
WELGEDACHT WATER CARE WORKS, GAUTENG PROVINCE

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

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Prepared for

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DEFINITIONS AND TERMINOLOGY

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.

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.

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.

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

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.

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).

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.

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CBD	Central Business District
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMM	Ekurhuleni Metropolitan Municipality
ERWAT	East Rand Water Care Company
GDARD	Gauteng Department of Agriculture and Rural development
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GP	Gauteng Province
H ₂ S	Hydrogen Sulphide
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
m ²	Square meters
m ³ /d	Cubic metres per day
MI/day	Mega litres per day
MW	Mega Watts
NEMA	National Environmental Management Act (Act No 107 of 1998)
NGOs	Non-Governmental Organisations
NWA	National Water Act (Act No 36 of 1998)
PES	Present Ecological State
SASS	South African Scoring System
SDF	Spatial Development Framework
SIA	Social Impact Assessment
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WCW	Water Care Works
WHO	World Health Organisation

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OVERVIEW OF THE PROJECT

CHAPTER 1

The East Rand Water Care Company (ERWAT) provides bulk wastewater management services to the Ekurhuleni Metro, which consists of previous municipalities of Kempton Park, Germiston, Alberton, Brakpan, Boksburg, Benoni and Springs. The existing **Welgedacht Water Care Works** (WCW) is currently under severe pressure from increasing wastewater volumes draining towards the plant due to new developments within the catchment. In order to adequately treat the wastewater volumes expected to drain towards the Welgedacht WCW in the short- and long-term, ERWAT are proposing the expansion of the Welgedacht WCW by approximately 100 MI/d over the next 30 years to address a bottleneck in the plant's treatment capacity in the short- to medium-term. The nature and extent of this facility, as well as potential environmental impacts associated with the construction of a facility of this nature are explored in more detail in this draft Environmental Impact Assessment (EIA) Report.

1.1. The Need for the Proposed Project

The existing **Welgedacht Water Care Works** (WCW) is located on the Farm Welgedacht 74IR Portion 82, near Springs within the Ekurhuleni Metropolitan Municipality of the Gauteng Province (refer to Figure 1.1). The WCW has been in operation since 2003, and is the DD5A regional plant. The plant has a design capacity of 35 megalitres per day (MI/d) but is presently receiving and treating 59 MI/d.

Growth rates in the area feeding into the Welgedacht WCW averaged at approximately 8% per annum during the past four years, ranging from 2% to 29% during peak growth periods. This is placing increasing pressure on the existing infrastructure at the Welgedacht WCW. In addition, studies indicate that planned developments within the catchment area of the WCW will place additional pressure on this works in the future. In order to adequately treat the wastewater volumes expected to drain towards the Welgedacht WCW, the additional capacity required at the WCW over the next 30 years is approximately 100 MI/d. This is planned to be implemented in a phased approach. The first extension of 50 MI/d is proposed to be commissioned as soon as possible, followed by a further 50 MI/d extension in 2021, assuming a growth rate of 3% per annum. It is estimated that this capacity will be fully utilised by the year 2034. The expansion of the existing Welgedacht WCW will ensure that the increasing wastewater volumes can be adequately treated while maintaining the quality of the effluent within the required standard.

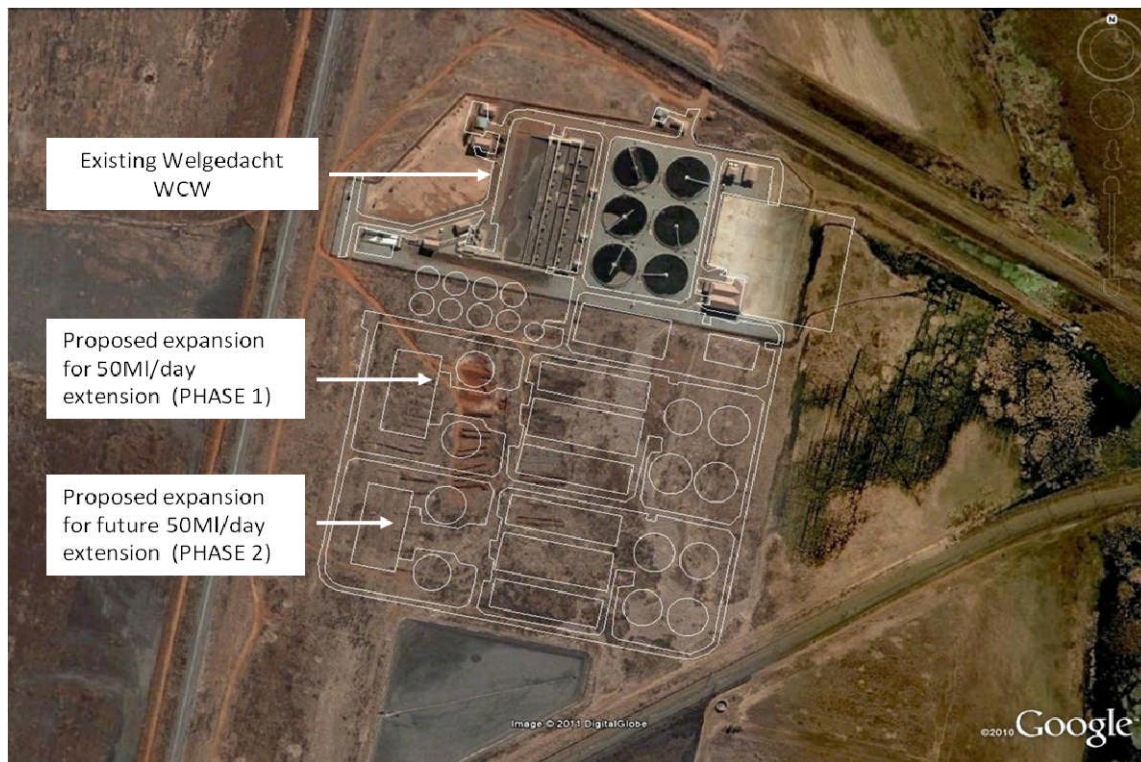


Figure 1.1: Layout of the proposed extension to the Welgedacht WCW

PURPOSE & OBJECTIVES OF THE EMP

CHAPTER 2

An Environmental Management Plan (EMP) provides a link between the impacts predicted and mitigation measures recommended within the Environmental Impact Assessment (EIA) report, and the implementation activities of a project to ensure that these activities are managed and mitigated so that unnecessary or preventable environmental impacts do not result. The EMP is a dynamic document which must be updated on an on-going basis as the project develops.

2.1. Purpose of the EMP

The objective of this EMP is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. This EMP provides specific environmental guidance for the construction, operation and decommissioning phase of the Welgedacht Water Care Works, and is intended to manage the activities in each of these phases so that unnecessary or preventable environmental impacts do not result.

The purpose of the EMP is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

This EMP has the following objectives:

- » To outline mitigation measures, and environmental specifications which are required to be implemented for the construction, operation and maintenance phase of the water care works in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the project.
- » To identify measures that could optimise beneficial impacts.
- » To ensure that the construction, operation and maintenance activities associated with the water care works do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » To ensure that all environmental management conditions and requirements as stipulated in the Environmental Authorisation (once received) are implemented throughout the project life-cycle.
- » To ensure that all relevant legislation (including national, provincial and local) is complied with during the operation and maintenance of the water care works.
- » 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 response to unforeseen events or changes in project implementation that were not considered in the EIA process.

The EMP has been developed as a set of environmental specifications (i.e. principles of environmental management for the construction, operation and maintenance of the Welgedacht Water Care Works), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications.

2.2. Applicable Documentation

The following environmental documentation is applicable for the project, and must be read in conjunction with this EMP:

- » Environmental Impact Assessment Process, Final Scoping Report: Upgrading of the existing Welgedacht Water Care Works, Gauteng Province (Savannah Environmental, April 2009)
- » Draft Environmental Impact Assessment: Upgrading of the existing Welgedacht Water Care Works, Gauteng Province (savannah Environmental, March 2011)

It must be borne in mind that the EMP is a dynamic document, which will be updated as and when required throughout the life-cycle of the Water Care Works.

Should there be a conflict of interpretation between this EMP and the Environmental Authorisation (once issued), the stipulations in the Environmental Authorisation shall prevail over that of the EMP, unless otherwise agreed by GDARD in writing. Similarly, any provisions in current legislation overrule any provisions or interpretations within this EMP.

2.3. Structure of the EMP

The first two chapters of this EMP provide background to the EMP and the Welgedacht Water Care Works. The sections which follow considers the construction, operation and decommissioning activities associated with the Welgedacht Water Care Works.

This section sets out the procedures necessary for ERWAT to achieve environmental compliance during the operation and maintenance of the Welgedacht Water Care Works. In order to ensure site-specific compliance associated with the water care works construction, operation and maintenance, this EMP includes the statement of an overarching environmental **goal**, as well as lists a number of **objectives** in order to meet this goal. The management plan has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions monitoring requirements and performance indicators. A

specific environmental management plan table has been established for each environmental objective. The information provided within the EMP table for each objective is illustrated below:

OBJECTIVE: 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

Project component/s	List of project components affecting the objective
Potential Impact	Brief description of potential environmental impact if objective is not met
Activity/risk source	Description of activities which could impact on achieving the objective
Mitigation: Target/Objective	Description of the target; include quantitative measures and/or dates of completion

Mitigation: Action/control	Responsibility
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting

**MANAGEMENT PLAN FOR WELGEDACHT WATER CARE WORKS:
 PLANNING & DESIGN**

CHAPTER 3

3.1. Goal for Planning and Design

Overall Goal for Planning and Design: Undertake the planning and design phase of the expansion of the Welgedacht WCW in a way that:

- » Ensures that the design of the WCW responds to the identified environmental constraints and opportunities.
- » Ensures that the best environmental options are selected for all components of the project.

3.2. Objectives

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

OBJECTIVE: Minimise noise

The Welgedacht Water Care Works lies at the interface of a number of land use type areas, namely rural (farms and agricultural holdings), residential, mining and industry, the design of the works should therefore be carefully planned to minimise and mitigate noise pollution from the WCW.

Project component/s	Design and planning of the expansion of the WCW
Potential Impact	Nuisance to surrounding areas
Activity/risk source	Operation of the WCW
Mitigation: Target/Objective	Minimisation noise from the WCW

Mitigation: Action/control	Responsibility	Timeframe
The design of the proposed new equipment is to incorporate all the necessary acoustic design aspects required in order that the overall generated noise level from the upgraded WCW installation does not exceed a maximum equivalent continuous day/night rating level (L_{Rdn}), namely a noise level of 70dBA (just inside the <i>property projection plane</i> , namely the property boundary of the WCW) as specified for industrial	ERWAT	Planning phase, before construction

Mitigation: Action/control	Responsibility	Timeframe
districts in SANS 10103 (Refer to Appendix B). Notwithstanding this provision, the design is also to take into account the maximum allowable equivalent continuous day/night rating level of the potentially impacted noise sensitive sites outside the new WCW property. Where the L_{Rdn} for the external site is presently lower than the maximum allowed, the maximum shall not be exceeded.		
The latest technology incorporating maximum noise mitigating measures for the new plant and equipment components should be designed into the system. (The contract specifications should indicate that the contractor shall achieve a sound pressure level not exceeding 85dBA at a 1 metre offset from all plant and equipment.)	ERWAT	Planning phase, before construction
The design process is to consider, <i>inter alia</i> , the following aspects: <ul style="list-style-type: none"> » The position and orientation of buildings on the site, if relevant. » The design of the buildings is to minimise the transmission of noise from the inside to the outdoors. » The insulation of particularly noisy new plant and equipment. (The contract specifications for the proposed upgraded WCW indicate that the contractor shall achieve a sound pressure level not exceeding 85dBA at a 1 metre offset from all plant and equipment). 	ERWAT	Planning phase, before construction
Specifically, consideration should be given to having the new RAS pump-stations inside a building.	ERWAT	Planning phase, before construction

Performance Indicator	» No complaints from surrounding residents
Monitoring	» A issues register must be kept on site to capture any complaints from surrounding residents

OBJECTIVE: The mitigation and possible negation of the potential visual impact of the WCW primary and ancillary infrastructure.

The ancillary infrastructure (i.e. the pump stations, substations, boiler room, gas holder, roads, drainage infrastructure and fencing), could represent a visual impact in close proximity to the proposed WCW. However, this infrastructure is all located within the development site footprint, and will be overshadowed by (and included within) the impact of the primary infrastructure. The visual impacts from primary infrastructure of the WCW on sensitive visual receptors should be taken into consideration.

Project component/s	WCW primary impacts and ancillary infrastructure.
Potential Impact	The potential visual impact of infrastructure and structures on observers in close proximity to the WCW.
Activity/risk source	The effects of visual clutter and industrial type infrastructure on commuters, residents and users of open space.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The amelioration of the visual impact by beautifying the grounds of the facility. » The screening of the facility on its perimeter. » The screening of the digester structures (i.e. the tallest primary infrastructure).

Mitigation: Action/control	Responsibility	Timeframe
Design and install landscape planting within the development site (i.e. along roads and open spaces)	ERWAT/ Landscape	Planning phase
Design and install screen planting (i.e. plants or trees with a height of at least 8-10m) outside of the perimeter fence.	ERWAT/ Landscape	Planning phase
Design and install screen planting (i.e. plants or trees with a height of at least 8-10m) to directly screen the digesters.	ERWAT/ Landscape	Planning phase

Performance Indicator	» The effective beatification of the grounds, perimeter screening and screening of the digesters.
Monitoring	» The monitoring of the condition and effectiveness of the landscape planting and screening.

OBJECTIVE: The mitigation of the potential visual impact of facility lighting

The facility lighting of the WCW should be sensitive to potential observers in the vicinity.

Project component/s	WCW lighting fixtures.
Potential Impact	The potential night-time visual impact of lighting fixtures on observers in proximity to the WCW.
Activity/risk source	The effects of glare and light trespass on motorists and observers in the region.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The containment of light emitted from the facility. » Minimal usage of security and other lighting.

Mitigation: Action/control	Responsibility	Timeframe
Undertake design, planning and specification of facility light fixtures to minimise direct glare and light trespass.	ERWAT/ Lighting engineer	Planning phase

Performance Indicator	» The effective containment of the light from facility fixtures.
Monitoring	» The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.

MANAGEMENT PLAN FOR WELGEDACHT WATER CARE WORKS: CONSTRUCTION

CHAPTER 4

No environmental fatal flaws were identified through the EIA process to be associated with the construction of the Welgedacht Water Care Works expansion. However, a number of potential impacts requiring management and mitigation were identified, i.e.:

- » Site establishment, management of the site and securing the site
- » Management of dust and emissions to air
- » Management of ecological impacts
- » Management of soil contamination and soil erosion.
- » Management of noise
- » Management of visual impacts
- » Management of social impacts

Environmental specifications (i.e. principles of environmental management for the construction of the expansion of the Welgedacht Water Care Works) and procedures necessary for ERWAT to achieve environmental compliance during the construction phase of the proposed expansion of the WCW are detailed within this section of the EMP.

4.1. Overall Goal for Construction

Overall Goal for Operation: Undertake the construction phase of the proposed expansion in a way that:

- » Ensures that the design of the expansion responds to the identified environmental constraints and opportunities.
- » Ensures that the best environmental options are selected for the project.
- » Ensures that there is minimal impact on the surrounding environment.

4.2. Institutional Arrangements: Roles and Responsibilities for the Construction Phase of the WCW

As the Proponent, ERWAT must ensure that the implementation of the extension to the WCW complies with the requirements of any and all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMP, and the implementation of the EMP through its integration into the contract documentation. ERWAT will retain various key roles and responsibilities during the construction of the water care works. These are outlined below.

4.2. Objectives for Construction

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

OBJECTIVE: To establish clear reporting, communication and responsibilities in relation to environmental incident

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environment Representative; Environmental Control Officer and Contractor for the construction phase of this project are as detailed below.

The **Project Manager** will:

- » Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that ERWAT and its Contractor(s) are made aware of all stipulations within the EMP.
- » Ensure that the EMP is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- » Be fully conversant with the Environmental Impact Assessment for the project, the EMP, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

The **Site Manager** (ERWAT's On-site Representative) will:

- » Be fully knowledgeable with the contents of the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents of the Environmental Management Plan.
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- » Have overall responsibility of the EMP and its implementation.
- » Conduct audits to ensure compliance to the EMP.
- » Ensure there is communication with the Project Manager, the Environmental Control Officer and relevant discipline Engineers on matters concerning the environment.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- » Confine activities to the demarcated construction site.

The **Safety, Health and Environment Representative** (SHE officer) will:

- » Develop and compile environmental policies and procedures.

- » Direct and liaise with the Environmental Control Officer (ECO) regarding monitoring and reporting on the environmental performance of the construction phase.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies on environmental performance and other issues as required.

An independent **Environmental Control Officer** (ECO) should be appointed at the outset of the construction phase. The ECO should be a suitably qualified independent consultant appointed at the outset of the construction phase. The ECO will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specification. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the Environmental Management Plan.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMP conditions or specifications are not followed then appropriate measures are undertaken to address this.
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMP.
- » Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- » Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.

Contractors and Service Providers: All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- » Ensuring adherence to the environmental management specifications.
- » Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken. Any lack of adherence to this will be considered as non-compliance to the specifications of the EMP.
- » Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- » Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- » Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- » Ensuring that a register of all public complaints is maintained.
- » Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMP (i.e. ensure their staff are appropriately trained as to the environmental obligations).

OBJECTIVE: Minimise Impacts on Heritage Sites

Although no sites, features or objects of cultural heritage significance were identified in the study area, there is the possibility of archaeological sites or graves being exposed during construction work. In this case, such a find must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

OBJECTIVE: Good site Establishment

The Contractor must recognise that the site for the expansion is within the footprint of the existing Welgedacht WCW. Where existing workers on the WCW could be exposed to danger by any of the works or site activities, the Contractor must, as appropriate, provide suitable barriers and/or warning signs in English and any other relevant language used in the area, all to the approval of the Site Manager.

Project component/s	» Construction and installation of the expansion to the WCW
Potential Impact	» Injuries to construction workers on site or general workers at the existing Welgedacht WCW
Activity/risk source	» Construction
Mitigation: Target/Objective	» Educate all workers of the dangers associated with a construction site

Mitigation: Action/control	Responsibility	Timeframe
Implement good barricades around construction site to restrict the movement of workers outside of the construction camp.	Contractor	During construction phase
Put up adequate warning signage.	Contractor	During construction phase
Conduct training and safety induction amongst workers	Contractor	During construction phase

Performance Indicator	No injuries or incidents on the construction site
Monitoring	An incident register will be used to record all incidents and injuries on site.

OBJECTIVE: Management of dust and emissions to air

There is the potential for increased dust from the site during construction of the expansion of the WCW. Therefore, it is recommended that a dust management plan be implemented to mitigate against cumulative dust impacts during construction and decommissioning phase.

Project component/s	» Installation of Module 1 and Module 2 to increase capacity of the Welgedacht WCW from 35 000 m ³ /day to 85 000 m ³ /day and 135 000 m ³ /day respectively.
Potential Impact	» Dust consists of particles that are large enough to settle down and not remain suspended indefinitely in the atmosphere. Dust negatively affects quality of life by causing soiling, contamination, structural corrosion and damage to precision equipment, machinery and computers.
Activity/risk source	» Construction and decommissioning of the expansion of the WCW
Mitigation: Target/Objective	» Minimisation of impacts on the surrounding area as a result of dust generated from construction activities.

Mitigation: Action/control	Responsibility	Timeframe
Removal of vegetation must be limited to only what is necessary to accommodate construction activities.	Contractor/ ERWAT	Construction
Maintain all vehicles in a roadworthy condition.	Contractor	Construction phase
Implement traffic control measures to limit vehicle-entrained dust from unpaved roads, e.g. by limiting vehicle speeds and	Contractor	

Mitigation: Action/control	Responsibility	Timeframe
by restricting traffic volumes.		
Roads must be sealed and maintained to ensure that dust emissions are minimised. Water can be used as a wetting or binding agent on the unpaved roads and terraces.	Contractor	During construction phase
Develop and implement an air pollution management plan for the Water Care Works during the construction phase	ERWAT/ Contractor	Pre-construction
Re-vegetate the construction terraces once all the construction is completed, and when the laydown area is vacated.	Contractor	Construction

Performance Indicator	» No complaints from affected residents or community regarding dust emissions during construction
Monitoring	<ul style="list-style-type: none"> » A complaints register will be maintained, in which any complaints from residents/the community will be logged. Complaints will be investigated and, where appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Minimise the impact of construction activities on the wetland, aquatic and terrestrial environment

There will be a potential loss of terrestrial habitat due to vegetation removal, and a loss of terrestrial species diversity due to habitat degradation and loss of habitat during the construction phase. The degradation of aquatic and wetland ecosystems and species will result due to increased sedimentation, spills, runoff, habitat degradation and loss during the construction phase.

Project component/s	» Construction activities associated with the expansion of the WCW
Potential Impact	» Degradation of aquatic, wetland and terrestrial ecosystems and loss of habitat due to increased dust and sedimentation, possible spills and runoff, and vegetation removal during construction.
Activity/risk source	» Increased vehicle movement, spills from machinery and site clearing.
Mitigation: Target/Objective	» To minimise dust and sediment settling on the adjacent habitats, contain spills and, limit vegetation clearing and movement within the natural areas.

Mitigation: Action/control	Responsibility	Timeframe
Limit construction to the dry season where possible. Maintain a 60m buffer zone around the wetland. Limit vehicle movement within buffer zone to avoid unnecessary damage to habitat.	Contractor/ERWAT	During construction, before operation starts
Rehabilitate previously impacted wetland areas, and areas impacted by construction	Contractor	After construction phase
Remove leftover stock and waste from construction site after construction.	Contractor	After construction phase
Erect temporary barriers to contain spills.	Contractor	After construction phase
Monitor the environment during construction to assess if any damage to wetland, aquatic and terrestrial environments has occurred as a result of the construction activities.	Contractor	After construction phase

Performance Indicator	<ul style="list-style-type: none"> » Wetland integrity shouldn't score less than a Present Ecological State (PES) Class Moderate (Refer to Appendix A for PESC guidelines and categories). » Wetland Index of Habitat Integrity shouldn't score less than a PES Category C. » SASS (South African Scoring System) score should not decrease by one or more PES Class when compared to the upstream site. » Dissolved Oxygen (DO) concentration should remain at 80 – 120% of saturation (lowest instantaneous concentration recorded over a 24 hour period). The Minimum Allowable Value (MAV) is 60% saturation for a period of 7 days and 40% saturation for 1 day. » Total Dissolved Solid (TDS) concentrations should not be changed by > 15 % from the normal cycles of the water body under unimpacted conditions at any time of the year. The amplitude and frequency of natural cycles in TDS concentrations should not be changed. » The pH values should not be allowed to vary from the range of the background pH values for a specific site and time of day, by >0.5 of a pH unit, or by >5 %, and should be assessed by whichever estimate is the more conservative. » Terrestrial habitat diversity shouldn't decrease more than what was found during the baseline survey (Monitoring to be done during same season for consistency).
Monitoring	<ul style="list-style-type: none"> » Monitoring of the performance indicators should be done on an annual basis during the wet season.

OBJECTIVE: Minimise or avoid soil contamination and soil erosion

Activities resulting from the construction phase could lead to contamination of soil resources. Erosion and soil loss will be associated with construction activities and the provision of erosion/sediment control measures is vital.

Project component/s	» Construction activities of the expansion of the WCW
Potential Impact	» Soil contamination and soil erosion
Activity/risk source	» Construction
Mitigation: Target/Objective	» Minimise soil contamination and soil erosion

Mitigation: Action/control	Responsibility	Timeframe
All incidences of spillage of chemicals or other pollution to be reported on and addressed within 24 hrs. Where an independent or specialist company is used, the local authority should be informed.	Contractor	During construction phase
Construction materials to be stored in a safe and neat manner, in designated areas.	Contractor	During construction phase
Cement should be kept dry (i.e. stored under a roof and off the floor or in a suitable container), and proper storage facilities are to be used for the storage of paints, chemicals, grease and oils.	Contractor	During construction phase
Prevent spillage of temporary toilet facilities, paint, grease, chemicals, oils and fuel storage tanks during decanting. Use oil-absorbent fibres if spills occur.	Contractor	During construction phase
Generators are to be well maintained to prevent leaks, and drip tray utilised for any stationary machinery or vehicles on site.	Contractor	During construction phase
Where spillages have occurred, contaminated soil must be cleaned. Where this cannot be done adequately, the soil must be removed and disposed of at an appropriate and registered landfill site.	Contractor	During construction phase
Install erosion control measures to minimise loss of topsoil and sedimentation of surface water resources.	Contractor	During construction phase

Performance Indicator	» No reports of soil contamination or soil erosion
Monitoring	» An incident register will be used to record all incidents on site.

OBJECTIVE: Implement appropriate waste management and materials handling practices

Activities resulting from the construction phase could lead to impacts resulting from waste management and materials handling. Good supervision of the waste management programme on site is critical for the minimisation of impacts.

Project component/s	» Construction activities of the expansion of the WCW
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Pollution of the surrounding environment through inappropriate waste management and/or material handling practices
Activity/risk source	» Construction
Mitigation: Target/Objective	» To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons » To comply with waste management guidelines developed by the contractor » To minimise production of waste » To ensure appropriate waste handling, storage and disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
All litter is to be disposed of in clearly marked litter bins, which are to be emptied daily, and littering should be prevented onsite.	Contractor	During construction phase
Dispose of all solid waste collected at an appropriately registered waste disposal site. The disposal of waste shall be in accordance with all relevant legislation.	Contractor	Duration of Contract
Where a registered waste site is not available for waste disposal, provide a method statement with regard to waste management.	Contractor	Pre-construction
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Pre-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	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
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.		
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	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
No waste may be buried or burnt on site	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction
Establish the necessary ablution facilities with chemical toilets. Provide adequate sanitary facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site. Ensure no ablution facilities are located within the 1:50 year flood line of the river or in identified sensitive areas.	Contractor	Erection: during site establishment Maintenance: for duration of Contract

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests for all waste streams
Monitoring	<ul style="list-style-type: none"> » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » Observation and supervision of waste management practices throughout construction phase » Waste collection to be monitored on a regular basis

- » Waste documentation completed
- » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Minimise noise from construction site

The impact of noise on the surrounding area will be limited, and largely attributed to the movement of construction vehicles on the site. All generators and machinery should be maintained in a good working condition, so as to minimise noise emissions.

Project component/s	Construction activities of the expansion of the WCW
Potential Impact	Nuisance to surrounding areas
Activity/risk source	Construction vehicles, generators and machinery
Mitigation: Target/Objective	Minimisation noise from construction site

Mitigation: Action/control	Responsibility	Timeframe
Construction site yards and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development site.	Contractor	During construction phase
Operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).	Contractor	During construction phase
All construction vehicles and equipment are to be maintained in good working order.	Contractor	During construction phase
Construction activities which will result in disturbance noise to neighbouring properties should be restricted to between 06h00 and 18h00 (as per the Environment Conservation Act), or an application for exemption be lodged with the Ekurhuleni Metropolitan Municipality (and neighbouring landowners consulted) for work to be conducted outside of this period.	Contractor	During construction phase
Adjacent property owners should be consulted and notified of any construction activities that could lead to excessive noise levels.	Contractor	During construction phase
Adjacent property owners should be consulted if any night time construction activities are proposed to take place.	Contractor	During construction phase
With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor should	Contractor	During construction

Mitigation: Action/control	Responsibility	Timeframe
liaise with local residents on how best to minimise the impact.		phase
Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.	Contractor	During construction phase

Performance Indicator	» No complaints from surrounding residents
Monitoring	» An issues register will be kept on site to capture any complaints from surrounding residents

OBJECTIVE: The mitigation of the potential visual impacts associated with construction.

The construction phase of the WCW should be sensitive to potential observers in the vicinity of the construction site.

Project component/s	Construction site.
Potential Impact	The potential disturbances of on-site construction activities, construction vehicles and dust on observers in proximity to the WCW.
Activity/risk source	The viewing of construction activities by observers on or near the site.
Mitigation: Target/Objective	The orderly operation of the construction site

Mitigation: Action/control	Responsibility	Timeframe
Reduce the construction period as far as possible through effective programming.	ERWAT/ Contractor	Construction phase
Limit the extent of construction activities and movement of vehicles to within designated areas.	ERWAT/ Contractor	Construction phase
Keep construction areas neat, organised and litter free. Remove waste regularly.	ERWAT/ Contractor	Construction phase
Restrict construction to daylight hours.	ERWAT/ Contractor	Construction phase
Rehabilitate all disturbed areas to acceptable visual standards.	ERWAT/ Contractor	Construction phase
Maintain rehabilitated areas and replace damaged or dead plants as required	ERWAT	Operational phase

Performance Indicator	» An orderly construction site with minimal dust, and rehabilitated vegetation cover that remains intact with no erosion.
Monitoring	» Monitoring of the condition of rehabilitated vegetation during operation.

OBJECTIVE: The mitigation of negative social impacts and the enhancement of positive impacts

Social impacts may arise due to the proposed construction to the expansion to the WCW.

Project component/s	Construction team.
Potential Impact	<ul style="list-style-type: none"> » Municipal service delivery, housing, open space management, an increase in crime levels and the general wellbeing of local residents. » Enhanced economic opportunities to local individuals (positive economic impact). » Conflict situations can impact on people's sense of safety and their quality of life as they are impaired in their daily movement. It can also delay the construction process with financial implications to ERWAT.
Activity/risk source	<ul style="list-style-type: none"> » The intensity of the effect will be influenced by the actual number of job seekers. (It was therefore it was not possible to assess this issue in detail). » Providing unskilled (and semi-skilled, where possible) job opportunities to local individuals, i.e. from areas within a radius of 10km from the site » Intra-conflict situations might arise between those community members who were successful in securing a job with the construction team, and those who were not. In addition, further conflict can arise between unsuccessful local job seekers and unemployed job seekers from elsewhere who enter the area in hope of securing a position on the construction team.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Manage the impact that the influx of job seekers might have on composition and functioning of the local community, with particular concern for the impact that these job seekers might have on the local residents' sense of safety and security. » Employ local labour as far as possible. » Minimising the potential for conflict to occur between local residents and construction workers. » A construction area with little to no conflict. » Fast and effective remediation of conflict situations.

Mitigation: Action/control	Responsibility	Timeframe
Ensure that employment procedures/policies are communicated to local stakeholders, especially community representative organisations and ward councillors.	Contractor	Planning phase
Unskilled job opportunities should be afforded to local residents. Local trade unions and local ward councillors (via a Labour Desk) could assist with the recruitment process to counteract the potential for social mobilisation.	Contractor	Planning phase
Equal opportunities for employment should be created to ensure that the local female population also has access to these opportunities. Females should be encouraged to apply for positions.	Contractor	Planning phase
Where possible, avail unskilled job opportunities equally to all members of the local community on a rotary basis. A worker who has completed a certain task must be moved to the bottom of the waiting list to afford other people on the waiting list an opportunity to do some work.	Contractor	Planning phase

Performance Indicator	<ul style="list-style-type: none"> » The number of loiterers at site » The number of people on the construction team that are from the local area (i.e. within a 10km radius from site) » The number and frequency of conflict situations pertaining to the project and its activities.
Monitoring	<ul style="list-style-type: none"> » The labour desk should be able to effectively monitor the number of job applications from outside the area. These can be verified with local community structures or the local ward councillor. » Develop and implement a grievance procedure that keeps track of grievances and the manner in which these were dealt with. » Regular grievance meetings with construction team.

OBJECTIVE: The mitigation of the social impacts associated with the influx of unemployed work seekers.

Depending on the number of job seekers, construction of the WCW can impact on municipal service delivery, housing, open space management, an increase in crime levels and the general wellbeing of local residents.

Project component/s	Construction team.
Potential Impact	Municipal service delivery, housing, open space management, an increase in crime levels and the general wellbeing of local residents.

Activity/risk source	The intensity of the effect will be influenced by the actual number of job seekers. (It was therefore it was not possible to assess this issue in detail).
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Manage the impact that the influx of job seekers might have on composition and functioning of the local community, with particular concern for the impact that these job seekers might have on the local residents' sense of safety and security. » Establish an employment strategy that is known and communicated to potential job seekers. » Prevent loitering of individuals at the construction site or within nearby residential areas. » Establish clearly identifiable features between actual construction workers and job seekers, such as overalls, ID cards, etc. » Prevent the formation of informal settlements in or close to the construction site or within or close to established residential areas.

Mitigation: Action/control	Responsibility	Timeframe
Have clear rules and regulations for access to the construction site to control loitering. Consult with the local SAPS to establish standard operating procedures for the control and/or removal of loiterers at the construction site.	Contractor	Construction phase
Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. Construction workers could also be issued with identification tags.	Contractor	Construction phase
The contractor should monitor areas where people gather in the field on a regular basis as this is normally the first indication that (informal) settlement might take place in the area. These people should be removed in co-operation with the local SAPS to prevent the formation and/or expansion of informal settlements in the area.	Contractor in liaison with local SAPS	Construction phase

Performance Indicator	» The number of loiterers at site
Monitoring	» The labour desk should be able to effectively monitor the number of job applications from outside the area. These can be verified with local community structures or the local ward councillor.

OBJECTIVE: The enhancement of local economic opportunities through the creation of job opportunities

The proposed project could result in enhanced economic opportunities to local individuals (positive economic impact).

Project component/s	Construction team.
Potential Impact	Enhanced economic opportunities to local individuals (positive economic impact).
Activity/risk source	Providing unskilled (and semi-skilled, where possible) job opportunities to local individuals, i.e. from areas within a radius of 10km from the site
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Employ a percentage of female workers. » Offer training opportunities to ensure sustainable skills development within the community. » Provide for alternative employment opportunities through the development of portable and other skills. » Ensure a more sustainable economic injection into the local community that can be sustained over the longer term

Mitigation: Action/control	Responsibility	Timeframe
Individuals with the potential to develop their skills should be afforded training opportunities. ERWAT or its appointed contractors should be involved in this process.	Contractor	Planning phase
Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project. This could include formal and/or informal training on how to look for alternative employment, information on career progression, etc. to ensure that people are equipped to seek other jobs with the skills that they have gained.	Contractor	Construction phase
Payment should comply with applicable Labour Law legislation in terms of minimum wages.	Contractor	Construction phase
Where local labourers are employed on a more permanent basis, cognisance should be taken of the Labour Law in terms of registering the worker with the Unemployment Insurance Fund (UIF), Pay as You Earn (PAYE), workman's compensation and all other official bodies as required by law. This would enable the worker to claim UIF as a means of either continuous financial support when the worker's position on the construction team has become redundant or once the construction phase ends.	Contractor	Construction phase

Performance Indicator	» The number of people on the construction team that are from the local area (i.e. within a 10km radius from site)
Monitoring	» The labour desk should be able to effectively monitor the number of job applications from outside the area. These can be verified with local community structures or the local ward councillor.

4.3. Detailing Method Statements

OBJECTIVE: To ensure all construction activities/practices/procedures are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMP.

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMP will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager (and ECO).

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

- » Construction procedures
- » Materials and equipment to be used
- » Getting the equipment to and from site
- » How the equipment/material will be moved while on-site
- » How and where material will be stored
- » The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur
- » Timing and location of activities
- » Compliance/non-compliance with the Specifications,
- » Rehabilitation procedures of post construction, and
- » Any other information deemed necessary by the Site Manager.

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

4.4. Awareness and Competence: Construction Phase of the Water Care Works

OBJECTIVE: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm.

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

- » Employees must 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 are aware of the location and have access to the document. Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Basic training in the identification of archaeological sites/objects, paleontological sites, and protected flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- » Ensuring that appropriate communication tools are used to outline the environmental "do's" and "don'ts" (as per the environmental awareness training course) to employees.
- » Records must be kept of those that have completed the relevant training.
- » Refresher sessions must be held to ensure the contractor's staff are aware of their environmental obligations.

4.5. Monitoring Programme: Construction Phase of the Water Care Works

OBJECTIVE: To monitor the performance of the control strategies employed against environmental objectives and standards.

A monitoring programme must 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. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, ERWAT will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported to the ECO.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- » Ensure adequate and appropriate interventions to address non-compliance
- » Ensure adequate and appropriate interventions to address environmental degradation
- » Provide a mechanism for the lodging and resolution of public complaints
- » Ensure appropriate and adequate record keeping related to environmental compliance
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
- » Aid communication and feedback to authorities and stakeholders.

The ECO will ensure compliance with the EMP, and to conduct monitoring activities. The Environmental Control Officer must have the appropriate experience and qualifications to undertake the necessary tasks. The ECO will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities.

MANAGEMENT PLAN FOR WELGEDACHT WATER CARE WORKS: REHABILITATION OF DISTURBED AREAS

CHAPTER 5

5.1. Overall Goal for the Rehabilitation of Disturbed Areas

Overall Goal for the Rehabilitation of Disturbed Areas: Undertake the rehabilitation measures in a way that ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

5.2. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE: *To ensure appropriate rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed*

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular maintenance during the operation phase. Rehabilitation should be undertaken in an area as soon as practically possible after the completion of construction activities within that area.

Project component/s	» All disturbed areas.
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention
Activity/risk source	» All disturbed areas/footprints
Mitigation: Target/Objective	» To ensure and encourage site rehabilitation of disturbed areas » To ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed

Mitigation: Action/control	Responsibility	Timeframe
All temporary facilities, equipment and waste materials must be removed from site as soon as practically possible after construction is complete.	Contractor	Following execution of the works
All temporary fencing and danger tape must be	Contractor	Following

Mitigation: Action/control	Responsibility	Timeframe
removed once the construction phase has been completed.		completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
Disturbed natural areas must be stabilised and rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Exxaro Resources in consultation with rehabilitation specialist	Post-rehabilitation
Exposed areas to be utilised during maintenance activities must be stabilised to minimise erosion potential.	Exxaro Resources in consultation with rehabilitation specialist	Post-rehabilitation
Ongoing alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Exxaro Resources in consultation with rehabilitation specialist	Post-rehabilitation

Performance Indicator	<ul style="list-style-type: none"> » All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities » Topsoil replaced on all areas and stabilised » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites » Completed site free of erosion and alien invasive plants
Monitoring	<ul style="list-style-type: none"> » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented (to be conducted quarterly for a period of at least two years). » On-going alien plant monitoring and removal should be undertaken on an annual basis for the life span of the facility.

MANAGEMENT PLAN FOR WELGEDACHT WATER CARE WORKS: OPERATION AND MAINTENANCE

CHAPTER 6

No environmental fatal flaws were identified through the EIA process to be associated with the operation and maintenance of the expansion of the Welgedacht Water Care Works. The only potential impact requiring management and mitigation during operation and maintenance was identified as ecological impacts.

Mitigation measures required to be implemented in order to minimise the above identified impacts were detailed within the EIA Report (Savannah Environmental, March 2011). Environmental specifications (i.e. principles of environmental management for the operation and maintenance of the expanded Welgedacht Water Care Works) and procedures necessary for ERWAT to achieve environmental compliance during the operation and maintenance of the expanded WCW are detailed within this section of the EMP.

6.1. Overall Goal for Operation

Overall Goal for Operation: To ensure that the operation and maintenance of the expansion of the Welgedacht WCW does not have unforeseen or avoidable impacts on the environment, and to ensure that all impacts are monitored and the necessary corrective action taken in all cases.

In order to address this goal, it is necessary to operate the Welgedacht Water Care Works in a way that:

- » Ensures that operation and maintenance activities are properly managed in respect of environmental aspects and impacts.
- » Enables operation and maintenance activities to be undertaken without significant disruption to other land uses in the area.

6.2. Objectives for Operation and Maintenance

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

OBJECTIVE: Minimise the impact of continued eutrophication on the aquatic and wetland environment

Further decrease in habitat integrity in the wetland and aquatic areas will result at the site and in the downstream Blesbokspruit Ramsar site, due to continued nutrient input, causing nuisance plant growth and algal growth. There will be a decrease in water quality at the site and in the downstream Blesbokspruit Ramsar site, due to continued phosphate and faecal coliform input, and further decrease in species diversity in the wetland and aquatic ecosystems areas and the adjacent Blesbokspruit Ramsar site due to decreased water quality and increased eutrophication.

Project component/s	» Construction activities of the expansion of the WCW
Potential Impact	» Decrease in water quality, habitat integrity and species diversity due to continued nutrient input into the system.
Activity/risk source	» Continued release of phosphates and faecal coliforms into the wetland and aquatic ecosystems.
Mitigation: Target/Objective	» To minimise the amount of nutrients released into the wetland and aquatic environment, and improve and maintain water quality.

Mitigation: Action/control	Responsibility	Timeframe
Limit phosphate and faecal coliforms that the least amount is released into the system. The WCW should aim to release < 0.025mgP/l and 0 FCU/100ml. All wastewater should be adequately treated before release.	Contractor	Operational phase
Nuisance vegetation should be managed to maintain habitat diversity. Wetland should be rehabilitated to increase habitat integrity.	Contractor	Operational phase
Re-vegetate disturbed areas to reduce erosion and runoff.	Contractor	Operational phase

Performance Indicator	<ul style="list-style-type: none"> » Wetland integrity shouldn't score less than a Present Ecological State (PES) Class Moderate » Wetland Index of Habitat Integrity shouldn't score less than a PES Category C » SASS score should not decrease by one or more PES Class when compared to the upstream site. » Dissolved Oxygen (DO) concentration should remain at 80 – 120% of saturation (lowest instantaneous concentration recorded over a 24 hour period). The Minimum Allowable Value (MAV) is 60% saturation for a period of 7 days and 40% saturation for 1 day. » Total Dissolved Solid (TDS) concentrations should not be changed by
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	<p>> 15 % from the normal cycles of the water body under unimpacted conditions at any time of the year. The amplitude and frequency of natural cycles in TDS concentrations should not be changed.</p> <p>» The pH values should not be allowed to vary from the range of the background pH values for a specific site and time of day, by > 0.5 of a pH unit, or by > 5 %, and should be assessed by whichever estimate is the more conservative.</p>
Monitoring	<p>» Monitoring of the performance indicators should be done on an annual basis during the wet season.</p>

OBJECTIVE: Minimise the impact of increased flow rate on aquatic and wetland environment

There will be a modification of aquatic and wetland habitats as well as a loss of aquatic and wetland species diversity at the site and in the downstream, adjacent Ramsar site, due to increased scouring of substrates, associated with increased effluent release rates and flow rates.

Project component/s	» Construction activities of the expansion of the WCW
Potential Impact	» Modification of wetland and aquatic habitat and loss species diversity due to increased flow rate and subsequent substrate scouring.
Activity/risk source	» Increased capacity of the WCW resulting in increased effluent release and increased flow rates down stream of the effluent release point.
Mitigation: Target/Objective	» To minimize the impact of increased flow rate on the wetland and aquatic environment

Mitigation: Action/control	Responsibility	Timeframe
Areas of high erosion potential downstream of the effluent release point should be identified and stabilised by means of gabions, Reno-mattresses and geo-fibers	Contractor	Operational phase
Rehabilitate areas that have already been eroded.	Contractor	Operational phase

Performance Indicator	<p>» Wetland integrity shouldn't score less than a Present Ecological State (PES) Class Moderate</p> <p>» Wetland Index of Habitat Integrity shouldn't score less than a PES Category C</p> <p>» SASS score should not decrease by one or more PES Class when compared to the upstream site.</p> <p>» Dissolved Oxygen (DO) concentration should remain at 80 – 120% of saturation (lowest instantaneous concentration recorded over a 24</p>
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	<p>hour period). The Minimum Allowable Value (MAV) is 60% saturation for a period of 7 days and 40% saturation for 1 day.</p> <ul style="list-style-type: none"> » Total Dissolved Solid (TDS) concentrations should not be changed by > 15 % from the normal cycles of the water body under unimpacted conditions at any time of the year. The amplitude and frequency of natural cycles in TDS concentrations should not be changed. » The pH values should not be allowed to vary from the range of the background pH values for a specific site and time of day, by > 0.5 of a pH unit, or by > 5 %, and should be assessed by whichever estimate is the more conservative.
Monitoring	<ul style="list-style-type: none"> » Monitoring of the performance indicators should be done on an annual basis during the wet season.

OBJECTIVE: The mitigation and possible negation of the potential visual impact of the WCW primary and ancillary infrastructure.

The ancillary infrastructure (i.e. the pump stations, substations, boiler room, gas holder, roads, drainage infrastructure and fencing), could represent a visual impact in close proximity to the proposed WCW. However, this infrastructure is all located within the development site footprint, and will be overshadowed by (and included within) the impact of the primary infrastructure. The visual impacts from primary infrastructure of the WCW on sensitive visual receptors should be taken into consideration.

Project component/s	WCW primary impacts and ancillary infrastructure.
Potential Impact	The potential visual impact of infrastructure and structures on observers in close proximity to the WCW.
Activity/risk source	The effects of visual clutter and industrial type infrastructure on commuters, residents and users of open space.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The amelioration of the visual impact by beautifying the grounds of the facility. » The screening of the facility on its perimeter. » The screening of the digester structures (i.e. the tallest primary infrastructure).

Mitigation: Action/control	Responsibility	Timeframe
Maintain all landscape planting and replace damaged or dead plants as required	ERWAT/ Landscape	Operational phase

Performance Indicator	<ul style="list-style-type: none"> » The effective beautification of the grounds, perimeter screening and screening of the digesters.
Monitoring	<ul style="list-style-type: none"> » The monitoring of the condition and effectiveness of the landscape

planting and screening.

OBJECTIVE: The mitigation of the potential visual impact of facility lighting

The facility lighting of the WCW should be sensitive to potential observers in the vicinity.

Project component/s	WCW lighting fixtures.
Potential Impact	The potential night-time visual impact of lighting fixtures on observers in proximity to the WCW.
Activity/risk source	The effects of glare and light trespass on motorists and observers in the region.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The containment of light emitted from the facility. » Minimal usage of security and other lighting.

Mitigation: Action/control	Responsibility	Timeframe
Undertake regular maintenance of light fixtures.	ERWAT/ Lighting engineer	Operational phase

Performance Indicator	» The effective containment of the light from facility fixtures.
Monitoring	» The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.

OBJECTIVE: Effective management and communication with affected communities

The process of communication and consultation with the community representatives must be maintained throughout the operation and maintenance phase of the modified Water Care Works.

Project component/s	Operation of Water Care Works
Potential Impact	Community opposition and/or attitude formation towards the operation of the Water Care Works
Activity/risk source	Water Care Works operation

Mitigation: Target/Objective	To ensure the on-going effective management and communication with affected communities
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Mitigation: Action/control	Responsibility
A list of the neighbouring properties, property owners' names, addresses, and telephone numbers, and land use will be drawn up. This will be kept on site and updated on a continuous basis in order to ensure effective channels of communication.	ERWAT

Performance Indicator	» Appropriate communication channels established between ERWAT and affected communities.
Monitoring	» An incidents/complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon.

OBJECTIVE: Minimise or avoid impacts from waste management and materials handling

Activities resulting from the operational phase could lead to impacts resulting from waste management and materials handling. Good supervision of the waste management programme on site is critical to success.

Project component/s	» Operational activities of the expansion of the WCW
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Pollution of the surrounding environment through inappropriate waste management and/or material handling practices
Activity/risk source	» Screenings from Raw Sewage received at the inlet » General waste from the admin building
Mitigation: Target/Objective	» To minimise production of waste » To ensure appropriate waste handling, storage and disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
All litter is to be disposed of in clearly marked litter bins, which are to be emptied on a regular basis, and littering should be prevented onsite.	ERWAT	During operational phase
Waste is to be removed on a regular basis and disposed of at an appropriately registered waste disposal site.	ERWAT	During operational phase
Where possible, general wastes from the water care works must be reused or recycled. Bins must be available on-site	ERWAT	During operational

Mitigation: Action/control	Responsibility	Timeframe
for collection, separation and storage of waste streams (such as wood, metals, general refuse etc).		phase
Disposal of waste must be in accordance with relevant legislative requirements.	ERWAT	During operational phase
No waste may be buried or burnt on site	ERWAT	During operational phase
Screenings are to be appropriately removed from site and taken to a registered landfill site.	ERWAT	During operational phase
Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any regulated waste. Waste disposal records must be available for review at any time.	ERWAT	During operational phase

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately, where possible » Provision of all appropriate waste manifests for all waste streams
Monitoring	<ul style="list-style-type: none"> » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » Observation and supervision of waste management practices throughout operational phase » Waste collection to be monitored on a regular basis » Waste documentation completed » An incident reporting system will be used to record non-conformances to the EMP

MANAGEMENT PLAN FOR WELGEDACHT WATER CARE WORKS: DECOMMISSIONING

CHAPTER 7

The economic lifespan of civil infrastructure of the WCW will be utilised for the proposed expected lifespan of approximately 30 years and the economic lifespan of Mechanical, Electrical and Instrumentation infrastructure is approximately 15 years (with maintenance) this is based on DWA Second Edition: 2004 "Technical Guidelines For The Development Of Water and Sanitation Infrastructure)). Equipment associated with this WCW would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly or replacement of the components of the WCW with more appropriate technology/infrastructure available at that time.

7.1 Disassemble and Replace Existing components of the WCW

OBJECTIVE: To avoid and or minimise the potential impacts associated with the decommissioning phase.

The various components of the WCW will be disassembled. These components will be reused, recycled or disposed of in accordance with regulatory requirements.

Project component/s	» Decommissioning phase of the WCW
Potential Impact	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life, stress, depression etc. However, the number of people affected is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
Activity/risk source	» Decommissioning of the WCW.
Mitigation: Target/Objective	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the water care works.

Mitigation: Action/control	Responsibility	Timeframe
» Retrenchments should comply with South African Labour legislation of the day.	ERWAT	At decommissioning.
» In as far as practically feasible, workers should be redeployed within other operations run by ERWAT	ERWAT	At decommissioning.

Performance Indicator	South African Labour legislation at the relevant time.
Monitoring	Retrenchments should comply with South African Labour legislation of the day.

**APPENDIX A:
GUIDELINES AND CATEGORIES OF THE PRESENT
ECOLOGICAL STATUS CLASS (PESC) OF A WETLAND**

Table1: Guidelines for the determination of the Present Ecological Status Class (PESC) of a wetland

Class Boundary	Class	Class Description
Within generally acceptable range		
>4	Very High	Unmodified, or approximated natural condition.
>3 and <=4	High	Largely natural with few modifications, but with some loss of natural habitats.
>2 and <=3	Moderate	Moderately modified, but with some loss of natural habitats.
2	Low	Largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.
Outside generally acceptable range		
>0 and <2	Very Low	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
0	Non Existent	Critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

Table 2: Ecological categories

Ecological Category	%	Description of Ecological Category
A	90-100	Unmodified/Natural
B	80-89	Largely natural with few modification. A small change in natural habitat and biota may have taken place, but the ecosystem function is essentially unchanged.
C	60-79	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	40-59	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions have occurred.
E	20-39	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions are extensive.
F	0-19	Critically modified. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. The basic ecosystem functions have been destroyed and the changes are irreversible.

**APPENDIX B:
GLOSSARY OF TERMS FROM NOISE IMPACT STUDY
AND NOISE IMPACT CRITERIA**

A1. GLOSSARY OF TERMS

In order to ensure that there is a clear interpretation of this report the following meanings should be applied to the acoustic terminology:

- **Ambient sound level** or **ambient noise** means the totally encompassing sound in a given situation at a given time, and usually composed of sound from many sources, both near and far. Note that ambient noise includes the noise from the noise source under investigation. The use of the word *ambient* should however always be clearly defined (compare with *residual noise*).
- **A-weighted sound pressure, in Pascals:** The root-mean-square sound pressure determined by use of frequency-weighting network A.
- **A-weighted sound pressure level (SPL) (noise level) (L_{pA}), in decibels:** The sound pressure level of A-weighted sound pressure is given by the equation:

$$L_{pA} = 10 \log (p_A/p_o)^2 \quad \text{where:}$$

p_A is the A-weighted sound pressure, in Pascals; and
 p_o is the reference sound pressure ($p_o = 20$ micro Pascals (μPa))

Note: The internationally accepted symbol for sound pressure level, dB(A), is used.
- **Controlled areas** as specified by the National Noise Control Regulations are areas where certain noise criteria are exceeded and actions to mitigate the noise are required to be taken. Controlled areas as related to roads, airports and factory areas are defined. These Regulations presently exclude the creation of *controlled areas* in relation to railway noise.
- **dB(A)** means the value of the sound pressure level in decibels, determined using a frequency weighting network A. (The "A"-weighted noise levels/ranges of noise levels that can be expected in some typical environments are given in Table A2 at the end of this appendix).
- **Disturbing noise** means a noise level that exceeds the outdoor equivalent continuous rating level for the time period and neighbourhood as given in Table 2 of SANS 10103:2008. For convenience, the latter table is reproduced in this appendix as Table A1.
- **Equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$)** means the value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, has the same mean-square sound pressure as a sound under consideration whose level varies with time.
- **Equivalent continuous rating level ($L_{Req,T}$)** means the equivalent continuous A-weighted sound pressure level during a specified time interval, plus specified adjustments for tonal character and impulsiveness of the sound and the time of day.
- **Equivalent continuous day/night rating level ($L_{R,dn}$)** means the equivalent continuous A-weighted sound pressure level during a reference time interval of 24-hours, plus specified adjustments for tonal character and impulsiveness of the sound and the time of day. (An adjustment of +10dB is added to the night-time rating level).

- **Integrating sound level meter** means a device that integrates a function of the root mean square value of sound pressure over a period of time and indicates the result in dBA.
- **Noise** means any acoustic phenomenon producing any aural sensation perceived as disagreeable or disturbing by an individual or group. Noise may therefore be defined as any *unwanted* sound or sound that is *loud, unpleasant or unexpected*.
- **Noise climate** is a term used to describe the general character of the environment with regard to sound. As well as the ambient noise level (quantitative aspect), it includes the qualitative aspect and the character of the fluctuating noise component.
- **Noise Control Regulations** means the regulations as promulgated by Gauteng Province.
- **Noise impact criteria** means the standards applied for assessing noise impact.
- **Noise level** means the reading on an integrating impulse sound level meter taken at a measuring point in the presence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation, and, if the alleged disturbing noise has a discernible pitch, for example, a whistle, buzz, drone or music, to which 5dBA has been added. (The "A"-weighted noise levels/ranges of noise levels that can be expected in some typical environments are given in Table A2 at the end of this appendix).
- **Noise nuisance** means any sound which disturbs or impairs or may disturb or impair the convenience or peace of any reasonable person considering the location and time of day. This applies to a disturbance which is not quantitatively measurable such as barking dogs, etc. (compared with disturbing noise which is measurable).
- **Residual sound level** means the ambient noise that remains at a position in a given situation when one or more specific noises are suppressed (compare with *ambient noise*).
- **Sound** means the aural sensation caused by rapid, but very small, pressure variations in the air. In quantifying the subjective aural sensation, "loudness", the letters dBA after a numeral denote two separate phenomena:
 - "dB", short for *decibel*, is related to the human's subjective response to the change in amplitude (or largeness) of the pressure variations.
 - The "A" denotes the ear's different sensitivity to sounds at different frequencies. The ear is very much less sensitive to low (bass) frequency pressure variations compared to mid-frequencies.

The level of environmental sound usually varies continuously with time. A human's subjective response to varying sounds is primarily governed by the total sound energy received. The total sound energy is the average level of the fluctuating sound, occurring during a period of time, multiplied by the total time period. In order to compare the effects of different fluctuating sounds, one compares the average sound level over the time period with the constant level of a steady, non-varying sound that will produce the same energy during the same time period. The average energy of sound varying in amplitude is thus equivalent to the continuous, non-varying sound. The two energies are equivalent.

- **Sound exposure level or SEL** means the level of sound accumulated over a given time interval or event. Technically the sound exposure level is the level of the time-integrated mean square A-weighted sound for stated time or event, with a reference time of one second.
- **Sound (pressure) level** means the reading on a sound level meter taken at a measuring point.
- **SANS 10103** means the latest edition of the South African National Standard SANS 10103 titled *The Measurement and Rating of Environmental Noise with Respect to Annoyance and to Speech Communication*.
- **SANS 10210** means the latest edition of the South African National Standard SANS 10210 titled *Calculating and Predicting Road Traffic Noise*.
- **SANS 10328** means the latest edition of the South African National Standard SANS 10328 titled *Methods for Environmental Noise Impact Assessments*.
- **SANS 10357** means the latest edition of the South African National Standard SANS 10357 titled *The Calculation of Sound Propagation by the Concawe Method*.

Refer also to the various South African National Standards referenced above and the Noise Control Regulations for additional and, in some instances, more detailed definitions.

TABLE A1: TYPICAL NOISE RATING LEVELS FOR AMBIENT NOISE IN DISTRICTS (NOISE ZONES)

Type of Districts ^a	Equivalent-Continuous-Rating-Level-for-Noise-(L _{Req,T}) ^b (dBA) ^a					
	Outdoors ^a			Indoors-with-open-windows ^a		
	Day-night- (L _{R,da}) ^a	Daytime ^b (L _{Req,d}) ^a	Night-time- (L _{Req,n}) ^a	Day-night- (L _{R,da}) ^a	Daytime ^b (L _{Req,d}) ^a	Night-time- (L _{Req,n}) ^a
a)→Rural-districts ^a	45 ^a	45 ^a	35 ^a	35 ^a	35 ^a	25 ^a
b)→Suburban-districts- (little road traffic) ^a	50 ^a	50 ^a	40 ^a	40 ^a	40 ^a	30 ^a
c)→Urban-districts ^a	55 ^a	55 ^a	45 ^a	45 ^a	45 ^a	35 ^a
d)→Urban-districts- (some workshops, business premises and main roads) ^a	60 ^a	60 ^a	50 ^a	50 ^a	50 ^a	40 ^a
e)→Central business- districts ^a	65 ^a	65 ^a	55 ^a	55 ^a	55 ^a	45 ^a
f)→Industrial-districts ^a	70 ^a	70 ^a	60 ^a	60 ^a	60 ^a	50 ^a

TABLE A2: NOISE LEVELS/RANGES OF NOISE LEVELS THAT MAY BE EXPECTED IN SOME TYPICAL ENVIRONMENTS

Noise Level dB(A)	Typical Environment	Subjective Description
140	30m from jet aircraft during take-off	
130	Pneumatic chipping and riveting (operator's position)	Unbearable
>120	Hearing damage possible even for short exposure	
120	Large diesel power generator	
105-120	Low level military aircraft flight	
110-120	100 m from jet aircraft during take-off	
110	Metal workshop (grinding work), circular saw	
105-110	High speed train at 300 km/h (peak pass-by level at 7,5m)	
90-100	Printing press room	Very noisy
95-100	Passenger train at 200km/h (peak pass-by level at 7,5m).	Very noisy
95-100	Freight train at 100 km/h (peak pass-by level at 7,5 m)	Very noisy
90-100	Discotheque (indoors)	
75-100	7,5 m from passing motorcycle (50 km/h)	
75-80	10 m from edge of busy freeway (traffic travelling at 120 km/h)	
80-95	7,5 m from passing truck (50 km/h)	
80	Kerbside of busy street	
70	Blaring radio	Noisy
70	3 m from vacuum cleaner	Noisy
60-80	7,5 m from passing passenger car (50 km/h)	
65	Normal conversation @ 1m	
65	Large busy office	
60	Supermarket/small office	
50	Average suburban home (day conditions)	Quiet
40	Library	
40-45	Average suburban home (night-time)	
30-35	Average rural home (night-time)	
25-30	Slight rustling of leaves	
20	Background in professional recording studio	Very quite
20	Forest (no wind)	

Noise Level dB(A)	Typical Environment	Subjective Description
0-20	Experienced as complete quietness	
0	Threshold of hearing at 1000 Hz	

A2. NOISE IMPACT CRITERIA

The international tendency is to express noise exposure guidelines in terms of absolute noise levels. These guidelines imply that in order to ascertain an acceptable living environment, ambient noise in a given type of environment should not exceed a specified absolute level. This is the approach provided by the environmental guidelines of the World Bank and World Health Organisation, which specify 55 dBA during the day (06:00 to 22:00) and 45 dBA during the night (22:00 to 06:00) for residential purposes, determined over any hour. SANS 10103 conforms to the described international tendency. The recommended standards to be applied are summarised in Table A1.

Communities generally respond to a change in the ambient noise levels in their environment, and the guidelines set out in SANS 10103 provide a good indication for estimating their response to given increases in noise. The suggested severity criteria for the noise impacts are summarised in terms of the above guidelines in Table A3.

TABLE A3: CATEGORIES OF COMMUNITY/GROUP RESPONSE (CRITERIA FOR THE ASSESSMENT OF THE SEVERITY OF NOISE IMPACT)

Increase in Ambient Noise Level (dBA)	Estimated Community/Group Response	
	Category	Description
0 – 10	Little	Sporadic complaints
5 – 15	Medium	Widespread complaints
10 - 20	Strong	Threats of community/group action
Greater than 15dBA	Very strong	Vigorous community/group action

Changes in noise level are perceived as follows:

- **3dBA:** For a person with average hearing acuity, an increase in the general ambient noise level of 3dBA will be just detectable.
- **5dBA:** For a person with average hearing acuity an increase of 5dBA in the general ambient noise level will be significant, that is he or she will be able to identify the source of the intruding noise. According to SANS 10103 the community response for an increase of less than 5dBA will be 'little' with 'sporadic complaints'. For an increase of equal or more than 5dBA the response changes to 'medium' with 'widespread complaints'.
- **10dBA:** A person with average hearing will subjectively judge an increase of 10dBA as a doubling in the loudness of the noise. According to SANS 10103 the estimated

community reaction will change from 'medium' with 'widespread complaints' to 'strong' with 'threats of community action'.

In the Gauteng Noise Control Regulations which are applicable for this project, an intruding noise is defined as 'disturbing' if it causes the ambient noise level to rise above the designated zone level, or if no zone noise level has been designated the typical rating levels for ambient noise in districts as indicated in SANS 10103. Refer to Table A1.