluent Management Facility, on Erf 5410 in Upington (Khara Hais Local Municipality), in the Northern Cape (Figures 1 & 2).

Since 1985 KWV Distillery and OWK Wines have been disposing their industrial effluent (via an underground pipeline) into large evaporation ponds. Volumes of wastewater have recently increased which do not conform to standards set aside by the Department of Water Affairs.

The proposed development therefore entails upgrading the existing pond system with the aim of treating the wastewater to irrigation standards (as opposed to evaporation). Various scenarios are being explored, including reed bed treatment. Proposed activities will take within the existing ponds, and no new ponds or infrastructure is envisaged.

The AIA forms part of the Environmental Impact Assessment (EIA) process that is being conducted by EnviroAfrica.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (Act No. 25 of 1999) makes provision for a compulsory Heritage Impact Assessment (HIA) when an area exceeding 5000 m² is being developed. This is to determine if the area contains heritage sites and to take the necessary steps to ensure that they are not damaged or destroyed during development.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).

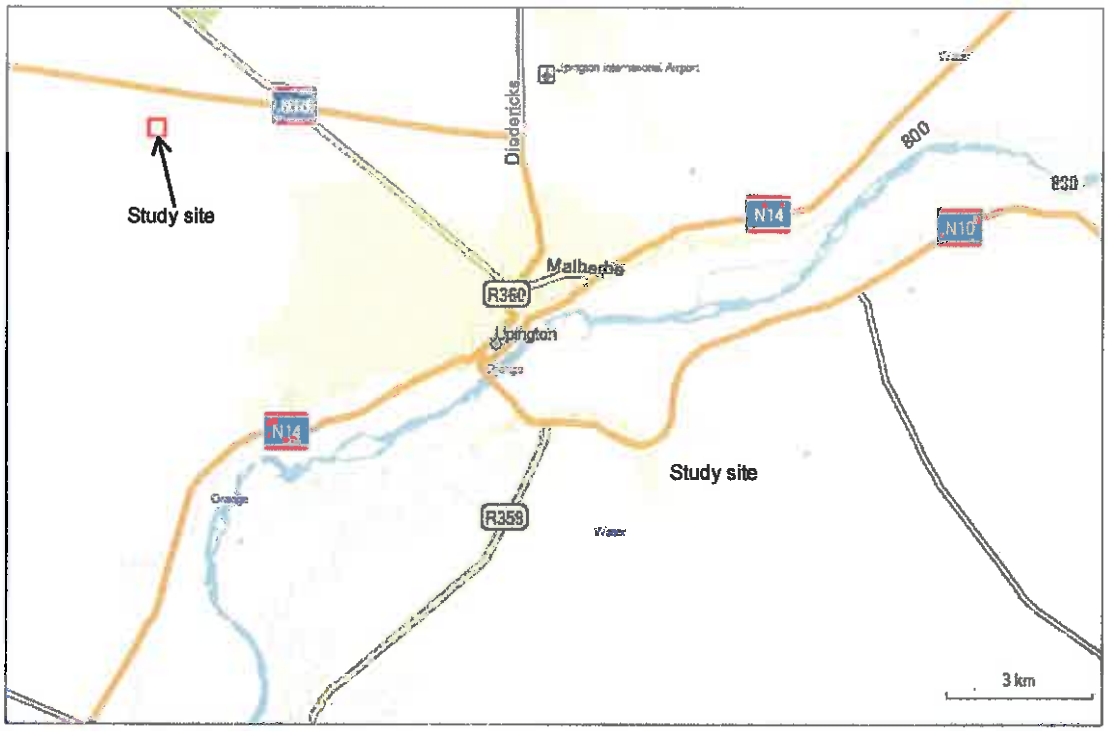

Figure 1. Locality Map

Figure 2. Google aerial photograph indicating the location site of the existing KWV facility (red square)

3. TERMS OF REFERENCE

The terms of reference for the archaeological study were to:

- Determine whether there are likely to be any important archaeological resources that may potentially be impacted by the proposed project;
- Indicate any constraints that would need to be taken into account in considering the development proposal;
- Identify potentially sensitive archaeological areas, and
- Recommend any further mitigation action.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The proposed site is located about 3kms north of the Upington industrial area and about 7kms west of the airport. The ± 40ha site, which is fenced off, is a flat, featureless landscape, sloping slightly to the south. It is estimated that more than 90% of the footprint area is highly degraded and has been already dramatically transformed by the current activities taking place on the site. Many of the evaporation ponds are filled with foul smelling wastewater and sludge, while others are empty and have not been used for a while. There are patches of relatively undisturbed land across the southern and south western portion of the property and in the northwest. The northern portion is severely degraded (Figures 3-10). Apart from gravel access roads, there is no other infrastructure on the proposed site. Surrounding land use comprises vast tracts of vacant land.

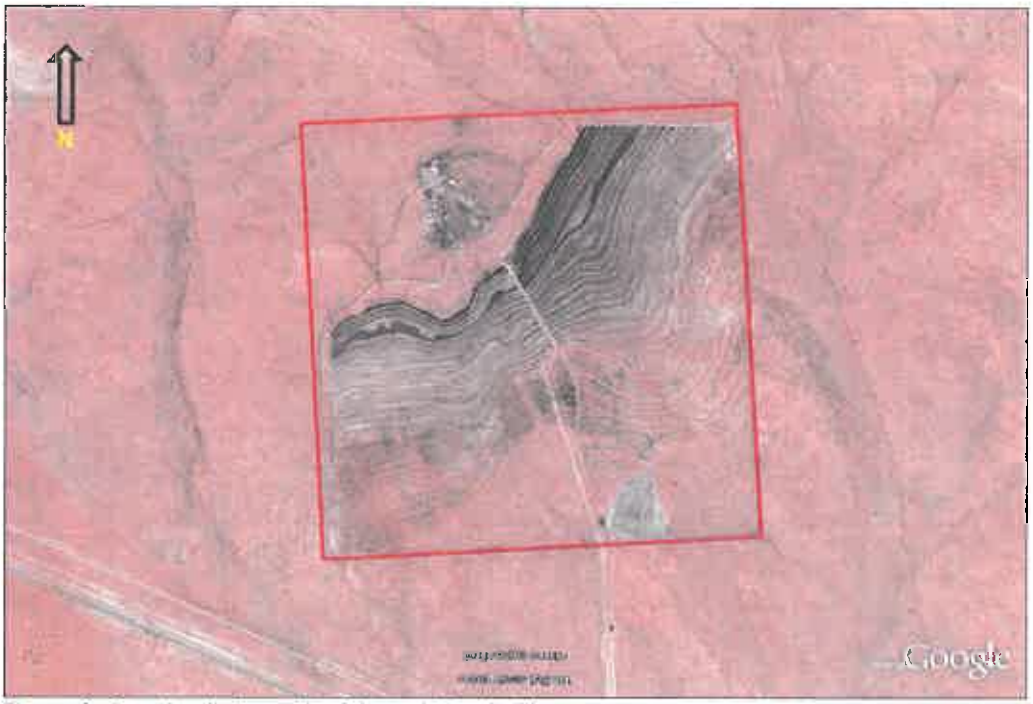

Figure 3. Google photograph of the existing facility

Figure 4. View of the site facing south

Figure 5. View of the site facing south. Note the empty ponds in the background.

Figure 6. View of the site facing south

Figure 7. View of the site facing east

Figure 8. View of the site facing north. Dry evaporation ponds

Figure 9. View of the site facing north.

Figure 10. View of the site facing north

Figure 11. View of the site facing north taken from the southern boundary

5. STUDY APPROACH

5.1 Method of survey

A fairly brief, random, survey of the facility was undertaken on 31 January 2013. A GPS track path was also created (refer to Figure 18 in Appendix II). All archaeological occurrences documented during the study were mapped using a hand-held Garmin Oregon 300 GPS unit set on the map datum WGS 84. A desk top study was also done.

5.2 Constraints and limitations

Apart from the overpowering odour of the ponds, there were no constraints or limitations associated with the study. Overall, archaeological visibility was good.

5.3 Identification of potential risks

Based on the results of the study, there are no archaeological risks associated with the proposed development. The footprint area is already very severely degraded.

5.4 Results of the desk top study

Not much archaeological work has been done in Upington, apart from an AIA for two small borrow pits on the northern bank of the Orange River near Uap, where small numbers of Later Stone Age implements were found (Kaplan 2008). About 35 mainly Middle Stone Age tools, of which 85% are in banded iron stone were also recorded during an AIA for the proposed upgrading of the Louisevale Road oxidation ponds a few kms south of the Orange River (Kaplan 2013a). Relatively large numbers of tools, assigned mainly to the Middle Stone Age, were documented during a study for a proposed solar energy farm in Keimoes about 30kms south west of Upington (Kaplan 2012a), while similar types of tools were encountered during a study for a large low cost housing project (Kaplan 2013b).

6. FINDINGS

Twenty-two artefacts were counted and mapped with a hand held GPS unit (refer to Table 2 in Appendix I). These, comprised three Early Stone Age implements, including two large cores (827 & 832), and nine Middle Stone Age flakes, blades, cores and flaked chunks. One double sided hammerstone (823) was also found, while the remainder of the lithics comprised chunks and retouched and/or utilized flakes in banded ironstone, silcrete, quartz, quartzite and indurated shale, of which some may also be Later Stone Age. No formal tools such as handaxes, points, scrapers or adzes, and no organic remains such as pottery or ostrich eggshell were found.

A collection of tools documented during the study are illustrated in Figures 12-17.

6.1 Significance of the archaeological remains

The very small numbers and isolated context in which they were found, means that the archaeological remains have been rated as having low (Grade 3C) significance.

Figure 12. ESA flake (822). Scale is in cm

Figure 13. Hammerstone (823). Scale is in cm

Figure 14. ESA core (827). Scale is in cm

Figure 15. ESA core (832) Scale is in cm

Figure 16. Collection of tools. Scale is in cm

Figure 17. Collection of tools. Scale is in cm

7. ASSESSMENT OF IMPACTS

In the case of the proposed upgrading of the KWV Upington Effluent Management Facility, it is expected that some archaeological impacts may occur during the construction phase of the project, but that the overall impact on important archaeological resources will be very low (Table 1).

Potential impacts on archaeological heritage	
Extent of impact:	Site specific
Duration of impact;	Permanent
Intensity	Low
Probability of occurrence:	Probable
Significance without mitigation	Low
Significance with mitigation	Negative
Confidence:	High

Table 1. Assessment of archaeological impacts.

8. CONCLUSION

The upgrading of the KWV Effluent Management Facility on Erf 5410 in Upington will have a very limited impact on the archaeological heritage. It is estimated that more than 90% of the site is already dramatically transformed and proposed upgrading will mostly take place within already highly disturbed areas on the property.

9. RECOMMENDATIONS

With regard to the proposed upgrading of the KWV Upington Effluent Management Facility, the following recommendations are made:

1. No further archaeological mitigation is required.

2. Should any unmarked human burials/remains or ostrich eggshell water flask caches be uncovered, or exposed during construction activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resources Agency (Att Ms Katie Smuts 021 462 4502). Burials must not be removed or disturbed until inspected by the archaeologist.

10. REFERENCES

Kaplan, J. 2013a. Archaeological Impact Assessment proposed upgrading of the Louisevale Road Waste Water Treatment Facility in Upington, Northern Cape Province. Report prepared for EnviroAfrica. ACRM.

Kaplan, J. 2013b. Archaeological Impact Assessment proposed low cost housing development Keimoes A & B, Northern Cape. Report prepared for EnviroAfrica. ACRM

Kaplan, J. 2012. Agency for Cultural Resource Management, the proposed Keren Energy Keimoes Solar Energy Plant on Erf 666, Keimoes, Northern Cape. Report prepared for EnviroAfrica. ACRM.

Kaplan, J. 2008. An archaeological assessment of two borrow pits alongside DR3321 Uap, Northern Cape Province. Report prepared for Van Zyl Environmental Consultants. ACRM.

Appendix I

Spreadsheet of waypoints and description of archaeological finds

Name of Site	Name of Farm	Lat/Long	Finds
	Erf 5410, Upington		
822		S28 25.292 E21 10.766	Large weathered ESA indurated shale flake
823		S28 25.279 E21 10.789	Double sided hammerstone
824		S28 25.207 E21 10.791	Small iron stone chunk
825		S28 25.278 E21 10.758	MSA retouched and utilized cobble flake
826		S28 25.299 E21 10.755	Large quartzite MSA flake
827		S28 25.204 E21 10.692	Large weathered Indurated shale ESA core
828		S28 25.195 E21 10.689	MSA quartzite flake
829		S28 25.207 E21 10.552	Chunky MSA quartz flake
830		S28 25.026 E21 10.435	Snapped indurated shale MSA flake/blade
831		S28 25.028 E21 10.431	Silcrete flake, & quartzite MSA flake
832		S28 25.044 E21 10.412	Large indurated shale ESA core
833		S28 25.056 E21 10.381	Banded ironstone flaked cobble/core
834		S28 24.996 E21 10.385	Small quartzite blade
835		S28 24.988 E21 10.388	Banded ironstone retouched/utilized cortex flake, & small nicked/utilized bladelet
836		S28 24.964 E21 10.378	Flat iron stone core, & MSA quartz blade
837		S28 24.941 E21 10.404	Broken, utilized and retouched MSA blade
838		S28 24.941 E21 10.410	Utilized/retouched chunk
839		S28 24.942 E21 10.465	Weathered indurated shale MSA disc core/chunk

Table 2. Spreadsheet of waypoints and description of archaeological finds.

Appendix II

Track path and illustration of waypoints

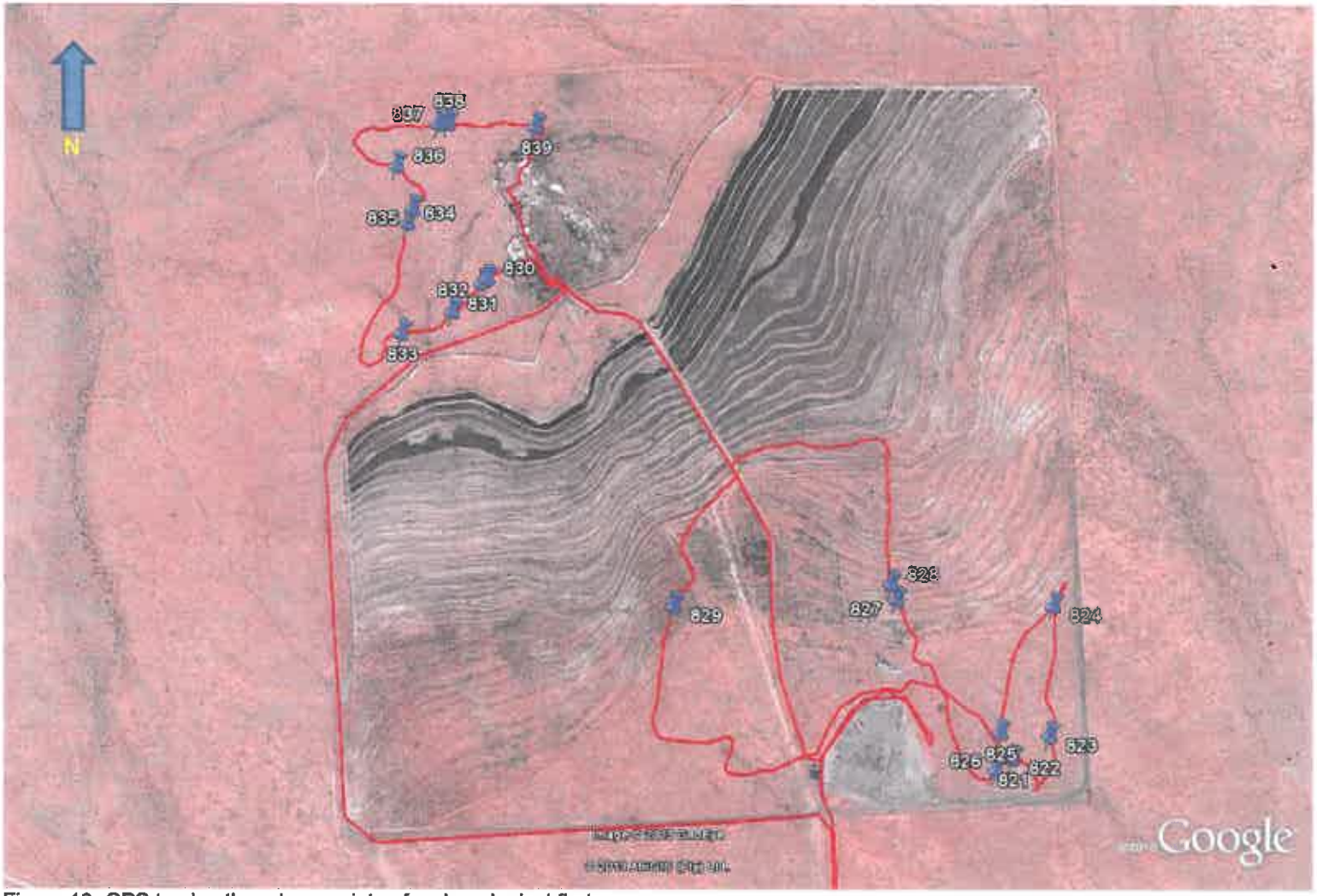

Figure 18. GPS trackpath and waypoints of archaeological finds

APPENDIX D (4)

Soil impact report

Impact of Distillery and Winery Effluent on Soil Chemistry of Evaporation Ponds

March 2013

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1. Background Information

EnviroAfrica was requested by DWAF to undertake a study to establish the effect of combined effluent from a distillery, winery and grape concentrate factory on the soil chemistry of evaporation ponds used to dispose of the effluent. The client intends to develop a reed-bed system on the area to improve the effluent with the intention of responsible irrigation of the water. The goal of the study was to establish whether the soil of the evaporation area is suitable for development of the reed-bed area without rehabilitation. The impact of the effluent on the chemistry of the soil in the potentially affected area is therefore compared to soil from an adjacent area. In addition, the heavy metal composition of coal ash from the distillery was established to evaluate it for possible soil contamination risk, if stored in the open.

2. Impact of Effluent on Soil Chemical Composition

Soil from eight locations was sampled at varying depths. The location of each sampling point is indicated in Figure 1. Sampling point one (1) is located at the closest point to the outlet, while the other sampling points (two to seven) were progressively further away from the outlet. Sampling point eight (8) was situated outside the affected area and serves as a control to which the impact of the effluent on the soil's chemical composition can be compared. Sampling points five (5) and seven (7) were also considered to be outside the affected area.

Bemlab conducted the chemical analyses that are presented in Table 1. The results indicate that the chemical composition of soil represented by sampling point one (closest to the effluent outlet) was detrimentally affected by the effluent. The soil's pH was reduced. It furthermore contains elevated levels of phosphorous (P), sodium (Na) and potassium (K). The last mentioned two elements are excessive which contribute to high salinity (indicated by a resistance value <300 Ω). Phosphorous contents in excess of 120 mg/kg and K higher than 290 mg/kg are considered to be excessive.

The 0-30 cm layers of sampling points four & six also have P and K concentrations that are higher than the other locations, but was not raised to the same extent as sampling point one. This is ascribed to a few incidents when effluent was discharged beyond the evaporation pond contours. Compared to the control (sampling point eight), the soil from the other sampling points (two, three, five & seven) was not affected. Soil layers deeper than 0-30 cm also remained unaffected in all cases. It therefore seems that when effluent was released, the volumes were small.

The chemistry of the soil from sampling point 1 can be remedied by application of one ton/ha gypsum and one ton calcitic lime per ha, with subsequent application of water to leach the Na & K from the soil. Mixing of layers of all the affected soils (sampling points one, four and six) to a depth of 60 cm during preparation of the area for establishment of the reed beds, must also be considered.

3. Composition and Pollution Potential of Coal Ash

The coal ash, that is waste material generated during steam production for both Orange River Cellars (OWK) concentrate plant and KWV distillery, was also analysed for its heavy metal content by Bemlab and the results are compared to published ranges in Table 2. The coal ash contains very low concentrations of only arsenic (As) & lead (Pb). Compared to ranges of heavy metal contents of coal ash, published by the American Coal Ash Association Educational Foundation (www.acaa-usa.org), as well as sludge analyses norms published by the Water Research Commission (Snyman & Herselman, 2006), the heavy metal content of the coal ash is very low. For every ton of coal ash deposited, only 2.74 g As and 2.31 g of Pb is applied.

4. Conclusions

- All the soils, including the control soil, have higher than expected K concentrations.
- Nevertheless, from the soil chemical analyses, it was found that only the soil represented by sampling point one was significantly contaminated by the effluent water. This is the area directly adjacent to the effluent outlet. The effect thereof can be remedied by lime and gypsum applications and the soil rehabilitated.
- The areas outside this heavily affected area show little or no contamination.
- It is advised that when the area is prepared for establishment of a reed bed system, the top 60 cm soil is properly mixed to lower the high P and K concentrations of the soil represented by sampling points four and six.
- The coal ash will pose no pollution threat when applied to soil or used in composting (if the volumes are less than 30% vol/vol).

Figure 1. Location of sampling points of soil in effluent evaporation ponds (courtesy of google.com).

Table 1: Chemical composition of soil in area where effluent evaporation ponds are located.

Sampling point	Soil depth (cm)	Soil texture	pH (KCl)	Resistance (ohm)	Stone Vol. %	P(Bray II) (mg/kg)	K (mg/kg)	Exchangeable Cations (cmol/kg)				Micro-elements (mg/kg)				Carbon (%)
								Na	K	Ca	Mg	Cu	Zn	Mn	B	
1	0 - 30	Sand	4.4	270	12	132	932	0.45	2.38	1.31	1.08	0.94	0.9	9.4	0.84	0.17
2	0 - 30	Sand	6.0	1470	43	4	150	0.05	0.38	3.16	2.56	0.59	0.2	89.9	0.33	0.12
	30 - 60	Sand	5.3	3470	7	7	187	0.04	0.48	1.83	1.60	0.58	0.3	95.5	0.35	0.10
3	0 - 30	Sand	6.2	2490	5	11	269	0.10	0.69	2.20	1.29	0.69	0.2	97.0	0.51	0.19
	30 - 60	Sand	5.9	1410	10	4	95	0.11	0.24	3.29	1.82	0.84	0.3	95.8	0.47	0.22
	60 - 90	Sand	6.1	1230	51	3	115	0.06	0.29	3.68	2.05	0.82	0.2	86.8	0.34	0.15
4	0 - 30	Sand	6.4	1860	13	50	441	0.02	1.13	2.73	1.09	0.90	0.7	62.6	0.39	0.29
	30 - 60	Sand	5.2	2440	8	13	204	0.03	0.52	1.99	1.79	0.96	0.6	114.5	0.31	0.15
5	0 - 30	Sand	6.7	2050	15	5	192	0.04	0.49	2.90	1.58	0.78	0.8	87.0	0.31	0.10
	30 - 60	Sand	6.5	1890	29	2	155	0.03	0.40	2.99	1.62	0.71	0.3	84.7	0.33	0.15
6	0 - 30	Sand	6.9	1450	49	52	331	0.03	0.85	8.74	1.11	1.72	1.2	91.7	0.36	0.15
	30 - 60	Loam	7.1	720	33	5	189	0.15	0.48	19.85	1.40	0.56	0.3	2.9	0.33	0.15
7	0 - 30	Sand	4.8	1850	14	17	211	0.04	0.54	2.16	1.98	0.88	0.5	122.5	0.31	0.22
	30 - 60	Sand	5.3	1980	12	27	203	0.04	0.52	2.48	1.27	0.88	1.0	62.8	0.32	0.17
8 (Control)	0 - 30	Loam	5.4	1190	53	10	217	0.03	0.56	4.34	2.48	1.38	0.4	116.8	0.45	0.17

Table 2. The pH and heavy metal content of coal ash produced by the KWV distillery.

Analysis	pH	Cd	Hg	As	Pb	Sb
		mg/kg				
Result	7.60	0.00	0.00	2.74	2.31	0.00
Published ranges of coal ash analyses*	-	0.01 - 76.0	0.013 – 49.5	0.00 – 391.0	0.02 - 273	-
Sludge norms**		< 40	< 15	< 40	< 300	-

* Source: American Coal Ash Association Educational Foundation, www.acaa-usa.org

** Source: Snyman, H.G. & Herselman, J.E., 2006. Guidelines for the utilization and disposal of wastewater sludge. Volume 2: Requirements for the agricultural use of wastewater sludge.