



**KONGIWE**  
ENVIRONMENTAL SCIENCE & ENGINEERING

## Construction and Operation Environmental Management Plan (EMP):

**Basic Assessment Report for the Tanganani Bulk  
Water Supply Pipeline in Diepsloot, Gauteng  
Province.**

**28 June 2017**

**GDARD Ref No: GAUT 002/17-18/E2009**

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**Please consider the Environment before you print this document.**

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## DEFINITIONS AND TERMINOLOGY

**Alien species:** A species that is not indigenous to the area or out of its natural distribution range.

**Alternatives:** Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

**Assessment:** The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

**Biological diversity:** The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

**Commence:** The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

**Cumulative impacts:** Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

**Direct impacts:** Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

**'Do nothing' alternative:** The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

**Drainage line:** A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial and riparian vegetation may or may not be present.

**Ecosystem:** A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

**Endangered species:** Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

**Endemic:** An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

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

- i. the land, water and atmosphere of the earth;
- ii. micro-organisms, plant and animal life;
- iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

**Environmental Impact:** An action or series of actions that have an effect on the environment.

**Environmental impact assessment:** Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

**Environmental management:** Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

**Environmental management programme:** An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its on-going maintenance after implementation.

**Environmental assessment practitioner:** An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

**Habitat:** The place in which a species or ecological community occurs naturally.

**Hazardous waste:** Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (Van der Linde and Feris, 2010;pg 185).

**Indigenous:** All biological organisms that occurred naturally within the study area prior to 1800

**Indirect impacts:** Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

**Interested and Affected Party:** Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

**Perennial and non-perennial:** Perennial systems contain flowing or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contain flows for short periods, such as a few hours or days in the case of drainage lines

**Pollution:** A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

**Rare species:** Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

**Red data species:** Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

**Riparian:** the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

**Significant impact:** An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

**Waste:** is defined as (a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or (b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the

Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste—

- i. once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;
- ii. where approval is not required, once a waste is, or has been re-used, recycled or recovered;
- iii. where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or (iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

**Wetland:** land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin *et al.*, 1979).

**Watercourse:** as per the National Water Act means -

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

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## CHAPTER 1: PROJECT DETAILS

The Gauteng Department of Human Settlements (GDHS) intends to construct a 1km long bulk water pipeline and reservoir water tower to supply water to the approved Tanganani Extension 7 Residential Development, east of Diepsloot in the City of Johannesburg.

As part of the Reconstruction and Development Programme (RDP), all housing within the Tanganani Extension 7 Residential Development must have adequate sanitary facilities, storm-water drainage, and convenient access to clean water. It is understood that water will be pumped from the approved service reservoir to the proposed water tower, after which water will gravitate downwards into the bulk supply water pipeline. This pressurised municipal water will feed into the water supply network of the Tanganani Extension 7 Residential Development.

Table 1.1 below outlines the details relating to the location of the proposed pipeline to be constructed, as per the requirements of Appendix 1 of GN R 982 of the 2014 EIA Regulations (as amended, April 2017).

**Table 1: Project details**

SITE SPECIFIC DETAILS	DESCRIPTION/ DIMENSIONS	
<b>Location of the site (water pipeline)</b>	Portion 984 of the Farm Knopjeslaagte 385 JR, Portion 202 of the Farm Diepsloot 388 JR, Remaining Extent of Portion 31 of the Farm Diepsloot 388 JR, Portion 191 of the Farm Diepsloot 388 JR, Portion 19 of the Farm Diepsloot 388 JR, Remaining Extent of Portion 2 of the Farm Diepsloot 388 JR Portion 119 of the Farm Diepsloot 388 JR	
<b>Municipal Jurisdiction</b>	City of Johannesburg Metropolitan Municipality City of Tshwane Metropolitan Municipality	
<b>Ward number</b>	City of Johannesburg: Wards number 94, 113 and City of Tshwane: Ward number 106	
<b>SG Code</b>	TOJR00000000038500984 TOJR00000000038800202 TOJR00000000038800031 TOJR00000000038800191 TOJR00000000038800019 TOJR00000000038800002 TOJR00000000038800119	
<b>Nearest Town</b>	Diepsloot: Approximately 3.5km east of the water tower and pipeline.	
<b>Site Co-ordinates (point of the water pipeline)</b>	Longitude WGS 84 DMS	Latitude WGS 84 DMS
	28° 2' 42.405" E	25° 55' 50.250" S
	28° 2' 34.910" E	25° 55' 52.295" S



SITE SPECIFIC DETAILS	DESCRIPTION/ DIMENSIONS	
	28° 2' 20.705" E	25° 55' 50.564" S
	28° 2' 21.049" E	25° 55' 44.809" S
	28° 2' 13.093" E	25° 55' 50.503" S
	28° 1' 59.657" E	25° 55' 30.930" S
	28° 1' 42.741" E	25° 55' 1.776" S
<b>Site access</b>	The pipeline connects at Portion 984 of the Farm Knopjeslaagte 385-JR, situated along the R563 (Summit Road). The pipeline is aligned adjacent to the existing road and will follow the road in a northerly direction for 1km to terminates at the approved Tanganani Extension 7 mixed-use residential development.	

The proposed water pipeline has been assessed based on a corridor of disturbance, with a varying width of 30m – 100m to allow for unforeseen construction deviations, should these be required. The Proposed Project has been designed such that it has the least negative impact on the environment. Table 2 below outlines the necessary technical details relating to the project:

**Table 2: Project details**

PROJECT COMPONENT	TECHNICAL DETAIL
<b>BULK WATER SUPPLY PIPELINE</b>	
Development Footprint	30 000m <sup>2</sup>
Length of the pipe (m)	1 000 m
Diameter of the pipe (m)	0.355 m
Peak Throughput (L/s)	Designed for 67 litres per second, with a maximum of 90 litres per second.
Class of High density polyethelene (HDPE) piping	PN16
Excavated depth for the pipeline	~ 1 to 1.5m
Excavated width for the pipeline	~ 1.2m

In terms of the 2014 Environmental Impact Assessment (EIA) Regulations, as amended in April 2017, published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), The Gauteng Department of Human Settlements (GDHS) requires environmental authorisation for the construction, operation and maintenance of the **Tanganani Extension 7 bulk supply water pipeline** (hereon referred to as the “Proposed Project”). In accordance with the EIA Regulations of 2014, as read with the Government Notice (GN) R982, a Basic Assessment process is triggered by the Proposed Project.

The nature and extent of the bulk project, and the potential environmental impacts associated with the construction and operation phases trigger the following listed activities:

**Table 3: Relevant listed activities triggered by the proposed project in terms of the amended EIA 2014 Regulations.**

LISTING NOTICE	ACTIVITY	ACTIVITY DESCRIPTION	RELEVANT PROJECT COMPONENT
Listing Notice 1	Activity 12	<i>The development of dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or infrastructure or structures with a physical footprint of 100 square metres or more; where the development occurs within a watercourse; in front of a development setback; or if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse</i>	Tanganani Extension 7 Bulk Supply Water Pipeline
Notice 1	Activity 19	<i>The infilling or depositing of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse</i>	The excavation and backfilling of the pipeline.
Notice 3	Activity 14	<i>The development in Gauteng within sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or bioregional plans of –  (ii) infrastructure or structures with a physical footprint of 10 square meters or more  Where such development occurs –  (a) Within a watercourse (c) if no development setback exists, within 32 meters of a watercourse, measured from the edge of the watercourse</i>	The construction of the pipeline with a segment crossing a wetland.

This project has been registered with the GDARD through submission of an online application for Environmental Authorisation (**Reference No: GAUT 002/17-18/E2019**). Table 0-2 below includes details of the activity description, the site, area and property description, the public participation process, the impact assessment, and the recommendations of the EAP.

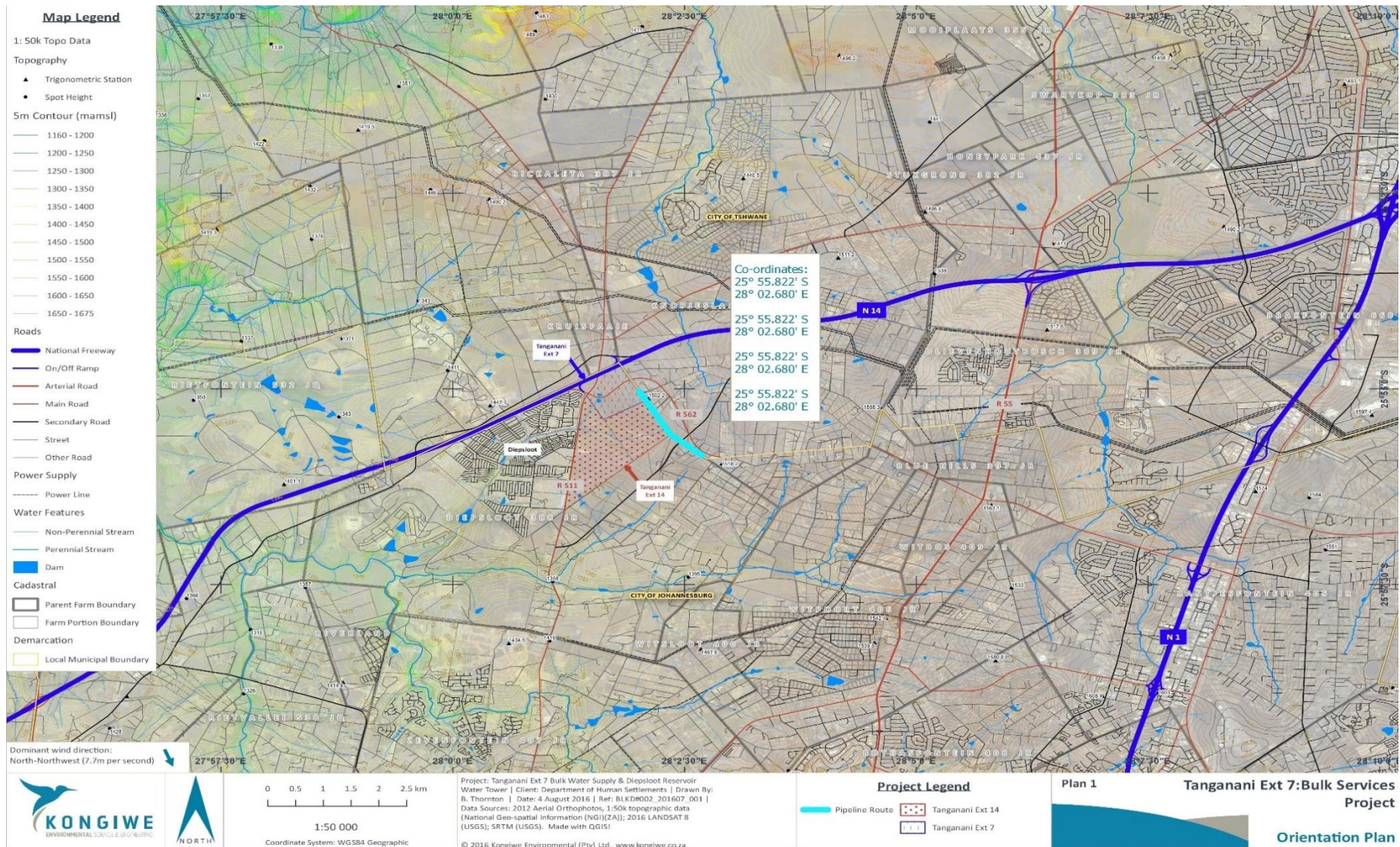


Figure 1: Locality Map showing the location and co-ordinate points of the 1km long bulk water supply pipeline.

## CHAPTER 2: OBJECTIVE OF THIS EMP

An Environmental Management Plan (EMP) can be defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced”. EMPs are therefore important tools for ensuring that the management actions arising from Environmental Impact Assessment (EIA) processes are clearly defined and implemented through all phases of the project life-cycle. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project<sup>1</sup>. The overall purpose of the guideline is twofold: to inform and guide the preparation and implementation of EMPs in a manner that promotes the effectiveness of EMPs; and to assist authorities and other reviewers in objectively evaluating the quality of EMPs.

This EMP has been developed as a set of environmental specifications, i.e. principles of environmental management for the proposed bulk water supply pipeline, which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

The EMP has the following objectives<sup>2</sup>:

- ❖ To outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the project.
- ❖ To ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- ❖ To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- ❖ To propose mechanisms for monitoring compliance, and preventing long-term or permanent environmental degradation.
- ❖ To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the EIA process.

This EMP for construction activities has been compiled in accordance with the EIA Regulations of December 2014 (as amended, 2017) and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. This EMP should be considered a dynamic document, requiring regular review and updating as new information becomes available in order for it to remain relevant to the requirements of the site and the environment. The mitigation measures identified

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1 Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: Guideline for Environmental Management Plans, 2005: [https://www.westerncape.gov.za/Text/2005/7/deadp\\_emp\\_guideline\\_june05\\_5.pdf](https://www.westerncape.gov.za/Text/2005/7/deadp_emp_guideline_june05_5.pdf)

2 Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: Guideline for Environmental Management Plans, 2005

within the Environmental Impact Assessment process are systematically addressed in the EMP, ensuring the minimisation of adverse environmental impacts to an acceptable level.

## **2.1. Roles and Responsibilities**

It is the responsibility of the Applicant and respectfully appointed contractors to implement the requirements of any and all environmental authorisations and any other permits (once issued), and obligations emanating from other relevant environmental legislation. This obligation will largely be met through the development of this EMP, and the implementation of this EMP through its integration into the contract documentation for activities associated with both construction and operation. Since this EMP is part of the BAR process undertaken for the project, it is important that this guideline document be read in conjunction with the draft Basic Assessment Report.

To ensure environmental compliance with this EMP, the appointed contractor will be responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications.

**Kongwe Environmental (Pty) Ltd** recommend that the contractor fulfil the following obligations:

- ❖ Ensuring that employees have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- ❖ Ensuring that a copy of the EMP is readily available on-site and that all site staff is aware of the location and has access to the document. Employees must be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- ❖ Ensure that the Environmental Control Officer (ECO) has basic training in the identification of archaeological sites/objects, and protected or Red List flora and fauna, should they be encountered on the site.
- ❖ Awareness of any other environmental matters, which are deemed to be necessary by the ECO.

## CHAPTER 3: STRUCTURE AND CONTENT OF THIS EMPR

The first two chapters of this EMP provided background to the EMP and the proposed project. The chapters which follow consider the:

- ❖ Construction activities; and
- ❖ Operation activities.

These chapters set out the procedures necessary for the environmental management during the construction and operation, as well as maintenance of the bulk water supply pipeline. The EMP is designed in such a way as to be as easily interpreted in order to achieve environmental compliance. Since the EMP is considered a dynamic document, objectives and EMP tables to follow below are required to be reviewed and possibly modified whenever changes, such as the following, occur:

- ❖ Planned activities change (i.e. in terms of the components of the facility).
- ❖ Modification to or addition to environmental objectives and targets.
- ❖ Additional or unforeseen environmental impacts are identified.
- ❖ Relevant legal or other requirements are changed or introduced.
- ❖ Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

The EMP tables for construction and operational impact management will consider the following:

1. Description of the **objective**, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies;
2. A list of the applicable **project component/s** affecting the objective above;
3. Brief description of **potential environmental impact** if objective is not met;
4. Description of **activities / Risk source** which could impact on achieving objective;
5. Description of the **mitigation target**; include the most applicable quantitative measures and/or dates of completion;
6. A list of **specific action(s)** required to meet the objective described above;
7. The **person responsible** for implementing the proposed mitigation measures; and,
8. The **timeframe** for the implementation of the mitigation measures
9. **Monitoring requirements**

For each aspect of the activity, an over-arching environmental **goal** is stated. To meet this goal, a number of **objectives** are listed. The management plan has been structured in table format in an attempt to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions monitoring requirements and performance indicators.

The information provided within the EMP table for each objective is illustrated below:

**Table 4: EMP Table Template.**

CONSTRUCTION AND OPERATION PHASE		
OBJECTIVE :		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
MITIGATION TARGET		
TYPICAL MITIGATION MEASURES	RESPONSIBILITY/RESPONSIBLE PERSON	TIMEFRAME
MONITORING REQUIREMENTS		

### 3.1. Details of the Kongiwe Project Team

The following members of Kongiwe Environmental core team are responsible for the compilation of this EMP.

**Table 5: EAP team members.**

TEAM MEMBER	ROLE OF EACH TEAM MEMBER
Bradly Thornton	Director; High-level project management
Gerlinde Wilreker	Environmental Project Manager
Ashleigh Blackwell	Environmental Assessment Practitioner
Nokuthula Ndala	GIS Consultant
Michael Hennessy	Environmental Lawyer

## CHAPTER 4: MANAGEMENT PLAN FOR CONSTRUCTION AND OPERATIONAL PHASE IMPACTS

### 4.1. Pre-Construction Management Measures

**Overall Goal:** undertake pre-construction activities (planning and design phase) in a way that:

- ❖ The design of the pipeline responds to the identified environmental constraints and opportunities to ensure that the construction activities will be undertaken without significant disruption to other land uses and activities in the area;
- ❖ Ensures that adequate regard has been taken of any landowner and community concerns in terms of what is required by law; and
- ❖ To ensure that all pre-construction activities are undertaken in accordance with all relevant legislative requirements.

#### Objective 1: Effective Communication Mechanism

PRE-CONSTRUCTION PHASE		
<b>OBJECTIVE :</b>		
On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the activity. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
❖ The bulk water supply pipeline	❖ Impacts on affected and surrounding landowners and land uses.	❖ Activities associated with construction of the bulk water supply pipeline .
<b>MITIGATION TARGET</b>		
❖ Effective communication with affected and surrounding landowners. ❖ Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.		
TYPICAL MITIGATION MEASURES	RESPONSIBILITY/RESPONSIBLE PERSON	TIMEFRAME



❖ The applicant is to compile and implement a grievance mechanism procedure for the public. This will be implemented during both the construction and operational phases of the project. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues. This procedure should be in line with the South African Labour Law.	❖ Project Applicant ❖ Contractor	❖ Pre-Construction
❖ Liaison with landowners is to be undertaken prior to the commencement of construction. This is to be in accordance with the EIA regulations of 2014.	❖ Contractor ❖ ECO	❖ Pre-Construction
<b>MONITORING REQUIREMENTS</b>		
❖ An incident reporting system should be used to record non-conformances to the EMP.		
❖ Public complaints register must be developed and maintained.		

## 4.2. Construction and Operational Management Measures

**Overall Goal:** Undertake the construction and operational phase in a way that:

- ❖ To ensure that the construction and operation activities are properly managed in respect of environmental aspects and impacts, and that the construction and operation activities will be implemented without significant disruption to other land uses and activities in the area.
- ❖ Minimises the impact on any remaining indigenous natural vegetation and habitats of ecological value.
- ❖ Minimises the impact on heritage site should they be uncovered.

Both the Gauteng Department of Human Settlements and Johannesburg Water must ensure that the construction of the bulk water supply pipeline complies with the requirements of any and all environmental authorisations, as well as any obligations emanating from other relevant environmental legislation. The obligations of the Applicant will be met through the development of the EMP, and the implementation of the EMP through its integration into the relevant contract documentation.

### Objective 1: Limit the development footprint to minimise impacts on fauna and flora

CONSTRUCTION AND OPERATION PHASE		
OBJECTIVE :		
In order to minimise impacts on flora, fauna and ecological processes, the development footprint should be limited.		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
❖ The bulk water supply pipeline	❖ Impacts on natural vegetation and habitats	❖ Site preparation and earthworks

	<ul style="list-style-type: none"> <li>❖ Impacts on soil</li> <li>❖ Loss of topsoil</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction of the bulk water supply pipeline</li> <li>❖ Stockpiling of topsoil, subsoil and spoil material during excavation</li> </ul>
<b>MITIGATION TARGET</b>		
<ul style="list-style-type: none"> <li>❖ To minimise footprints of disturbance of vegetation/habitats on-site and in surrounding areas.</li> <li>❖ Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas.</li> </ul>		
<b>TYPICAL MITIGATION MEASURES</b>	<b>RESPONSIBILITY/RESPONSIBLE PERSON</b>	<b>TIMEFRAME</b>
<ul style="list-style-type: none"> <li>❖ Construction and operation activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Project Applicant</li> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction site establishment and duration of the contract</li> </ul>
<ul style="list-style-type: none"> <li>❖ A pre-construction ecological walkthrough should be conducted.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Ecologist</li> </ul>	<ul style="list-style-type: none"> <li>❖ Pre-Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ All alien plants present at the site should be controlled annually using the best practice methods for the species present.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ An Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities (should this be required) to ensure the correct demarcation of no-go areas (should these be identified).</li> </ul>	<ul style="list-style-type: none"> <li>❖ ECO</li> <li>❖ Contractor</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ Rehabilitate any disturbed areas immediately after construction in that area is complete to stabilise landscapes.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ Soil disturbance and vegetation clearing should be kept to minimum.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ Soil disturbance should be kept to a minimum and erosion controlled.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ No fuelwood collection should be allowed on-site and no fires should be allowed within the site.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ The intentional harming or killing of animals will be prohibited through on-site supervision and worksite rules.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<b>MONITORING REQUIREMENTS</b>		
<ul style="list-style-type: none"> <li>❖ Ad hoc bi-monthly site compliance inspections by and ECO will be sufficient to ensure the compliance of the project.</li> </ul>		

- ❖ An incident reporting system must be used to record non-conformances to the EMP.
- ❖ Monitoring of alien plant establishment within the project development footprint
- ❖ Recording faunal fatalities to monitor success of relocation efforts

## Objective 2: Ensure appropriate traffic management

CONSTRUCTION AND OPERATION PHASE		
<b>OBJECTIVE :</b>		
Construction and operation activities may result in impacts on road users, especially along Summit road. Appropriate traffic management measures must be implemented to ensure the safety of road users		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
<ul style="list-style-type: none"> <li>❖ The bulk water supply pipeline</li> <li>❖ R562 (Summit Road) as an access road</li> </ul>	<ul style="list-style-type: none"> <li>❖ Impact on traffic movement</li> <li>❖ Impact on road user safety</li> </ul>	<ul style="list-style-type: none"> <li>❖ Transportation of staff to site</li> <li>❖ Transportation of construction material to, and from site</li> </ul>
<b>MITIGATION TARGET</b>		
<ul style="list-style-type: none"> <li>❖ Minimise impact on traffic movements.</li> <li>❖ As far as possible, ensure safety of road users.</li> </ul>		
TYPICAL MITIGATION MEASURES	RESPONSIBILITY/RESPONSIBLE PERSON	TIMEFRAME
<ul style="list-style-type: none"> <li>❖ Signage must be established at appropriate points warning of turning traffic and the construction site, identifying speed limits, travel restrictions, and other standard traffic control information. All signage to be in accordance with prescribed standards and must be appropriately maintained for the duration of the construction period.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Project Applicant</li> <li>❖ Contractor</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ A designated access route to the construction areas should be used at all times, no vehicles are permitted to stray from the approved access route.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<b>MONITORING REQUIREMENTS</b>		
<ul style="list-style-type: none"> <li>❖ An incident reporting system must be used to record non-conformances to the EMP.</li> <li>❖ Contractor must monitor indicators listed above to ensure that they have been implemented.</li> <li>❖ The Applicant must develop a complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where</li> </ul>		

appropriate, acted upon.

- ❖ An incident reporting system must be used to record non-conformances to the EMP.

### **Objective 3: Appropriate handling of potential waste generated at the site**

CONSTRUCTION PHASE		
<b>OBJECTIVE :</b>		
The construction phase of the proposed project may produce a small amount of domestic waste (litter) and other general solid waste including rubble. Since haulage vehicles and machinery will be petrol and diesel operated, trace amount of hydrocarbons may be leaked during the construction activities.		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
<ul style="list-style-type: none"> <li>❖ The bulk water supply pipeline</li> <li>❖ Diesel machinery and haulage vehicles</li> </ul>	<ul style="list-style-type: none"> <li>❖ The release of small amounts of diesel and petrol hydrocarbons from leaking vehicles and machinery.</li> <li>❖ Litter or contamination of the site or water through poor waste management practices.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Vehicles associated with site preparation and earthworks</li> <li>❖ Packaging and other construction wastes.</li> <li>❖ Hydrocarbon leakage from vehicles and machinery.</li> <li>❖ Spoil material from excavation, earthworks and site preparation for the excavated trench</li> </ul>
MITIGATION TARGET		
<ul style="list-style-type: none"> <li>❖ To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons.</li> <li>❖ To ensure that the maintenance of machinery on-site does not cause pollution of the environment or harm to persons.</li> <li>❖ To comply with waste management legislation.</li> <li>❖ To minimise production of waste.</li> <li>❖ To ensure appropriate waste storage and disposal.</li> <li>❖ To avoid environmental harm from waste disposal.</li> </ul>		
TYPICAL MITIGATION MEASURES	RESPONSIBILITY/RESPONSIBLE PERSON	TIMEFRAME
<ul style="list-style-type: none"> <li>❖ Any spills must receive the necessary clean-up action. If required, bioremediation kits are to be kept on-site and used to remediate any spills that may occur.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>

or oils.		
❖ Construction contractor must provide specific detailed waste management plans to deal with all waste streams.	❖ Contractor ❖ ECO	❖ Construction
❖ Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	❖ Contractor ❖ ECO	❖ Construction
❖ Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.).	❖ Contractor	❖ Construction
❖ Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	❖ Contractor ❖ ECO	❖ Construction
❖ Construction equipment (haulage vehicles and machinery) must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised	❖ Contractor	❖ Construction
❖ Any spilled cement or concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	❖ Contractor ❖ ECO	❖ Construction
❖ In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	❖ Contractor ❖ ECO	❖ Construction
❖ Upon the completion of construction, the area must be cleared of potentially polluting materials.	❖ Contractor ❖ ECO	❖ Construction

MONITORING REQUIREMENTS
<ul style="list-style-type: none"> <li>❖ An incident reporting system must be used to record non-conformances to the EMP.</li> <li>❖ Contractor must monitor indicators listed above to ensure that they have been implemented.</li> <li>❖ Observation and supervision of handling practices and vehicle maintenance throughout construction phase</li> <li>❖ Waste collection to be monitored on a regular basis.</li> </ul>

#### **Objective 4: Management of dust and emissions to air**

CONSTRUCTION AND OPERATION PHASE		
<b>OBJECTIVE :</b> The movement of haulage vehicles on the public and private access roads during construction and operation of the bulk water supply pipeline will result in dust emissions. Limited gaseous or particulate emissions are anticipated from exhaust emissions from diesel-operated equipment on-site and heavy-duty haulage vehicles that will access site.		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
<ul style="list-style-type: none"> <li>❖ The bulk water supply pipeline</li> <li>❖ Vehicles carrying project components</li> </ul>	<ul style="list-style-type: none"> <li>❖ Dust and particulates from exposed areas and vehicle movement onsite.</li> <li>❖ Release of minor amounts of air pollutants (for example NO<sub>2</sub>, CO and SO<sub>2</sub>) from haulage vehicles and on-site operation equipment.</li> <li>❖ Potential impact on site personnel and other land users within 1km radius of the site.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Fugitive dust from areas cleared of vegetation and due to vehicle movement on site.</li> <li>❖ Atmospheric exhaust emissions.</li> </ul>
<b>MITIGATION TARGET</b>		
<ul style="list-style-type: none"> <li>❖ To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase.</li> <li>❖ To ensure appropriate management of exposed areas and gravel road surfaces to minimise dust emissions.</li> <li>❖ To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the operation phase.</li> </ul>		
TYPICAL MITIGATION MEASURES	RESPONSIBILITY/RESPONSIBLE PERSON	TIMEFRAME
<ul style="list-style-type: none"> <li>❖ Ensure all vehicles are roadworthy, drivers are qualified and are made aware of the potential noise and dust issues.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>
<ul style="list-style-type: none"> <li>❖ Cover loads must be placed on vehicles carrying dusty construction materials.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>

❖ Vehicles which are emitting volumes of smoke should be taken for maintenance immediately.	❖ Contractor	❖ Construction
❖ An appropriate dust suppressant must be applied on all exposed areas as required to minimise/control airborne dust.	❖ Contractor	❖ Construction
❖ Efforts must be made to employ and train local staff, as well as source materials for construction from local businesses where appropriate.	❖ Contractor	❖ Construction
MONITORING REQUIREMENTS		
<ul style="list-style-type: none"> <li>❖ Visual monthly inspections of dust generated by activities throughout the construction phase.</li> <li>❖ Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the contractor.</li> <li>❖ A complaints register must be maintained, in which any complaints from residents/the community will be logged. Complaints must be investigated and, where appropriate, acted upon.</li> <li>❖ An incident reporting system must be used to record non-conformances to the EMP.</li> </ul>		

## Objective 5: Protection of Heritage Resources

CONSTRUCTION AND OPERATION PHASE		
<p><b>OBJECTIVE :</b> The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. Excavations for foundations will damage archaeological sites, as will road construction activities. No heritage resources are expected to occur on site, this objective has been stated as a pre-cautionary measure.</p>		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
❖ The bulk water supply pipeline	❖ Heritage objects or artefacts found on site are inappropriately managed or destroyed	<ul style="list-style-type: none"> <li>❖ Site preparation and earthworks</li> <li>❖ Foundations or plant equipment installation</li> <li>❖ Mobile construction equipment movement on site</li> </ul>
MITIGATION TARGET		
❖ To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation		
TYPICAL MITIGATION MEASURES	RESPONSIBILITY/RESPONSIBLE PERSON	TIMEFRAME
❖ If a heritage object is found, work in within the immediate area must be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ All staff and all personal</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> <li>❖ Duration of the contract</li> </ul>

authority (SAHRA) of the item/site, and undertake due/required processes.		
❖ Alignment should be altered to avoid the graves, and give them sufficient berth that they are not negatively impacted by excavation work, or by increased traffic resulting from construction	❖ Contractor ❖ Applicant	❖ Pre- Construction ❖ Design
❖ Graves be fenced off, with the fence situated at least 5m from the graves	❖ Contractor	❖ Pre-Construction ❖ Construction
❖ There should be a gate in the fence to allow access to the graves by family members.	❖ Contractor	❖ Pre-Construction ❖ Construction
❖ Pipeline alignment should be moved at least 15m from the fenced off graves, providing a buffer of 20m total around the graves.	❖ Contractor ❖ Applicant	❖ Pre- Construction ❖ Design
❖ Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	❖ Contractor ❖ All staff and all personal	❖ Construction ❖ Duration of the contract
❖ Should any heritage remains be exposed during excavations, these must be immediately reported to the Provincial Heritage Resource Authority of the Gauteng Province, in terms of the national Heritage Resources Act (Act No. 25 of 1999). Heritage remains uncovered or disturbed during earthworks may not be disturbed further until the necessary guidance and approval have been obtained from the relevant Heritage Authority.	❖ Contractor ❖ All staff and all personal	❖ Construction ❖ Duration of the contract
<b>MONITORING REQUIREMENTS</b>		
❖ Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported.		
❖ An incident reporting system must be used to record non-conformances to the EMP.		



**Objective 6: Maximise local employment and business opportunities during construction**

CONSTRUCTION AND OPERATION PHASE		
<b>OBJECTIVE :</b>		
Although limited, employment opportunities could be created during the construction phase, specifically for semi-skilled and unskilled workers. Employment of locals and the involvement of local SMMEs would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
❖ Construction and installation of the bulk water supply pipeline	❖ The opportunities and benefits associated with the creation of local employment and business	❖ Contractors who utilise their own labour for unskilled tasks will reduce the employment and business opportunities for locals. ❖ The inflow of various specialists from outside the study area. ❖ Sourcing of individuals with skills similar to the local labour pool outside the municipal area.
<b>MITIGATION TARGET</b>		
❖ Employment of a maximum number of low-skilled to semi-skilled workers for the project from the local area where possible.		
TYPICAL MITIGATION MEASURES	RESPONSIBILITY/RESPONSIBLE PERSON	TIMEFRAME
❖ Attempt to ensure that low-skilled workers are sourced from the local area	❖ Contractor ❖ Local Municipality	❖ Construction
❖ An equitable process should be promoted whereby locals and previously disadvantaged individuals (including women) are considered for employment opportunities.	❖ Contractor	❖ Construction
❖ Create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMMEs during the construction process	❖ Local Municipality ❖ Contractor	❖ Construction
❖ Communication efforts concerning job creation opportunities should refrain from creating unrealistic expectations.	❖ Contractor	❖ Construction
<b>MONITORING REQUIREMENTS</b>		

❖ Developer and or appointed ECO must ensure that the measures listed above have been met for the construction phase

**Objective 7: Minimise loss of wetland habitat and ecological structure during construction.**

CONSTRUCTION AND OPERATION PHASE		
OBJECTIVE :		
Minimise the loss of wetland habitat and ecological structure during the construction and operation of the pipeline. A 30m – 100m buffer area will be established around the upper reaches of the wetland.		
APPLICABLE PROJECT COMPONENT/S	POTENTIAL IMPACT	ACTIVITY SOURCE OF RISK
<ul style="list-style-type: none"> <li>❖ Construction and installation of the bulk water supply pipeline</li> <li>❖ Excavation for trenches ~ 1 – 1,5m deep.</li> </ul>	<ul style="list-style-type: none"> <li>❖ The opportunities and benefits associated with the creation of local employment and business</li> </ul>	<ul style="list-style-type: none"> <li>❖ Although the upper reaches of the wetland have been transformed, construction could alter the landscape and influence the drainage processes on the site. This in turn, will influence the drainage and status of the wetland area.</li> <li>❖ Loss of habitat and displacement of Giant Bullfrogs recorded on site</li> <li>❖ Exposure of the site to alien and invasive vegetation; and</li> <li>❖ Erosion of the soil surface due to excavation and surface vegetation being removed, this results in exposed soil conditions susceptible to erosion</li> </ul>
MITIGATION TARGET		
<ul style="list-style-type: none"> <li>❖ Loss of wetland habitat and ecological structure minimised during construction.</li> <li>❖ As far as possible potential displacement of Giant Bullfrogs must be minimised</li> <li>❖ Potential for clean-up of the existing environment, with regards to illegal dumping, at the upper reaches of the site</li> </ul>		
TYPICAL MITIGATION MEASURES	RESPONSIBILITY/RESPONSIBLE PERSON	TIMEFRAME
<ul style="list-style-type: none"> <li>❖ Where the wetland crosses the upper reaches of the wetland, and effective buffer must be implemented. A buffer of 30m – 100m will be implemented.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Contractor</li> <li>❖ ECO</li> </ul>	<ul style="list-style-type: none"> <li>❖ Construction</li> </ul>

❖ The relevant approvals must be obtained from the Department of Water and Sanitation (DWS) for any activities within wetland areas and their associated buffers. In this regard special mention is made of a General Authorisation in terms of section 21 (c) and (i) of the National Water Act (NWA).	❖ Applicant	❖ Prior to Construction
❖ Permit only essential construction personnel within 32m of the wetland habitat.	❖ Contractor	❖ Construction
❖ Keep all demarcated sensitive zones outside of the construction area off limits during the construction phase of the development.	❖ Contractor	❖ Construction
❖ Do not leave soil surfaces open to erosion for lengthy time periods.	❖ Contractor	❖ Construction
❖ Time construction as far as possible so that construction takes place outside the rainy seasons, thus reducing opportunities for erosion from rainfall events.	❖	❖
❖ Do not allow vehicles to indiscriminately drive through wetland zones and ensure that all access paths are marked and all other areas are marked as out of bounds.	❖ Contractor ❖ ECO	❖ Construction
❖ Prevent run-off from work areas entering wetland habitats.	❖ Contractor	❖ Construction
❖ Implement waste management as contemplated in the EMPr in order to prevent construction related waste from entering the wetland environment	❖ Contractor	❖ Construction
❖ The construction servitude needs to be kept to a minimum width to limit vegetation destruction, and needs to be clearly demarcated in the field. Ideally the construction disturbance	❖ Contractor	❖ Construction

<p>footprint should be kept to an area no wider than 5 m. No activities should be allowed outside the construction servitude.</p>		
<p>❖ All materials stockpiles and construction camps should be located outside wetland areas.</p>	<p>❖ Contractor</p>	<p>❖ Construction</p>
<p>❖ The areas where vegetation is destroyed and disturbed will however need to be monitored against invasion by alien vegetation and, if encountered, will need to be removed. If natural re-vegetation is unsuccessful, seeding and planting of the area will need to be implemented in consultation with an appropriate wetland vegetation specialist.</p>	<p>❖ Contractor</p>	<p>❖ Construction</p>
<p>❖ Excavated soils will need to be replaced in the same order as excavated from the trench, i.e. sub-soil must be replaced first and topsoil must be replaced last. This will maximise opportunity for re-vegetation of disturbed areas.</p>	<p>❖ Contractor</p>	<p>❖ Construction</p>
<p>❖ Excavation of the trench should only take place immediately before placement of the pipe. Ideally the trench should not remain open for longer than 7 days</p>	<p>❖ Contractor</p>	<p>❖ Construction</p>
<p>❖ Excavated soils should be stockpiled on the upslope side of the excavated trench so that eroded sediments off the stockpile are washed back into the trench.</p>	<p>❖ Contractor</p>	<p>❖ Construction</p>
<p>❖ Concentration and accumulation of flows along the servitude should be prevented by regularly providing for surface runoff to flow into the adjacent grassland rather than along the construction servitude and into the wetlands.</p>	<p>❖ Contractor</p>	<p>❖ Construction</p>

❖ Closure and rehabilitation of the pipeline servitude should commence as soon as the pipeline has been laid in the trench.	❖ Contractor	❖ Construction
❖ Soils should be landscaped to the natural landscape profile with care taken to ensure that no preferential flow paths or berms remain	❖ Contractor	❖ Construction
❖ Trench breakers must be installed along the pipeline trench. A material with low hydrological conductivity (a Bentonite mix is recommended), in the form of trench breakers should be packed around the pipe and should be installed at regular intervals to prevent the pipeline behaving as a conduit and to intercept any concentrated flow down the pipeline route. Spacing between trench breakers should vary depending on the slope of the landscape – the steeper the slope the smaller the distance between trench breakers. Spacing should be such that flows backing up behind one trench breaker extend back to the base of the previous trench breaker.	❖ Contractor	❖ Construction
❖ It is recommended that all invasive alien vegetation be cleared from site following the completion of construction activities, with follow up clearing being undertaken after 6 months.	❖ Contractor	❖ Construction
❖ Institute environmental best practice guidelines as per the DWA Integrated Environmental Management Series for Construction Activities.	❖ Contractor	❖ Construction
❖ Limit quantities of hazardous substances on site to the volumes used during 1 days' work.	❖ Contractor	❖ Construction

❖ All soil contaminated due to leaks or spills should be remediated on site. If this is not possible, such contaminated soils must be disposed of in a suitable waste facility.	❖ Contractor	❖ Construction
❖ Waste should be stored on site in clearly marked containers in a demarcated area. All waste material should be removed at the end of every working day to designated waste facilities at the main construction camp/suitable waste disposal facility. All waste must be disposed of offsite.	❖ Contractor	❖ Construction
❖ A walk through survey should be undertaken long the entire pipeline route 6 months after completion of construction activities and then again at yearly intervals to survey for signs of subsidence along the pipeline route. Any subsidence should be immediately repaired	❖ Contractor ❖ Ecologist	❖ Construction
❖ Any damage/erosion caused by pipe failure must be repaired immediately following the event	❖ Contractor	❖ Construction
<b>MONITORING REQUIREMENTS</b>		
<ul style="list-style-type: none"> <li>❖ Regular inspections and maintenance of the pipeline must be undertaken during the operational phase, with any leaks repaired immediately.</li> <li>❖ Inspection to be undertaken of affected wetland area at completion of construction activities within the wetland, and after 6 months;</li> <li>❖ Inspections to be undertaken by wetland specialist or suitably qualified ecologist;</li> <li>❖ Inspection to focus on erosion, revegetation and alien vegetation; and</li> <li>❖ All recommendations from the monitoring report to be implemented.</li> </ul>		

## CHAPTER 5: DETAILING METHOD STATEMENT

### 5.1. Project role players and responsibility matrix

In order for the EMP to be successfully implemented, all the role players involved in the project need to co-operate. For this to happen, role players must clearly understand their roles and responsibilities in the project, must be professional, form respectful and transparent relationships, and maintain open lines of communication.

RESPONSIBLE PERSON	ROLE / RESPONSIBILITY
Applicant / Developer	The Applicant is accountable for ensuring compliance to the EMP and conditions contained in the Environmental Authorisation (EA). The ECO must be contracted by the Applicant as an independent appointment to objectively monitor the implementation of relevant environmental legislation, conditions of Environmental Authorisations (EA's), and the EMP for the project. The developer is further responsible for providing and giving mandate to enable the ECO to perform responsibilities. The developer must ensure that the ECO is integrated as part of the project team.
Contractor	The principle contractor, hereafter known as the 'Contractor', is responsible for implementation and compliance with the requirements of the EMP and conditions of the EA's, contract and relevant environmental legislation. The Contractor must ensure that all sub-contractors have a copy of and are fully aware of the content and requirements of this EMP. The contractor is required, where specified, to provide Method Statements setting out in detail how the management actions contained in the EMP will be implemented.
Site Manager	The Site Manager has over-all responsibility for managing the project, contractors, and consultants and for ensuring that the environmental management requirements are met. All decisions regarding environmental procedures must be approved by the Site Manager. The Site Manager has the authority to stop any construction activity in contravention of the EMP in accordance with an agreed warning procedure.
Environmental Control Officer (ECO)	<p>The ECO will objectively monitor implementation of relevant environmental legislation, conditions of Environmental Authorisations (EA's), and the EMP for the project. The ECO must be on site prior to any site establishment and must endeavour to form an integral part of the project team. Furthermore, the ECO must be proactive and have access to specialist expertise as and when required, these include botanists, ecologists, etc. Typically, the appointed ECO must also have access to expertise such as game capture, snake catching, etc.</p> <p>The duty of the ECO is to conduct audits on compliance to relevant environmental legislation, conditions of EA, and the EMP for the bulk water supply pipeline project. The size and sensitivity of the development, based on the BAR, will determine the frequency at which the ECO will be required to conduct audits.</p>
Competent Authority	The Competent authority is the relevant environmental department that has issued the Environmental Authorisation. The Competent authority is responsible for ensuring that the monitoring of the EMP and other authorisation documentation is carried out, this will be achieved by reviewing audit reports submitted by the ECO and conducting regular site visits.

Other Authority	Other authorities are those that may be involved in the approval process of an EMP. Their involvement may include reviewing EMP's to ensure the accuracy of the information relevant to their specific mandate. Other authorities may be involved in the development, review or implementation of an EMP.
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## 5.2. Method Statement

Method Statements are written submissions by the Contractor in response to a request by the ECO. The Method Statements set out the site, materials, labour and method that the contractor proposes using to carry out an activity. These documents contain the appropriate detail that allows an assessment to be made on whether the Contractor's proposal is in accordance with the requirements of the EMP. All Method Statements including those which may be required as ad hoc or emergency construction method statements must be submitted to the Engineer for approval prior to the commencement of the activity.

The Contractor may not commence the activity covered by the Method Statement until it has been submitted to the Site Manager for review, except in the case of emergency activities and then only with the consent of the Site Manager. Review of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

### 5.2.1. Monitoring Programme

A monitoring programme should be in place not only to ensure conformance with the EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. Typically, the Environmental Authorisation will determine the frequency of monitoring, where this is not clear, the Applicant will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Contractor and / or Site Manager of the will ensure that the monitoring is conducted and reported.

### 5.2.2. Monitoring Reports

For the purpose of this project, bi-monthly audit reports will be compiled and submitted to GDRAD for their records as deemed practical or with the Final Audit Report. Typically, the monitoring report must contain details of the activities undertaken during the specific project period, including any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out.

### 5.2.3. Non-Conformance Reports

The Applicant must provide the ECO and other supervisory staff with means available to submit non-conformance reports to the Site Manager. Non-conformance reports specifically address the cause,



nature and effects of any environmental non-conformance by the Contractor and in some instances the Applicant. Records of penalties imposed may be required by the relevant authority.

It is essential that the non-conformance report be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

#### **5.2.4. Audit Report**

A final environmental audit report must be compiled by an independent auditor. This report is to be submitted to the GDARD upon completion of the construction and rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions (once issued) and the requirements of the EMP.

#### **5.2.5. Awareness training**

The ECO is responsible for ensuring that the contractor and other professions on site are given an environmental awareness induction session which not only clearly defines what the environment is but specifics details outlining the requirements of the EMP as a management tool to protect the environment. The ECO may use daily toolbox talks including alerting the workforce to particular environmental concerns associated with the tasks for that day or the area in which they are working. Awareness posters and a hand out must be produced to create awareness throughout the site.

#### **5.2.6. Site Documentation**

The following documentation that must be held on site and must be made available to the ECO and/or Approving Authority on request. This includes:

- ❖ Site daily diary /instruction book/ Incident reports;
- ❖ Records of all remediation / rehabilitation activities;
- ❖ Copies of ECO reports (management and monitoring);
- ❖ Environmental Management Plan (EMPR);
- ❖ Complaints register; and
- ❖ Method statements.

## CHAPTER 6: REHABILITATION PLAN

### Objective 1: To ensure the rehabilitation of disturbed areas

<b>OBJECTIVE :</b>		
To ensure that the rehabilitation of disturbed areas following the execution of the works results in negligible residual environmental impacts and that the site is as far as possible remediated or curtailed .		
<b>APPLICABLE PROJECT COMPONENT/S</b>	<b>POTENTIAL IMPACT</b>	<b>ACTIVITY SOURCE OF RISK</b>
❖ The bulk water supply pipeline	❖ Environmental integrity of site undermined by construction, operation and maintenance activities	❖ Disturbed areas/footprints
<b>MITIGATION TARGET</b>		
❖ To ensure and encourage site rehabilitation of disturbed areas		
<b>TYPICAL MITIGATION MEASURES</b>	<b>RESPONSIBILITY/RESPONSIBLE PERSON</b>	<b>TIMEFRAME</b>
❖ After construction, any area cleared or disturbed (as a result of the activity) within and outside the boundaries of the construction site shall be rehabilitated to a state as specified by the ECO. All construction equipment and excess materials shall be removed from the site upon completion of the work. No discarded materials of any nature shall be buried on the site, or on any vacant or open land in the area and shall only be disposed of at the appropriate registered waste disposal site.	❖ Contractor ❖ Applicant	❖ Post -Construction
❖ All invasive alien plants shall be cleared from the site. On-going clearance shall be undertaken during the operation of the activity.	❖ Contractor ❖ Applicant	❖ Post -Construction
❖ Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix where possible.	❖ Contractor ❖ Applicant	❖ Post -Construction
<b>MONITORING REQUIREMENTS</b>		
❖ On-going inspection of rehabilitated areas to determine effectiveness of rehabilitation measures implemented		
❖ On-going alien plant monitoring and removal should be undertaken on an annual basis		
❖ An incident reporting system must be used to record non-conformances to the EMP.		

## CHAPTER 7: EMP REVIEW

The Site Manager and/or Contractor is responsible for ensuring the work crew is complying with procedures, and for informing the work crew of any changes that may have been implemented by GDARD before starting any works. If the contractor cannot comply with any of the activities as described above, they should inform the ECO with reasons within 7 working days.

This EMP was compiled with the intention that it is seen as a dynamic document, and as such it must be updated when required. This will ensure that the construction activities are planned and implemented taking sensitive environmental features into account as far as possible.

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