



# **AVIANTO ESTATE MIXED-USED DEVELOPMENT DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME**

## **Avianto Estate Mixed-use Precinct**

Submitted to:

Gauteng Department of Agriculture & Rural  
Development

**Contract No: GAUT/PVT/DOV/02-10/001**

Prepared by:



**Document Number: 1**

*Document Title:*

Draft Environmental Management Programme for Avianto Estate Mixed-use Precinct

**Document History**

Revision	Revision Date	Revision Comments	Originator	Reviewed By
1.0	10/11/2010	First Draft for Public Comment	Andrew Woghiren	Snowy Mothiba

**Distribution List**

Name	Designation	Company/Organisation
A van Aswegen	Managing Director	Avianto Group
T D'Oliveira	Director	Dolveira Developments
M Mokoena	Executive Manager	Mogale City - IEM
Aristotelis Kapsosideris	Environmental Manager	GDARD
Hein Pienaar	DD: Land Use Management	Cradle of Humankind (MA)

**Originator:**

Andrew Woghiren **Pr Sci Nat MSc (Wits)**

Tel: +27 11 575 4951

Fax: +27 11 576 6000

Cell: +27 72 567 5812

E-mail: [Andrew@tholoanaconsulting.co.za](mailto:Andrew@tholoanaconsulting.co.za)

## TABLE OF CONTENTS

Section 1: INTRODUCTION .....	1
1.1 Environmental Aspects Addressed.....	2
1.1.1 Objectives of the EMP .....	3
1.1.2 The Planning and Design Phase .....	5
1.1.3 The Pre-construction and Construction Phase .....	5
1.1.4 The Operational Phase.....	5
1.1.5 Rehabilitation Phase.....	6
1.2 General Project Description.....	6
Section 2: ROLES AND RESPONSIBILITIES .....	8
2.1 Environmental Control Officer .....	8
2.1.1 Liaison with Authorities.....	8
2.1.2 Routine Monitoring and Liaison with Contractors .....	9
2.1.3 Environmental Awareness Plan.....	9
2.2 Environmental Liaison Officer (ELO) .....	9
2.3 Community Liaison Officer (CLO).....	9
Section 3: ENVIRONMENTAL MANAGEMENT PROGRAMME .....	10
3.1 Risks and Key Issues .....	10
3.2 Environmental Management Programme.....	16
Section 4: CONCLUSIONS AND RECOMMENDATIONS.....	45
APPENDIX 1: INCIDENT LOG .....	46
APPENDIX 2: MANAGEMENT OF TOPSOIL .....	47
APPENDIX 3: RE-VEGETATION OF SELECTED AREAS .....	49

## ABBREVIATIONS

CLO	Community Liaison Officer
EMP	Environmental Management Programme as per the EIA Regulations, 2010
EIA	Environmental Impact Assessment as defined in the EIA Regulations, 2006 and EIA Regulations, 2010.
ECO	Environmental Control Officer
EE	Consulting Engineer
ELO	Environmental Liaison Officer
IAP	Interested and Affected Party
SABS	South African Bureau of Standards
GDARD	Gauteng Department of Agriculture & Rural Development

## EXPERTISE OF THE EAP

### PROFESSIONAL BODIES

- Registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (Ecological Science)
- Member of the British Ecological Society
- Member of the South African Institute of Botanists
- Member of the International Association for Impact Assessment

### EDUCATIONAL QUALIFICATIONS

- Master of Science in Animal, Plant & Environmental Sciences (University of the Witwatersrand, Johannesburg) 2002
- Bachelor of Science Honours in Botany & Chemistry (University of Nigeria) 1999

### OTHER QUALIFICATIONS & SHORT COURSES

- Certificate in Public Participation: Planning for Effective Public Participation International Association for Public Participation - IAP2 (2007)
- Certificate Course in Wetland Delineation, Legislation & Rehabilitation, Continuing Education at University of Pretoria (2005)
- Enviro-Legal Training Course (July 2004)
- Enviro-Legal Training Course 10 – 13 June 2003 (2003)
- Three-day Workshop on Scientific Report Writing and Publications (2001)
- Environmental Science Overview, Continuing Science Education at the University of the Witwatersrand (2000)
- Statistical Research Design and Analysis, University of the Witwatersrand (2000)

### EXPERIENCE IN ENVIRONMENTAL IMPACT ASSESSMENT

#### Experience in managing various Environmental Impact Assessments in the SADC region, some of which include:

- *Project Leader* for four Strategic Environmental Assessments to support the Electrical Network Master Plans of the Western Cape Peninsula, Margate, Kwazulu-Natal, Pretoria Area and the Central Region. Client – NETGroup Solutions on behalf of Eskom Distribution. Role included project technical advisory and leadership of project team, financial control, programme management and client liaison.
- *Project Manager* for the Environmental Impact Assessment of the Expansion of the Sishen-Saldanha Iron Ore Export Handling Facility at Saldanha Bay, Western Cape, South Africa. Managed the project from August 2005, and later served on the EIA team up until 2009. Role included Environmental process management and quality

- control reviewing, specialist coordination, client liaison, etc. Applicant – Transnet Projects.
- *Project Manager* for the development of a Biodiversity Framework and Strategy for the City of Tshwane Metropolitan Municipality, Gauteng, South Africa. I managed the project from its inception up to August 2007. Role included biodiversity planning, managing the strategy development process, quality control, specialist coordination, client liaison, etc. Client – City of Tshwane Metropolitan Municipality.
  - *Project Manager* for the environmental impact statement and environmental management of issues surrounding the Pearls of Umhlanga Development, Umhlanga Rocks, Kwa-Zulu Natal. Tasks entailed managing a technical team tasked with assessing environmental concerns and public issues raised on the development (on-going).
  - *Project Manager* for Scoping Report and Impact Assessment of the proposed Celebration Mixed-use Development, Northriding, Johannesburg. Applicant: Celebration Northriding (Pty) Ltd.
  - *Project Manager*: For a total of 15 projects: 3 EIAs, 7 Scoping studies and 5 Exemptions, required as part of the Swaziland Electricity Board 400 kV Integration Phase II. Project included route planning and determination surveys across various towns and city centres in Swaziland. Applicant – Swaziland Electricity Corporation.
  - *Project Manager*: For the extended scoping process and compilation of a scoping report for a 33 kV Distribution line in Muldersdrift, Krugersdorp, Gauteng Province, South Africa. Applicant – Mogale City Local Municipality.
  - *Project Manager*: For the development of an Environmental Management Plan for the construction of a 33 kV Distribution line in Muldersdrift, Krugersdorp, Gauteng Province, South Africa. Applicant – Mogale City Local Municipality.
  - *Project Manager* for the development of an Environmental Management Plan for the Chamdor – Factoria 33kV power line, Gauteng Province South Africa. Applicant – Mogale City Local Municipality.
  - *Project Manager* for an extended scoping exercise and report compilation for a proposed Retail Centre in Hurlingham, Gauteng Province, South Africa. Applicant – Abland (Pty) Ltd.
  - *Project Manager*: For the extended scoping process and compilation of the scoping report for a Mixed-use development on William Nicol, Hurlingham, Gauteng Province, South Africa. Applicant: RPP Developments (Pty) Ltd.
-

**SECTION 1: INTRODUCTION**

Dolveira Developments (Pty) Ltd have applied for environmental authorisation for the establishment of a proposed-mixed-use precinct, which is to be known as Avianto Estate. Tholoana Sustainable Development & Environmental Consultants (Tholoana Consulting) was appointed by Dolveira Developments (Pty) Ltd to undertake the Environmental Impact Assessment for the Avianto Estate Mixed-use Precinct, which is a 231 ha development in Muldersdrift, Mogale City Local Municipality, Gauteng. The proposed development precinct will be located around the existing Wedding and Conference Centre also by the name Avianto and would occupy various farm portions on the Farms Driefontein 179 IQ and Rietvallei 180 IQ.

The site abuts the N14 National Road to the southeast and is bisected by the D1496 Road (Kromdraai Road), which runs in a north-west to south-east direction. The site is adjacent to the Drift Extensions 6 and 7, known as Le Jardin, and considered to be the first phase of the proposed Avianto Estate.

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Regulations, 2010, an Environmental Management Programme (EMP) must accompany the environmental impact assessment report. The EMP, which must comply with section 24N of the Act, must include all the information specified in Regulation 33 of the EIA Regulations, 2010. If the Competent Authority (GDARD) decides to grant authorisation and in the event that this Draft EMP is approved, GDARD will specify the requirements for management, monitoring and reporting of the impacts of the development on the environment, as contained in the approved environmental management programme. Consequently, the Applicant must ensure that the contents of this document are strictly adhered to in order to manage the environmental impacts that may arise from the construction and operation works of the various phases. In terms of the provisions of the EIA Regulations 2010; this document should also be read as a living document that must be amended or updated periodically as required.

The Competent Authority may also require the holder of the authorisation to provide environmental audit reports on the impacts of the authorised activity on the environment, at specified times or intervals or whenever requested by the Competent Authority. This means that in order to comply with the authorisation the Proponent must make financial provision for environmental monitoring and compliance audits as a key component of the EMP.

The purpose of this document is to outline a programme of action to mitigate and manage of the impacts of the proposed development on the surrounding environment and ensure that such impacts do not comprise the natural endowment of the site.

As a requirement of the environmental assessment for the above project this Environmental Management Programme (EMP) has been drawn up and submitted to the Gauteng Department of Agriculture and Rural Development (GDARD) for approval prior to the commencement of construction. This document specifies management responses that will ensure that the impacts of the development are minimised. All other conditions that may be specified in the Environmental Authorisation must be included in the final EMP. This EMP therefore is a stand-alone document, which must be used on the site during each phase of the development.

The following complementary appendices have been attached to this document:

- a) An Example of an Incident Log to be used by the ECO during construction and operational phases of the development (Appendix 1);
- b) Details on the management of topsoil (Appendix 2); and
- c) A description of re-vegetation procedures to be used during rehabilitation.

## 1.1 ENVIRONMENTAL ASPECTS ADDRESSED

In the event that a negative environmental impact is identified, it can be avoided, mitigated or offset. The mitigation hierarchy requires that every effort is made to avoid an impact and only when it is unavoidable should it be mitigated or offset. This EMP formulates mitigation measures that must be made binding on all contractors during construction, as well as measures that must be implemented during the operational phase. The point of departure for this EMP is to take a pro-active route by addressing potential problems before they occur, aiming to limit corrective measures needed during the construction and operational phases of the development. Additional mitigation will be included throughout the project's various phases as necessary.

For the purpose of the EMP it is envisaged that the development will be implemented in as many as 24 different phases, some of which could be combined. The expected period over which the entire development could be constructed is 10 to 20 years. Thus, the EMP is a dynamic document that should be updated over time.

### 1.1.1 Objectives of the EMP

The EMP aims to document the mitigation measures that were identified during the EIA into a single working document that to be used to manage the impacts of the construction and operation phases. This mitigation plan has been compiled in a manner that addresses environmental impacts that could be encountered on the site for the proposed Avianto Estate. This development entails the construction of a mixed-use estate comprising various land uses: residential, sports and recreational and commercial uses.

The EMP focuses on management of the negative impacts such as biodiversity loss; it also outlines measure to be follows in order to reduce the social impacts of the project on local residents and adjacent landowners. The aim is to prevent, reduce or mitigate the negative social and environmental impacts, while enhancing the beneficial aspects of the project. This document specifies environmental management activities for the different parties responsible for various mitigation tasks during all phases of the project. It therefore forms a key component of the construction contracts, and the specifications laid down in this EMP will be enforceable under the general conditions of the contracts. Any mitigation measures in this document that do not specifically refer to a section of the site are applicable for the protection of the site's environmental integrity, and it will thus be the responsibility of the Contractor(s) who directly impacts on this aspect of the environment. The stated objectives of the plan are to ensure that:

- a) All project activities are managed in a manner that reduces or avoids negative social and environmental impacts, while enhancing positive impacts;
- b) Timely precautions are taken to forestall damage and claims arising from damages;
- c) Communication between Dolveira Developments, their agents, contractors and affected parties is optimised to ensure that all role-players are aware of their specific responsibilities;
- d) The affected sensitive habitats and natural features are rehabilitated according to guidelines laid down in this EMP;

- e) The completion date of the contract is not delayed due to problems arising from landowners' concerns with the project.
- f) Local entrepreneurs are utilised throughout the project cycle for labour and provision of non-specialised services;
- g) Accurate records of environmental or social incidents, including accidents or objections and complaints are kept, so that the responsible parties are accountable in the event of claims against the Applicant;
- h) Environmental Audit or Compliance Reports are submitted to the GDARD in terms of an agreed schedule or as and when required;
- i) Any improvements made in the mitigation of the EMP due to on-going monitoring of its effectiveness are documented, and then made available for future reference.
- j) In order to meet the preceding objectives, an Environmental Control Officer must be appointed by the Applicant. The ECO's responsibilities are outlined in section 2 of this EMP.

This EMP focuses on the key environmental impacts of the construction and operation of the estate which abuts some sensitive habitats such as an Egoli Granite Grassland situated on a Class 2 Ridge and the Crocodile River. There are also a number of wetlands present on the site. Therefore, it is of utmost importance that a qualified Ecologist, who is well acquainted with the ecological issues at stake, monitors the entire project from its initial construction phases through to the last phases to be built. Ongoing monitoring and compliance will be required during the operation phase of the estate and it is envisaged that the "House Rules" of the estate should dovetail with environmental monitoring. The Section 21 Company to be established for the Estate will be instrumental in implementing the EMP during the operational phase. Furthermore, the social impacts (such as impacts on the informal settlements, landowners, etc.) must also be taken account when planning the construction of any phase of the estate. This EMP addresses the following three phases of the development:

### **1.1.2 The Planning and Design Phase**

Due to the conceptual nature of the development at this time, additional planning will still be undertaken. This is an ideal opportunity to incorporate pro-active environmental management measures to ensure that the development occurs in a sustainable manner.

Pro-active environmental measures minimise the risks of impacts occurring. There is still a possibility of accidental impacts taking place; however, through the incorporation of contingency plans (e.g. as detailed in this EMP) during the planning phase, the necessary corrective action can be taken to further limit detrimental impacts arising from unforeseen/foreseen incidents. For instance, an oil spillage incident could be regarded as foreseeable and thus contingency measures to deal with its occurrence can be put in place. An unforeseeable event could be the unavailability of a key role player in this EMP. In the latter case, a practical solution to the problem has to be sought. This emphasises the need to see this EMP as a dynamic working tool that needs to be modified as necessary.

### **1.1.3 The Pre-construction and Construction Phase**

The majority of the impacts during this phase will have immediate effect (e.g. noise-, dust- and water pollution). If the site is monitored on a continual basis during the construction phase, it is possible to identify these impacts as they occur. These impacts can then be mitigated through the contingency plans identified in the planning phase, together with a commitment to sound environmental management on the part of the Dolveira Developments (the Proponent) and the Contractor(s).

### **1.1.4 The Operational Phase**

By taking pro-active measures during the planning and construction phases, potential environmental impacts emanating during the operational phase must be minimised. This, in turn, will minimise the risk and reduce the monitoring effort, but it does not make monitoring redundant. Monitoring of certain sensitive

issues such as erosion, storm water management and alien infestation will still be required. The Section 21 Company to be established for the Estate will be instrumental in implementing the EMP during the operational phase.

#### **1.1.5 Rehabilitation Phase**

This phase outlines as far as possible, measures to rehabilitate the environment affected by the development. The aim is to restore the area to its natural or predetermined state which includes progressive rehabilitation measures as required.

### **1.2 GENERAL PROJECT DESCRIPTION**

Dolveira Developments proposes to build a mixed-use estate on various portions of the Farm Driefontein 179 IQ and Rietvallei 180 IQ in Muldersdrift, Mogale City. The proposed development precinct will be located on portions 61, 69, 71, 73, 74, 77, 80, 81,82,126, 129 and the remainder of portion 30 and the remainder of the farm Driefontein 179 IQ, as well as portion 172 of the farm Rietvallei 180 IQ (Figure 1). The objective is to build a variety of housing typologies and ownership options for the residential market within a security estate while retaining a rural setting. The complementary land uses to this largely residential development are: limited business uses, offices, community facilities, medical facilities, sport and recreational facilities.

In order to achieve this goal, the Applicant has opted to retain and enhance the natural status of 56.9% of the site, while developing only 43.1%. The development also embraces the concept and principles of green building within the estate.

#### Development Phasing

It is envisaged that Avianto Estate will be developed in the order indicated by the numbers on the plan below:

### **Financial Provision or Budget for Implementation of EMP**

The Contractor will be required to provide for the implementation of the aspects of the EMP that pertain to his/her activities. The proposed budget for the EMP includes professional fees for the Environmental Control Officer (ECO), the Environmental Liaison Officer (ELO) and the Community Liaison Officer (CLO), etc. The budget items are estimated as ballpark figures in Table 2, which will need to be verified by the Contractor(s).

**Table 2: Financial Provision and Budget for Avianto EMP Implementation**

*Budget per implementation/construction phase*

<u>Cost Items</u>	<u>Monthly (R)</u>	<u>Annually (R)</u>	<u>Remarks</u>
1. Appointment of Environmental Control Officer	7000	77000	
2. Appointment of Environmental Liaison Officer	3500	38500	
3. Appointment of Community Liaison Officer	5000	55000	
4. Provision of Environmental Training and Awareness for Contractors' personnel	6000	6000	once-off
5. Travel Costs of ECO, ELO, CLO	1000	11000	
6. Telecommunication, Stationery, etc.	300	3300	
7. Specialists & ad hoc input	1000	11000	only as required
8. Water Quality Monitoring (on the Crocodile River)	1200	13200	quarterly
<b>Total Estimated Budget</b>	<b>R 25 000</b>	<b>R 215 000</b>	

The manner in which the EMP is financed will depend upon the extent to which Dolveira Developments' in-house resources are used for these tasks. The estimated cost of the EMP is therefore conservative, and it will vary depending on the scale and duration of each phase of the project. As a minimum, it is suggested that ca. **R 215,000** is set aside for environmental monitoring and compliance measures over a 12-month period. This figure can be significantly reduced by promoting economies of scale, e.g. one ECO could be responsible for several phases of the project if these are implemented simultaneously.

**SECTION 2: ROLES AND RESPONSIBILITIES****2.1 ENVIRONMENTAL CONTROL OFFICER**

It is mandatory that Dolveira Developments appoints an independent Environmental Control Officer (ECO) to oversee all the environmental aspects relating to the development. The ECO must be a suitably qualified Ecologist or an Environmental Scientist with experience in managing impacts on natural habitats. The ECO must be appointed during the planning phase and must form part of the project management team. She/he must attend monthly project meetings, compile periodic Environmental Compliance Reports (ECRs) to evaluate compliance with the EMP and be responsible for providing feedback on potential environmental problems associated with the development. The ECR must contain information on the implementation and compliance of the EMP with the conditions of Environmental Authorisation in accordance with the (EIA Regulations, 2010) and with the directives of the Competent Authority. In addition, the ECO would be responsible for:

- Liaison with relevant authorities, i.e. the Gauteng Department of Agriculture and Rural Development;
- Liaison with contractors regarding environmental management; and
- Undertaking routine monitoring and appointing a competent person/institution to be responsible for specialist monitoring, whenever necessary.

The ECO will be responsible for monitoring compliance, rather than enforcing it. The onus is on the Applicant to ensure that the Contractor(s) complies with the conditions of the Environmental Authorisation.

**2.1.1 Liaison with Authorities**

During the construction phase, the ECO will be responsible for submitting monthly Environmental Audit or Compliance Reports on the development to GDARD. These audit reports will be based on the mitigation measures recommended and will include a description of the general state of the site, with specific reference to sensitive areas and areas of non-compliance. In order to keep a record of any impacts, an environmental incident log (Refer to Appendix 1) must be kept on a continual basis.

### **2.1.2 Routine Monitoring and Liaison with Contractors**

The ECO will be responsible for informing the contractors of any decisions that are taken concerning the natural and social environment during the construction phase of the development. This would also include informing the contractors of the necessary corrective actions to be taken against employees transgressing the management activities stipulated in this EMP. Routine monitoring would be necessary during the construction (monthly) and operational (annually) phases of this development.

### **2.1.3 Environmental Awareness Plan**

As required in the EIA Regulations 2010, the ECO will assist the Applicant by providing training and environmental awareness information sessions for the entire project team as well as the Contractor(s) and the Applicant's agents. The awareness must highlight the key risks and pertinent site issues and it must explain the chosen manner of mitigating these risks. Ideally, a once-off training session should be provided once the Contractor has been appointed.

## **2.2 ENVIRONMENTAL LIAISON OFFICER (ELO)**

An Environmental Liaison Officer (ELO) must be appointed by the Contractor and be trained to assist with the continuous monitoring of the construction activities. Any issues raised by the ECO will be routed through the ELO for the Contractors' attention. The ELO shall be permanently on site to ensure daily environmental compliance with the EMP and would ideally also be a senior and respected member of the construction crew. Past experience has revealed that ELO's that can relate to the workforce are the most effective for information transfer and ensuring compliance with the EMP.

## **2.3 COMMUNITY LIAISON OFFICER (CLO)**

The contractor must appoint a Community Liaison Officer (CLO) to act as a point of contact between the contractor's team and the community that will be affected by the construction activities. Any complaints from the community about construction activities must be channelled through the CLO, and the CLO must relay feedback from the contractor to the groups of interested and affected parties (I&APs). It is possible the same person acts as CLO and ELO, but in this case, given the nature of the project and the level of public interest, a separate person must be appointed as CLO. As a minimum, the CLO must liaise with I&APs affected by the project, especially those in the informal settlements, NGOs and Environmental Groups interested in or affected by the project, local residents and the Ward 23 councillor of Mogale City.

**SECTION 3: ENVIRONMENTAL MANAGEMENT PROGRAMME****3.1 RISKS AND KEY ISSUES**

Risks and key issues were identified and assessed during the EIA investigations. The draft EIA report outlined key mitigation measures which are the essence of this EMP. For the purposes of developing a better understanding of this document, a detailed overview of the aspects of the development that the EMP addresses is provided.

Western section of proposed Avianto Estate

This area consists of approximately 455 sectional title residential units and approximately 99 "Residential 1" stands. The proposed layout in this area is as far as possible aligned to maximise usage of the disturbed or semi-development portions of the land, i.e. informal roads, asbestos tailings, while leaving undeveloped those features that were identified to be sensitive, e.g. Egoli Granite Grassland.

Eastern Section of proposed Avianto Estate

The 1:100 year flood line associated with the Crocodile River and a secondary tributary, as well as a network of wetlands and some artificial dams create a noticeable north-south and east-west open space system within the eastern half of the site. This area is to be retained further enhanced by integrating it into the development and linking such open space areas throughout the development. The majority of the proposed 300 "Residential 1" stands are situated on this part of the site in front of the integrated open space system, which contributes to the idea of a country atmosphere. It is intended that residents will efficiently utilise the walkways and sport and recreational facilities associated with the open space system without having to use motor vehicle transport.

Overall the proposed development will consist of:

- (i) 1156 Sectional Title units, i.e. 5 erven zoned "Residential 3" with 701 dwelling units, and 2 erven zoned "Residential 4" with 455 dwelling units;
- (ii) 300 "Residential 1" stands;
- (iii) A Retirement Village with 160 dwelling units located on 2 erven zoned "Special";
- (iv) Medical Facility and Frail Care Facility associated with retirement village; on 2 erven zoned "Institution";
- (v) A Business Park, zoned "Business 3";

- (vi) An Office Park on 1 erven (including hotel, conference facilities and spa) zoned “*Special*”;
- (vii) Sport and Recreational Facilities (including marshy golf course (existing), tennis courts (existing), swimming pools, club house, cricket oval, etc.), zoned “*Special*”;
- (viii) Educational Facility on 1 erven, zoned “*Educational*”;
- (ix) A Conservancy zoned “Private Open Space”;
- (x) An Office Park along the N14 highway, zoned “*Business 3*”;
- (xi) 11 erven for Private Open Space (representing approximately 56.9% of the site), zoned as “*Private Open Space*”;
- (xii) 3 erven zoned “*Special*” for access, access control and conveying of engineering services; and
- (xiii) Road infrastructure and associated engineering services – an electrical substation, sewerage, water supply and waste handling facilities.

Infrastructure and services to be constructed which are covered by this EMP include:

#### Roads bridges and storm water management

The following access arrangements for the proposed development are envisaged:

- Access Road No. 1 – access will be provided along the existing road intersecting with Muldersdrift Road. The road will have to be surfaced, and will tie in with one of the internal roads planned for the proposed development. Refer to Mariteng Plan 160 19 01, appended in Annexure F.
- Access Road No. 2 – access will be provided via St Antonio’s Road.
- Access Road No. 3 – the access will be located along the southern side of the proposed development, and will intersect with Road 1496.

A detailed township layout has been prepared for the proposed development, and is shown on Mariteng Plan 160 19 01, appended in Annexure F of the EIA Report. The final internal road network layout is based on the geometric input provided by the civil engineers. At present no detailed analyses were done for the internal access points serving the main trip generators. This aspect will be addressed once the Site Development Plan is available, as part of the detail design of the respective portions of the site.

## Bulk Water Supply and Sewerage

### Water Reticulation

It is estimated that the total anticipated water demand for the township will be 1,736,840.001 litres per day, or 20.1 litres per second. Adding a peak factor of 4 this amounts to 80.4 litres per second; additional allowance for Fire Flow brings the total to 130.4 litres per second.

Although the existing 160mm water main in the eastern section of the proposed development will cater for this section, where the bulk of the development will occur; it is still insufficient to cater for the entire development and for future demand in the area. Extensive upgrading of the water supply is thus required.

### Proposed services

The intention is to install a bulk water supply line from the recently completed 315mm bulk main serving the Pinehaven and Featherbrook areas to a new reservoir to be installed within the boundary of the proposed estate. This water line would be supplied from the Munsieville Reservoir which is currently underutilised according to Klunene Consulting (2010). The estate would then be supplied from the planned reservoir with a supplemental supply from the existing water supply. The reservoir and bulk line would be in line with the current proposals in the Muldersdrift Infrastructure Master Plan of Mogale City (ProPlan 2005).

Based on a maximum velocity of 2.5 metres per second it is proposed to install a minimum of 315mm diameter main to the reservoir.

In summary, the major components of the proposed infrastructure for water supply are:

- Installation of approximately 5.5km of 300mm dia bulk water supply;
- Construction of a 3.5MI reservoir located at a high point in the township;
- Construction of internal reticulation including 250mm to 110mm dia according to Mogale City Standards;
- Construction of a bridge over Crocodile River for water supply line;
- Installation of a Water Tower and Booster Pump; and
- Installation of Pressure Release Valve (PRV) chambers.

## Sewer Reticulation

At present, the area comprises mostly undeveloped agricultural holdings and there is no local sewer infrastructure to cater for the development. There is however a large bulk outfall sewer – Driefontein Outfall Sewer, which runs through the eastern sector of the proposed township from south to north. This sewer is owned and maintained by Johannesburg Water. It drains in a northerly direction and connects the Driefontein Sewer Treatment Works directly to the north of the proposed township. The first goal is to connect the development to the Driefontein Waste Water Treatment Works, which is owned by Johannesburg Water (Pty) Ltd. If Johannesburg Water (JW) approves connection to the Driefontein Sewer Works then a pump station will be built at a specified location (on a disturbed portion of the Ridge) at the top northern part of the site just to the west of the Crocodile River.

Should connection to the Driefontein Works not be granted by JW it will be necessary to install a sewer treatment plant. Mogale City has approved the construction of such a plant subject to all relevant licenses being obtained, i.e. Water Use Licence and permission to reuse the grey water for irrigation purposes in the open spaces. Effluent water from the works can be utilised for irrigation of the open areas within the Avianto Estate and also released to the Crocodile River. If required a further treatment process can be installed at the end of the treatment works to further clean the water. It is currently proposed to transport the sludge to the Percy Stewart sewer treatment works for handling.

The capacity of the works required for Avianto alone is 1.2MI/day; however, Mogale City has requested that the developer allows for up to 2MI/day. It is proposed to use a Compact Membrane Bio Reactor System to treat the sewerage. See attached product schematic diagram.

The proposed plant is modular and can be installed in modules as small as 250m<sup>3</sup> up to 750m<sup>3</sup>. It is proposed to develop the capacity of the plant in line with the phasing of Avianto. The power required will depend on the size of the works but at the full 1.2MI/d capacity it is anticipated that 2 x 33kVA units will be in operation.

## Proposed services

The intention is to connect the two new sewers to the proposed pump station located at the northern point of the proposed township in the natural drainage valley. This would necessitate the construction of a sewer pipe bridge over the Crocodile River (Klunene, 2010). The sewer on the western side of the river would need to be large enough to accommodate the entire Muldersdrift Catchment area as specified in the Master Plan (ProPlan 2005).

In summary, the major components of the proposed infrastructure for sewerage are:

- Installation of a 2MI Modular Sewage Treatment Plant;
- Installation of a 400mm diameter Muldersdrift Bulk Sewer along the western bank of the Crocodile River;
- Installation of 200mm diameter Avianto Bulk Sewer along the eastern bank of the Crocodile River;
- **Or** Construction of a Pump Station and rising main to Driefontein Sewer Works along the northern boundary of the township in the natural drainage valley;
- Construction of a sewer pipe bridge over Crocodile River, which could be used for the rising main as well; and
- Construction of internal sewer reticulation of 160mm diameter pipes to Mogale City Council Standards.

#### Electrical Infrastructure

The electrical infrastructure to be constructed for the development includes:

- A new Eskom 11kV overhead line;
- A new 88/11kV Substation installed with a xx MVA Transformer;
- One new 11kVA bulk intake point; and
- Realignment of an existing 88kV overhead distribution line that traverses the site.

The risks and key issues identified during the EIA include:

#### ➤ **Key issue 1: Biodiversity impacts**

The key issues and impacts that must be managed pertain to biodiversity; the proposed buffer of the Cradle of Humankind World Heritage Site; alignment of the development with the local and provincial planning framework; provision of bulk services and the potential social impacts and benefits that could accrue from the project. Key negative biodiversity impacts that this EMP addresses are:

- Impacts on biodiversity – through loss of species or ecologically sensitive/endangered habitats, such as the Class 2 Ridge, with Egoli

Granite Grassland, impacts on the system of wetlands and man-made dams,

- Impacts on the Crocodile River and its tributary, the Muldersdrif se Loop. the system of man-made wetlands on site;
- Habitat destruction and possible loss of certain rare and endangered species, such as the Giant Bullfrog.

➤ **Key issue 2: The social environment**

It must be emphasised that whilst there are a number of impacts relating to the natural environment, this development will have a major impact on the lives and means of livelihood of a fairly large group of people who have been identified by means of an extensive social impact assessment. Therefore, a major focus of the EMP is on reducing/mitigation the negative social impacts, while enhances the expected positive benefits and spin-offs of the development. Three groups of people were identified as affected parties: residents of an informal settlement within the site, adjacent landowners, and employees of the existing Avianto who live within the area. In this regard the social issues flagged during the survey, as well as the concerns raised in the public consultation process must be taken into account. Therefore, implementation of the project must take into account key impacts that affect people and their well-being, such as the relocation exercise, provision of affordable (subsidised) housing with security of tenure to those currently living in the area.

### 3.2 ENVIRONMENTAL MANAGEMENT PROGRAMME

The intention of this section of the EMP report is that it forms a stand-alone document, which can be used as an integrated environmental management tool during the various phases of the project.

The following table forms the core of this EMP for the planning, construction and operational phases of each phase of the Estate. This table must be used as a checklist on site during each phase of the development. Compliance with this EMP must be audited monthly during the construction phase and once immediately following completion of construction. This must be followed up with **bi-annual audits** thereafter. Alternatively, one audit must be done prior to the scheduled maintenance activities and another afterwards.

**ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED AVIANTO ESTATE MIXED-USE PRECINCT**

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Planning & Design Phase	General	<p>This EMP will be made binding on Dolveira Developments, the design team, contractors and subcontractors working on the site (see Appendix 1). The special conditions of the contract must include provision for the stripping and stockpiling of topsoil from the site for later re-use.</p>	Dolveira Developments, ECO	Once off
		<ul style="list-style-type: none"> <li>• Dolveira Developments must appoint an Environmental Control Officer (ECO) to oversee the environmental aspects of the development.</li> <li>• The ECO must form part of the project management team and must attend all project meetings.</li> <li>• The ECO will be required to supply the Project Manager/Consulting Engineer with a monthly report, on the adherence or non-adherence of the contractors and sub-contractors to the environmental guidelines contained in this EMP. An incident log (see Appendix 2) must be used to keep a record of non-compliance.</li> <li>• The ECO must ensure that the development is restricted to the approved construction areas within the site.</li> <li>• It is recommended that local people be hired to provide temporary jobs, especially where unskilled labour can be used.</li> <li>• During construction, employees must be trained on how to respond to the EMP.</li> </ul>	Dolveira Developments, ECO, EE	Once off

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Planning & Design Phase	Preservation of Natural Open Spaces	<p>The preferred way to mitigate biodiversity impacts is to conserve natural areas. Large portions of the site are deemed worthy of conservation; therefore, the following measures must be implemented to preserve the natural endowment of the site prior to site establishment.</p> <ul style="list-style-type: none"> <li>• Establishment of a biodiversity monitoring component as part of this EMP.</li> <li>• It is of utmost importance that the wetlands and riparian areas delineated in this study (including their associated buffer zones) be integrated into the natural open spaces of the development. This is to ensure the continued presence of sensitive biodiversity elements.</li> <li>• No development should take place within the wetland or riparian areas, including their associated buffers.</li> <li>• Wetland and riparian areas and their associated buffers should be fenced off during construction phases to prevent any human activity from encroaching onto these areas.</li> <li>• A relocation programme for the protected plant species recorded in the wetland should be implemented as part of an ecological management plan for the site.</li> <li>• Rehabilitation and ecologically sensitive landscaping should be provided for all wetlands as prescribed in the Wetland and Riparian Report.</li> <li>• Rehabilitation of the impacted wetlands should be budgeted and planned for;</li> <li>• Periodic audits by qualified Ecologists in conjunction with the Environmental Control Officer during the Construction period;</li> <li>• Ensuring that the house rules of the Estate cater for biodiversity conservation and protection of natural open spaces.</li> </ul>	Contractor, ECO	As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Planning Phase	Site Establishment	<ul style="list-style-type: none"> <li>• Chemical toilets must be emptied regularly and the site contractor must supply toilet paper.</li> <li>• Positioning of chemical toilets must not be nearer than 800m from the Crocodile River or any water body.</li> <li>• Toilets and latrines must be placed within easy access of the workforce, to ensure that the surrounding environment is not used instead.</li> <li>• Care must be taken that water points do not turn into mud baths or form open pools of standing water.</li> <li>• Site establishment must not be allowed below the 100-year flood line or as approved by the ECO.</li> <li>• Locate construction camps outside of visually sensitive areas and away from critical view sources;</li> <li>• Where possible locate campsites in areas of low visual quality (e.g. near a disturbed area).</li> <li>• Do locate camp sites close to existing stands of alien trees which can serve as a screen or act as a backdrop for the visual impact of a camp or lay-down area;</li> <li>• Where possible make use of sites that have previously been disturbed, which may not have been re-vegetated.</li> </ul>	Contractor, ECO	Once off or Monitor weekly
Planning Phase	Safety and security	<ul style="list-style-type: none"> <li>• The Contractor must make provision for 24hr on-site security during the construction period.</li> </ul>	Contractor, ECO, ELO	

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Planning Phase	Waste disposal	<ul style="list-style-type: none"> <li>• The construction crew must adhere to all the relevant by-laws and regulations applicable to the disposal of construction waste and rubble. Sufficient containers must be on the construction site to handle the amount of litter, wastes, and builders' wastes generated on the site.</li> <li>• Containers must be emptied frequently to avoid rodents, insects or any other organisms accumulating on the site and becoming a health hazard to adjacent properties.</li> <li>• No waste must remain on the construction site for more than two weeks.</li> </ul>	Dolveira Developments, Contractor, Construction crew, ELO	Continuous

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
	Ecological impacts	<p><u>Alien plants</u></p> <p>An alien plants control programme for the entire site of the line must be drawn up prior to the construction. This programme must be made binding on the Dolveira Developments, and it must detail measures to be implemented during the maintenance phase. This is important given the presence of aggressive invaders such as <i>Acacia mearnsii</i> and <i>A. Dealbata</i> (see Appendix F of Floral Assessment).</p>	Dolveira Developments, ECO	During pegging exercise, but prior to construction
	Environmental impacts of site establishment	<p>Prior to establishment of the site camp(s), the Contractor shall produce a site establishment plan for the approval of the ECO. The plan must show the positions of the following for approval by the ECO:</p> <ul style="list-style-type: none"> <li>• All lay-down yards;</li> <li>• Vehicle fuelling areas, fuel storage areas;</li> <li>• Ablution areas;</li> <li>• Litter areas;</li> <li>• Spoil sites;</li> <li>• Overnight vehicle parking areas; and</li> <li>• The ECO may require any amendments to the site establishment plan that may be necessary to mitigate environmental impacts.</li> </ul>	Contractor, ECO	At project initiation and as work progresses, as necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
	Destruction of flora and displacement of fauna	A strategy for the eradication of alien invasive and obstructive plants occurring on site must be devised in collaboration with adjacent landowners.	Dolveira Developments to approach adjacent land owners, ECO.	Planning phase

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	General	<ul style="list-style-type: none"> <li>• All the persons employed by the contractors shall abide by the requirements of the EMP.</li> <li>• It is the contractor's responsibility to ensure that the workforce is aware of and conforms to the environmental guidelines that are applicable in this EMP.</li> <li>• Work near the depressions must be carried out so as to minimise disturbance to the water and habitat. Spoil and construction materials must not be stored in or next to pans such that the waste water does not flow into the pans or cause a risk of pollution.</li> <li>• No uncontrolled discharges from the site/working area to depressions shall be permitted. All discharge points will require approval e.g. wastewater discharges include concrete mixing, vehicle washing etc.</li> <li>• Should surface water be polluted, and fauna and indigenous flora show signs of deterioration, specialist hydrological or ecological advice must be sought for the appropriate treatment and remedial procedures to be followed. The requirements for such input shall be agreed with the engineer. If liability is found to rest with the contractor, the costs of containment and rehabilitation shall be for the contractor's account, including the costs of specialist input.</li> <li>• No trees or bushes shall be damaged or cut down by the Contractor or by any of his employees whether for use on the construction site or otherwise without the written consent of the Environmental Control Officer.</li> </ul> <p>The ECO must label all trees and shrubs to be avoided on site. This must be done per construction phase as the project is implemented.</p>	Dolveira Developments, ECO, Contractor	Once off

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Vegetation clearance	<p>The clearing of vegetation would very likely result in a loss of visual quality and reduced alter the sense of place/natural beauty of the site. Suitable mitigation measures for the clearing of construction site include:</p> <ul style="list-style-type: none"> <li>• The large portion of Egoli Granite Grassland should be allocated as a conservancy within the development and could include hiking trails and bird hides. Other low impact activities such as weekend accommodation huts could be considered within the small footprint of the existing disturbances within the Primary Grassland;</li> <li>• Leave as much of the natural vegetation intact in order to maintain ecological corridors for the movement of species and make an effort to increase the natural areas around sensitive features such as ridges, wetlands and river;</li> <li>• Cordon off the protected and orange list plant species and protect from construction activities and vehicles;</li> <li>• Where protected and declining orange data plant species occurs outside areas of high sensitivity and thus outside the no development zone, these species must be relocated to suitable open spaces (grassland) within the development;</li> <li>• Relocation of plants of conservation importance should be implemented by a qualified Plant Ecologist;</li> <li>• Implement an alien invasive monitoring plan to prevent the colonisation and spread of alien invasive plant species;</li> <li>• Create open, natural space within the development and reduce the amount of hard paved surfaces;</li> <li>• Natural open spaces should be left in their undeveloped state (not landscaped) and any existing or new exotic vegetation that is present on the site must be removed and eradicated;</li> </ul>	Contractor, ECO	As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase		<ul style="list-style-type: none"> <li>Erect buildings and permanent structures in degraded areas which are in a permanently transformed ecological state and therefore offer no benefit to conservation;</li> <li>Landscaping should emulate the existing natural grasslands and koppies and only utilise plants that naturally occur within the area; and</li> <li>Remove all exotic, invasive vegetation and implement a monitoring and eradication plan to keep the site free from invasive plants.</li> </ul>	Contractor, ECO	Monitor weekly or monthly
	Re-vegetation of natural areas	Vegetation restoration must be with indigenous species and areas identified as potentially erosive must be vegetated with a mix approved by the ECO. This action will reduce the time the bare area will be subject to the agents of erosion. This phase must be continually monitored for at least six months or until the end of one rainy season. Monthly site visits are recommended to actively remove invasive species and to assess project progress.		Monitor Monthly after rehabilitation.
Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Re-vegetation of previously disturbed areas	Re-vegetation must be with indigenous species. Time permitting, the natural seed bank and vegetative structures retained in the topsoil can be utilised instead of various seed mixtures. However, a seed mix will have to be used to re-vegetate previously disturbed areas, should re-vegetation be delayed. Areas that are to be re-vegetated must be seeded with a prescribed seed mix approved by the ECO.	Contractor, ECO	Monitor weekly or monthly

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction phase	Ecological impacts of floral and faunal destruction	<p>The construction activities will inevitably alter the landscape and influence the ecological processes on the site. This could lead to certain species becoming rare in the local context. The following measures should be implemented to mitigate these ecological effects:</p> <p>No development should take place within areas zoned as high sensitivity (Primary grassland, wetland zones and associated 30m buffer as well as the riparian zones and associated 32m buffer from the edge of the riparian area). These areas must be incorporated into natural open space planning within the development. Incorporate pedestrian walkways and interpretive trails, using natural materials and permeable paving, while respecting buffer zones around sensitive habitats such as rivers and wetlands. Furthermore, use recycled material such as plastic timber in the creation of benches and other structures within parks and open spaces;</p> <p>Numerous protected plants as well as Gauteng Orange Data plants occur on the site. Development could destroy the habitat and inevitably the persistence of these species which will put further strain on the already declining populations</p> <ul style="list-style-type: none"> <li>• Cordon off the protected and orange list plant species and protect from construction activities and vehicles;</li> <li>• Where protected and declining orange data plant species occurs outside areas of high sensitivity and thus outside the no development zone, these species must be relocated to suitable open spaces (grassland) within the development; and</li> <li>• Relocation of plants of conservation importance should be implemented by a qualified plant specialist.</li> </ul>	Contractor, ECO, ELO	Monitor weekly or monthly

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction phase	Ecological impacts of floral and faunal destruction	<ul style="list-style-type: none"> <li>• Indigenous trees must be protected in order to retain as many bird species as possible (see species list in Floral Assessment Report). Tree felling along the servitude route must be limited to the absolute minimum required for maintenance of the line. Indiscriminate tree felling is prohibited.</li> <li>• Where possible, construction work must be restricted to one area at a time on the site. This will give the smaller birds, mammals and reptiles sufficient time to weather the disturbance in an undisturbed zone close to their natural territories or to move out of the immediate area.</li> <li>• Construction workers must refrain from hunting and snaring. Contractual restrictions, including adequate fines, must be imposed to ensure no hunting, snaring, etc. occurs.</li> </ul>	Contractor, ECO, ELO	Monitor weekly or monthly

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Topsoil management	<p>The topsoil cleared must be retained and stockpiled such that topsoil layers are stored at separately from subsoil layers. Topsoil contains most of the inorganic matter, decomposed organisms and plant available nutrients, thus the removal of the topsoil constitutes a major loss in terms of ecosystem function. In order to ensure that the minimal amount of soil is removed with vegetation clearance, it is strongly advised that vegetation be harvested as close to ground level as possible before earthworks machinery are utilised. Soil removed in this manner will contain the existing seed bank, stolons, rhizomes and runners as well as an additional supply of organic matter, which will be beneficial during the early stages of vegetation reinstatement. Harvested grass must be retained and used as a mulch to combat erosion. A precautionary measure must be taken so that the topsoil is not stockpiled for an extensive period (greater than 3 months). This is to prevent the redundancy of the existing seed bank in the topsoil layer, as well as the alteration of soil characteristics, such as permeability, bulk density etc.</p> <p><u>Sedimentation of streams and rivers</u></p> <ul style="list-style-type: none"> <li>• To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bunded area.</li> <li>• The temporary storage of topsoil, inert spoil, fill, etc. must be above the 1:20-year flood line.</li> <li>• Stockpiles must not be higher than 2m to avoid compaction, and single handling is recommended.</li> </ul> <p>Dust suppression is necessary for stockpiles older than a month – with either water or a biodegradable chemical binding agent.</p>	Contractor, ECO	Monitor weekly

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Groundwater contamination	<p>If construction vehicles are to be refuelled at the construction site, the fuel containers must be provided with bunding walls that will prevent the escape of fuel in the event of a large spillage. Spills and contaminated soil must be removed immediately to an appropriate disposal facility. In terms of the legislation, a risk assessment must also be undertaken in order to comply with the requirements for hazardous installations.</p> <p>Construction vehicles must be maintained in good working order, to reduce the probability of leakage of fuels and lubricants.</p>	Contractor, ECO	As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Impacts on Crocodile River, Dams and Wetlands	<p><u>Erosion of stream banks, floodplains and valley bottoms and other wetland habitat</u></p> <ul style="list-style-type: none"> <li>• No development should take place within the wetland or riparian areas or in their associated buffer zones;</li> <li>• · Wetland and riparian areas and their associated buffer zones should be fenced during the construction phase to prevent any human activity from encroaching onto these areas;</li> <li>• · Wetland and riparian areas outside the study area that are affected by access to the site by machinery and the labour force should also be fenced off and protected;</li> <li>• · No animals may be trapped, hunted or handled in any way; and</li> <li>• · No vegetation may be collected or used for firewood.</li> </ul> <p><u>Increased storm water runoff and velocity</u></p> <p>Vegetation clearing from routine construction activities results in large areas of bare soil and hard impermeable surfaces. Stormwater runoff volume consequently increases, resulting in erosion and sedimentation of the Muldersdrift se Loop. This should be of limited significance if the recommended mitigation measures are implemented.</p> <ul style="list-style-type: none"> <li>• Construction on steep slopes will require erosion control measures and correct grassing methods;</li> <li>• Any erosion formed during the construction phase or during the vegetation establishment period shall be backfilled and compacted, and the areas restored to an acceptable condition (80% vegetation cover);</li> <li>• Regular monitoring should identify areas where erosion is occurring;</li> <li>• Disturbed surfaces to be rehabilitated should be ripped, and the area must be backfilled with topsoil or overburden;</li> </ul>	Contractor, ECO	Weekly or As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Impacts on Crocodile River, Dams and wetlands	<ul style="list-style-type: none"> <li>• A stormwater management plan must be implemented. Stormwater on the site must be managed so as to reduce the silt loads in the system. Measures must be implemented to distribute stormwater as evenly as possible to avoid point sources of erosion;</li> <li>• To prevent the erosion of material that is stockpiled for long periods, the material should be retained in a bermed area; and</li> <li>• Construct an earth bank around any upslope portion of any stockpiles in order to redirect runoff and prevent scouring of stockpiles.</li> </ul> <p><u>Floral disturbance (drainage areas).</u></p> <ul style="list-style-type: none"> <li>• Appropriate flow diversion and erosion control structures (i.e. earth embankments) must be put in place where soil may be exposed to high levels of erosion due to steep slopes, soil structure etc.;</li> <li>• Stormwater at the construction crew camps must be managed so as to reduce the silt loads in the drainage channel. Measures must be implemented to distribute stormwater as evenly as possible to avoid point sources of erosion;</li> <li>• Construction on steep slopes and in soft or erodible material will require erosion control measures and correct grassing methods;</li> <li>• All construction areas should be suitably top-soiled and vegetated as soon as possible after construction; and</li> <li>• Disturbed surfaces to be rehabilitated must be ripped, and the area must be backfilled with topsoil or overburden.</li> </ul>	Contractor, ECO	As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Impacts on surface and ground water pollution	<ul style="list-style-type: none"> <li>• Construction vehicles are to be maintained in good working order so as to reduce the probability of leakage of fuels and lubricants;</li> <li>• A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas;</li> <li>• Storage of potentially hazardous materials should be above any 100-year flood line, or as agreed with the Environmental Controlling Officer. These materials include fuel, oil, cement, bitumen etc.;</li> <li>• Surface water draining off contaminated areas containing oil and petrol would need to be channelled towards a sump which will separate these chemicals and oils;</li> <li>• Concrete is to be mixed on mixing trays only, not on exposed soil;</li> <li>• Concrete and tar shall be mixed only in areas which have been specially demarcated for this purpose;</li> <li>• After all the concrete / tar mixing is complete all waste concrete / tar shall be removed from the batching area and disposed of at an approved dumpsite;</li> <li>• Stormwater shall not be allowed to flow through the batching area. Cement sediment shall be removed from time to time and disposed of in a manner as instructed by the Consulting Engineer;</li> <li>• All construction materials liable to spillage are to be stored in appropriate structures with impermeable flooring;</li> </ul>	Contractor, ECO	As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Impacts on surface water and wetlands	<ul style="list-style-type: none"> <li>• Portable septic toilets are to be provided and maintained for construction crews.</li> <li>• Maintenance must include their removal without sewage spillage;</li> <li>• Under no circumstances may ablutions occur outside of the provided facilities;</li> <li>• No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted. Any discharge points need to be approved by the relevant authority;</li> <li>• In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately;</li> <li>• Store all litter carefully so it cannot be washed or blown into any of the water courses within the study area;</li> <li>• Provide bins for construction workers and staff at appropriate locations, particularly where food is consumed;</li> <li>• The construction site should be cleaned daily and litter removed;</li> <li>• Conduct ongoing staff awareness programs so as to reinforce the need to avoid littering; and</li> <li>• Backfill must be compacted to form a stabilised and durable blanket and the current load above the sewer lines must at no time be exceeded.</li> </ul>	Contractor, ECO	As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Impacts on proposed buffer zone	<p><u>Potential impact on Proposed buffer of COHWHS</u></p> <ul style="list-style-type: none"> <li>The Management Authority should be given an opportunity to periodically review the layout and designs, and where possible strive to take this type of development into account in certain areas, which have been identified as being permissible for developments in terms of the SDF, provided that they include large natural open spaces.</li> <li>Strict controls over the Estate's house rules should be implemented to prevent any further sub-division and densification in the Estate. As an example, larger stands would be required to maintain at least 50% of the erf as open space, which would greatly reduce to loss of a sense of place.</li> <li>A COHWHS Impact Monitoring Committee is to be established to oversee all mitigation relating to this impact. This committee could have representatives from the MA, the Developers, and the Section 21 Company that manages the Estate.</li> </ul>	Contractor, ECO	As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Impact on bulk services	<ul style="list-style-type: none"> <li>• A Services Agreement for provision of infrastructure should be negotiated with Mogale City to agree on the timeframes and procedures for installation of bulk services, <u>prior</u> to any development phase being approved.</li> <li>• The Muldersdrift Outfall Sewer and a future Treatment Facility should be fast-tracked, and bulk contributions from future/potential developments should be used to install these facilities.</li> <li>• The developers must install all internal and external connections according to SABS and Mogale City approved standards.</li> <li>• Strict controls over the Estate's house rules should be implemented to restrict the burden on bulk infrastructure and services. These should be viewed in line with climate change adaptation imperatives. Such measures include:                             <ul style="list-style-type: none"> <li>▪ 15 kl of rainwater storage for irrigation</li> <li>▪ Mandatory installation of a grey water re-use system</li> <li>▪ Minimising latent heat loss and geothermal heating</li> <li>▪ Photovoltaic panels for essential energy</li> <li>▪ Option to partake in the recycling program;</li> <li>▪ Insulation under the surface beds</li> <li>▪ Minimum external wall 280mm cavity</li> <li>▪ Insulation in the ceiling voids for pitched roof area</li> <li>▪ Turf or insulation to other flat slabs (green roofs)</li> <li>▪ Passive solar design including a north orientation and correct overhangs</li> <li>▪ Wall materials with appropriate thermal mass and no need to repaint over time</li> <li>▪ Solar geysers or heat exchange pumps for hot water</li> <li>▪ Gas hob for cooking.</li> </ul> </li> </ul>	Dolveira Developments	Once-off

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Enhancement of Social Benefits	<p><u>Social benefits of affordable housing</u></p> <p>The most significant ways to enhance the development are:</p> <ul style="list-style-type: none"> <li>• To conduct a relocation survey in order to ensure that the local residents are the primary direct beneficiaries of the houses;</li> <li>• That the socio-economic profile of the region be considered during implementation of the project;</li> <li>• That the mitigation and enhancement measures included in this report and in other specialists' reports prepared for this proposed development be considered and implemented to decrease the effect of negative impacts on communities and maximize the effect of positive impacts on affected land owners and community members.</li> <li>• That labour should be sourced locally as far as possible during construction and operation phases of the project. This will minimise the risk of conflict among local residents and newcomers, and improve relationships for workers housed in temporary housing for construction workers.</li> </ul> <p>Specific Elements to be monitored by this EMP include:</p> <ul style="list-style-type: none"> <li>• The Housing and Infrastructure departments of Mogale City should be engaged to agree on installation of bulk services, financing of the houses, and on a relocation strategy prior to any houses being transferred.</li> <li>• The affordable housing units must be transferred with tenure only after it has been ascertained that the beneficiaries do not own any other formal housing, or any not due to benefit from a similar scheme elsewhere.</li> </ul>	Contractor, ECO	As necessary

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Enhancement of Social Benefits	<ul style="list-style-type: none"> <li>• That the Ward 23 Councillor and other key stakeholders be made aware of the impact that the influx of new people could have on the area. They should also be made aware of the social impacts associated with the proposed development.</li> <li>• The Sustainability Institute in Cape Town or some other entity should be engaged to assist in training the new community to ensure that they change their lifestyle and hygienic patterns to bring them in line with those of people who now have access to formal housing.</li> </ul>	Dolveira Developments,	As necessary
Construction Phase	Enhancement of living standards	<ul style="list-style-type: none"> <li>• Unskilled job opportunities should be awarded to the people from local neighbouring areas. Even if Dolveira Developments uses a recruiting agency, the local ward councillor could assist during recruitment of labourers;</li> <li>• Equal opportunities for employment should be created to ensure that the local female and youth population also have access to these opportunities;</li> <li>• Individuals with the potential to develop their skills should be afforded training opportunities.</li> <li>• Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project;</li> <li>• Payment should comply with all applicable Labour legislation in terms of minimum wages and conditions of employment.</li> <li>• Where local labourers are employed on a more permanent basis, these labourers should be registered with the Unemployment Insurance Fund (UIF), Pay as You Earn (PAYE) or any other official bodies as required by law. This would enable the workers to claim UIF as a means of continuous financial support when the workers' positions on the construction itself have become redundant or once the construction phase comes to an end.</li> </ul>		

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Destruction of cultural or heritage resources	<ul style="list-style-type: none"> <li>• The proponent must ensure that an archaeologist inspects the footprint of each site. If a particular excavation has impacts on a heritage site, but cannot be shifted, mitigation measures, i.e. the controlled excavation of the site prior to development, must be implemented. Only a qualified Archaeologist can do this after obtaining a valid permit from the SAHRA or the relevant Gauteng Provincial Heritage Authority.</li> <li>• The same action holds true for any infrastructure development such as access corridors, construction campsites, etc.</li> <li>• Rock outcrops might contain rock shelters, engravings or stone walled settlements, and must, therefore, be avoided unless previously inspected by an archaeologist.</li> <li>• Archaeological material, by its very nature, occurs below ground. The proponent must, therefore, keep in mind that archaeological sites might be exposed during the construction work. If anything is noticed, work in that area must be stopped and the occurrence must immediately be reported to a museum, preferably one at which an archaeologist is available. The archaeologist must then investigate and evaluate the findings.</li> <li>• Any mitigation measures applied by an archaeologist, in the sense of excavation and documentation, must be published in order to bring this information into the public domain.</li> </ul>	Contractor, ECO	As necessary
Construction Phase	Waste reduction	Construction waste must be limited, and removed daily or weekly, as agreed with the ECO. No hazardous waste must be produced. An educational litter program must be introduced, which allows for the initial supply of suitable rubbish bins in the area, followed by a weekly supply of bags to all workers. Large waste containers could be provided for the dumping of larger refuse items. These must be cleared once a week.	Contractor, ELO	Once off or Monitor weekly

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Monitoring	Daily monitoring will be necessary during construction. The ECO will be responsible for this monitoring, which will entail auditing environmental performance against the mitigation actions recommended in this report. The monitoring of lateral spread of the construction will require monthly site visits by GDARD. An ELO must be appointed to monitor the situation with a more practical 'hands-on' approach. A supervisor must be appointed to monitor unauthorised movement of construction crew.	ECO, Contractor, ELO	Once off or Continuously
Operational Phase	Monitoring	Routine monitoring and bi-annual auditing will be necessary during the operational phase. The ECO will be responsible for this monitoring, which will entail auditing (twice yearly) environmental performance against the mitigation actions recommended in this report.	ECO, Contractor	Twice a year
	Groundwater contamination	Facilities for the disposal of hydrocarbon-based fuels and lubricants must be made available during maintenance activities.	ECO, Contractor	Once off or Continuously
	Ecological impacts	A re-vegetation exercise for all excavation trenches for the pylons must be undertaken with grasses that are indigenous to this study area (see the species list in Floral Assessment) to ensure that the ecosystem is restored, as closely as possible, to its initial state.	Contractor, ECO	As necessary after construction

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Operational Phase	Impacts on surface water and wetlands	<p><u>Altered hydrological regime of Crocodile River and Wetlands</u></p> <ul style="list-style-type: none"> <li>• In order to minimize artificially generated surface stormwater runoff, total sealing of paved areas such as parking lots, driveways, pavements and walkways should not be permitted. Permeable material should rather be utilized for these purposes (GDACE, 2009);</li> <li>• The crossing of natural drainage systems should be minimized and only constructed at the shortest possible route, perpendicular to the natural drainage system (GDACE, 2009);</li> <li>• Where possible, bridge crossings should span the entire stretch of the flood line or buffer zone (GDACE, 2009); and</li> <li>• Implement an ecologically-sensitive stormwater management plan that includes forbids directly discharge into the identified buffer zone of the watercourse and drainage lines and seepage wetland.</li> </ul> <p><u>Decreased biodiversity</u></p> <ul style="list-style-type: none"> <li>• Development should not encroach onto wetland or riparian areas or their associated buffer zones;</li> <li>• Disturbed wetland and riparian zones should be rehabilitated as a matter of priority;</li> <li>• Include a continuum of natural open spaces in the development layout that allows for linkages between wetland and riparian areas;</li> <li>• Smaller, intervening patches of surviving habitat can also serve as "stepping stones" that link fragmented ecosystems by ensuring that certain ecological processes are maintained within and between groups of habitat fragments;</li> <li>• Palisade fencing should be used to allow for the continued natural movement of fauna.</li> <li>• Provide landscaping guidelines that require that landscaping associated with the development include forage and host plants required by pollinators and other fauna.</li> </ul>	ECO, Contractor, ELO	Once off or Continuously

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Operational Phase	Impacts on surface water and aquatic biota	<p><u>Impacts on aquatic biota</u></p> <ul style="list-style-type: none"> <li>• The land-owner must apply to the relevant provincial conservation agency for a permit to stock yellowfish species in farm dams.</li> <li>• The dam or dams must be free of alien fish species.</li> <li>• The conservation agency will determine which species of yellowfish are native to the catchment area in which the dam is situated. A permit will then be issued listing the species that may be stocked and where they may be obtained.</li> <li>• Stocked fish should be caught by conservation agency staff from the nearest stream or river in the same catchment as the dam. If possible, approximately 100 juvenile fish of size 5-10cm or 20-30 larger fish of a size greater than 30cm should be stocked. It is imperative that fish are not moved from one river system to another for stocking purposes. The landowner should not catch fish for stocking unless authorized to do so by the conservation agency.</li> <li>• Where feasible, spawning areas should be created in dams to allow stocks to expand. The dam and streams feeding the dam should be managed in such a way as to facilitate favourable spawning habitat. Such a management plan should be drafted by a suitably qualified individual with specific expertise in yellowfish ecology.</li> <li>• A record of each stocking must be kept by the provincial conservation agency and it is essential that the co-ordinates of the dam being stocked are taken and retained for future reference purposes.</li> </ul>	ECO, Contractor, ELO	Once off or Continuously

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Operational Phase	Impacts on surface water and wetlands	<p><u>Surface water pollution</u></p> <ul style="list-style-type: none"> <li>• Maintenance vehicles are to be maintained in good working order, to reduce the probability of leakage of fuels and lubricants.</li> <li>• Storage of potentially hazardous materials must be above the 100-year flood line, or as agreed with the ECO. These materials include fuel, oil, Cement, bitumen, etc.</li> <li>• Sufficient care must be taken when handling these materials for maintenance work, to prevent pollution.</li> <li>• Surface water draining off contaminated areas containing oil and petrol must be channelled towards a sump which will separate these chemicals and oils.</li> <li>• Oil residue shall be treated with oil absorbent such as Drizit or similar and this material removed to an approved waste site.</li> <li>• All maintenance materials liable to spillage are to be stored in appropriate structures with impermeable flooring.</li> <li>• Portable chemical toilets are to be provided and maintained for maintenance crews, should long-term maintenance project commence. Maintenance must include their regular removal without sewage spillage.</li> </ul>	ECO, Contractor, ELO	Once off or Continuously

Phase of development	Impact/Issues	Action	Responsible party	Frequency of Action
Construction Phase	Sedimentation	<ul style="list-style-type: none"> <li>• Development within the study area should occur within the winter months where possible so as to decrease the runoff of sediment into the Muldersdrif se Loop during times of heavy rainfall;</li> <li>• Ensure that the proposed development makes use of a layout design that facilitates the management and attenuation of stormwater at the source;</li> <li>• Water use licences will be required in accordance with Section 21 of the National Water Act for any proposed upgrading of bridges, development within the designated floodlines and discharge of stormwater into the Muldersdrif se Loop; and</li> </ul>		
Operational Phase	Impacts on surface water and wetlands	<ul style="list-style-type: none"> <li>• At all times care must be taken not to contaminate surface water resources – Crocodile River, Wetlands and Dams on site.</li> <li>• In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately.</li> </ul> <p><u>Auditing and Compliance Monitoring</u></p> <p>The Section 21 Company managing the Estate must provide for bi-annual or 6-monthly monitoring of the water quality of the Crocodile River and selected dams and wetlands within the Estate.</p> <p>The results from the monitoring must form part of the Environmental Audit Report in order to determine the effectiveness of the mitigation measures in this EMP.</p>	ECO, Contractor, ELO	Every 6 months



Figure 1: Aerial photograph showing various sensitive locations on the site.

**SECTION 4: CONCLUSIONS AND RECOMMENDATIONS**

No aspect of the physical and biological environments, having conservation, scientific or educational value must be damaged or destroyed during the construction and operational phases of the proposed development. These goals can be achieved if the mitigation measures outlined in this document are applied to ameliorate negative impacts.

This Environmental Management Programme (EMP) must be used as an on-site reference document during all phases of this development, and auditing must take place in order to monitor compliance with the EMP. Parties responsible for transgression of this EMP must be held liable for any rehabilitation that may be required. Parties found liable for environmental degradation through irresponsible behaviour or negligence must receive penalties.

This report was prepared in terms of the well-recognised integrated environmental management principles and on the strengths of the information prepared at the time. If there are any queries please address them to:

Tholoana Consulting

PO Box 67302

BRYANSTON

2021

South Africa

Acceptance and Commitment to the EMP

\_\_\_\_\_ (Signature)

Name:

For Dolveira Developments (Pty) Ltd

Date:



**APPENDIX 2: MANAGEMENT OF TOPSOIL****Topsoil****Source of topsoil**

- i. Topsoil shall be striped from all areas that are to be utilised during the construction period and where permanent structures and access is required. These areas will include temporary and permanent access roads, construction camps, and lay down areas, pump sites, valve chambers, reservoir sites and borrow pits. Topsoil shall be stripped after clearing of woody vegetation and before excavation or construction commences.
- ii. The topsoil is regarded as the top 300mm of the soil profile irrespective of the fertility appearance, structure, agricultural potential, fertility and composition of the soil.

**Topsoil stripping**

- i. Soil shall be stripped to a minimum depth of 150mm and maximum depth of 300mm or to the depth of bedrock where soil is shallower than 300mm. Herbaceous vegetation, overlying grass and other fine organic matter shall not be removed from the stripped soil.
- ii. No topsoil which has been stripped shall be buried or in any other way be rendered unsuitable for further use by mixing with spoil or by compaction using machinery.
- iii. Topsoil shall preferably be stripped when it is in a dry condition in order to prevent compaction.

**Topsoil stockpiling**

- i. Stripped topsoil shall be stockpiled in areas, which have been approved, by the Electrical Engineer or Environmental Control Officer. Soil stockpiles may take the form of windrows.
- ii. Topsoil stripped from different soil zones shall be stockpiled separately and clearly identified as such. Under no circumstances shall topsoil obtained from different soil zones be mixed.
- iii. Soil stockpiles shall not be higher than 2.5m or stored for a period longer than one year. The slopes of soil stockpiles shall not be steeper than 1 vertical to 2.5 horizontal.
- iv. No vehicles shall be allowed access onto the stockpiles after they have been placed. Topsoil stockpiles shall be clearly demarcated in order to prevent vehicle access and for later identification when required.
- v. Soil stockpiles shall not be allowed to become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation in the soil.
- vi. After topsoil removal has been completed, the Contractor shall apply soil conservation measures to the stockpiles where and as directed by the Electrical Engineer or Environmental Control Officer. This may include the use of erosion control fabric or grass seeding.

**Topsoil replacement**

- i. Topsoil shall be replaced to a minimum depth of 75mm over all areas where it has been stripped and over disused borrow pits, after construction in those areas has Ceased. Topsoil placement shall follow as soon as construction in an area has Ceased.
- ii. All areas onto which topsoil is to be spread shall be graded to the approximate original landform with maximum slopes of 1:25 and shall be ripped prior to topsoil placement. The entire area shall be ripped parallel to the contours to a minimum depth of 300mm.
- iii. Topsoil shall be placed in the same soil zone from which it had been stripped. However, if there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil may be brought from other soil zones at the approval of the Electrical Engineer or Environmental Control Officer.
- iv. Where topsoil that has been stripped by the Contractor is insufficient to provide the minimum specified depth, the Contractor shall obtain suitable substitute material from other sources at no cost to the employer. The suitability of the substitute material shall be determined by means of soil analyse, which are acceptable to the Electrical Engineer or Environmental Control Officer.
- v. No vehicles shall be allowed access onto or through topsoil after it has been reinstated.
- vi. After topsoil reinstatement is complete, cleared and stockpiled vegetative matter shall be spread randomly by hand over the top soiled area.

**APPENDIX 3: RE-VEGETATION OF SELECTED AREAS**

- i. Areas where re-vegetation has not been successful after topsoil has been redistributed shall be hydro-seeded or hand spread with a seed mixture approved by the Environmental Control Officer. Seeding shall be carried out as soon as practicable during the growing season, after topsoil replacement is complete.
- ii. Flat or gently sloping (1:3) areas to be seeded shall be ripped in lines 300mm Centre to Centre and to a depth of at least 300mm parallel to the contours to alleviate soil compaction and to establish a seedbed suitable for the establishment of growth.
- iii. The Contractor shall work into the soil fertilizers at a rate and depth to be determined by the Environmental Control Officer, based on soil analyse. Fertilizers shall be spread evenly over the area to ensure uniform distribution.
- iv. Notwithstanding the fact that the Environmental Control Officer will determine the method of grassing, the type of grass seed used and the of application of seed, the Contractor shall be solely responsible for the cost of replanting or re-seeding where acceptable cover is not obtained.
- v. However, where in the opinion of the Contractor it is doubtful from the outset whether it will be possible to establish an acceptable cover, he may inform the Consulting Engineer or Environmental Control Officer of his reasons and the Consulting Engineer or Environmental Control Officer shall, if he agrees, either adopt another method of grassing or agree to accept whatever cover can be obtained, provided that all reasonable efforts have been made to establish a good cover using the method proposed. Any such agreement shall only be valid if given in writing by the Consulting Engineer or Environmental Control Officer.
- vi. Acceptable cover is defined as follows:

An acceptable grass cover shall mean that not less than 80% of the seeded area shall be covered with grass and that there shall be no bare patches of more than 500mm in maximum diameter.
- vii. The areas, which show no vegetation growth nine (9) months after completion of the rehabilitation work, will be ripped, additional topsoil spread and seeded with indigenous grass species at no additional cost to the proponent.
- viii. The following grass mix or a similar one approved by the Environmental Control Officer shall be used:

