





DELTA
built environment consultants

ENVIRONMENTAL MANAGEMENT PROGRAMME

CONSTRUCTION OF THE NEW KLEREFONTEIN EOC BUILDING

FINAL REPORT
REVISION 00

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GLOSSARY OF TERMS AND ABBREVIATIONS

AEL	Atmospheric Emission Licence
CARA	Conservation of Agricultural Resources Act, 1989 (Act No. 43 of 1989)
COLTO	Committee of Land Transport Officials
CQA	Construction Quality Assurance
DAFF	Department of Agriculture, Forestry and Fisheries
Delta BEC	Delta Built Environment Consultants
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
ECA	Environment Conservation Act, 1989 (Act No. 73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Programme
EMPR	Environmental Management Programme Report
EMS	Environmental Management System
EOC	Engineering Operational Centre
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
IEA	Independent Environmental Auditor
KPI	Key Performance Indicator
NBI	National Botanical Institute
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFA	National Forests Act, 1998 (Act No. 84 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
OAR	Observation Action Register
OHSA	Occupational Health & Safety Act, 1993 (Act No. 85 of 1993)
PPE	Personal Protective Equipment
Pty	Proprietary Company
ROD	Record of Decision
RE	Resident Engineer
SHEQ	Safety, Health, Environment and Quality
SAHRA	South African Heritage Resources Agency
SANRAL	The South African National Roads Agency SOC Limited
SARAO	South African Radio Astronomy Observatory
SECO	Site Environmental Control Officer
SKAO	Square Kilometre Array Observatory
SLA	Service Level Agreement
SMS	Site Maintenance Services
TOPS	Threatened or Protected Species

WML	Waste Management License

1 INTRODUCTION

1.1 BACKGROUND

Delta Built Environment Consultants (Delta BEC) has been appointed by South African Radio Astronomy Observatory (SARAO), which is a National Facility of the and National Research Foundation (NRF), to conduct the Environmental Authorisation process (via a Basic Assessment) for the proposed construction of the New SKA1 Mid Engineering Operations Centre Building (EOC) at SARAO Karoo Support Base on the Klerefontein farm near Carnarvon, Northern Cape.

SARAO is a National Facility of the NRF and has established its support base (SARAO Karoo Support Base) at Klerefontein. The farm Klerefontein is owned by the Northern Cape Provincial Department for Roads and Public Works. The NCPDRPW has allocated the farm to the Northern Cape Department of Agriculture where the farm is actively used as an Agricultural Research Centre.

The NRF and the NCDA concluded a memorandum of Agreement to secure the approximately 8,5 ha (red area) for use by SARAO/SKAO as the Support base for the SKA Project in the Karoo. The intended development by SARAO/SKAO on Klerefontein will be formally recorded per notarial deed on the Deed of the Klerefontein farm considering the value of the investment SARAO will be implementing on the 8,5 ha.

South Africa's National Infrastructure Plan incorporates the Square Kilometre Array (SKA) and MeerKAT projects as Strategic Integrated Projects (SIPs) (SIP 16). The aim of the project is to provide opportunity for Africa, and South Africa, to contribute towards global advanced science projects. As a SIP project, the proposed project is given a provision for a reduced timeframe for EIA and BA application process.

The SKA1-MID Engineering Operations Centre (EOC) will be an expansion of the current infrastructure on site where the current workshops will be expanded as a singular building to incorporate:

- New office space
- Additional workshops
- Expansion of generator facilities and diesel storage

There is also a second building on site which is the old farmhouse which will remain unaltered as it is more than 60 years old and is therefore protected by the National Heritage Resources Act (Act 25 of 1995).

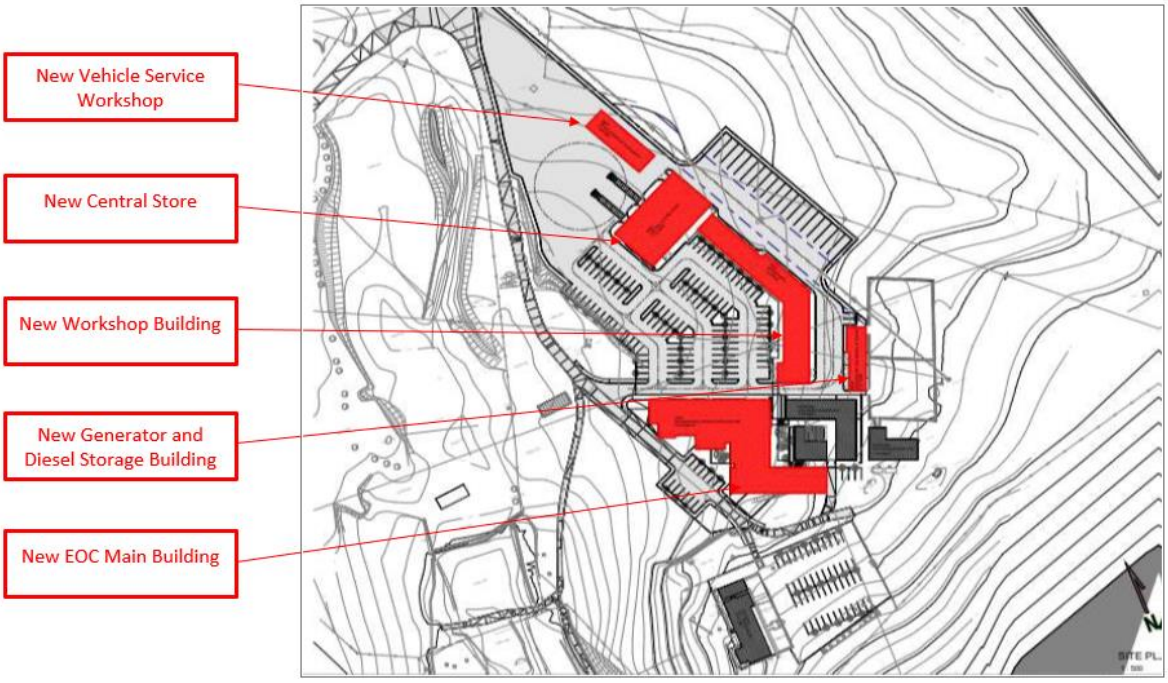

Figure 1: Proposed EOC Extension Building

The Environmental Management Plan (EMP) provides a description of the methods and procedures for mitigating and monitoring impacts. The EMP also contains environmental objectives and targets which the project proponent needs to achieve to reduce or eliminate negative environmental impacts. Monitoring methods and performance indicators are also included.

It is the duty of the client to implement this EMP on the project site and it is recommended that copies of this EMP must always be kept at the site office. Copies thereof must be distributed to all senior contract personnel. All senior personnel involved in the operation of the development must familiarise themselves with the content of the EMP.

A detailed induction protocol, incorporating the conditions of the EMP must be developed, and all Contractors and future permanent staff must be subjected to stringent training on these environmental (biophysical and socio-economic) requirements and responsibilities.

Where possible, broad cost estimates have been included to provide an indication of the resources required to successfully implement the control measures. These can be used for planning purposes or will assist in prioritising the implementation and can be further refined by the project team. Additional management plans may be required at a later stage to provide detail on specific aspects of the project (e.g., stormwater management plan). The mitigation measures that form part of the Construction Phase should be incorporated into the contractual conditions of the Contractor as part of the contract agreement.

The roles and responsibilities for the implementation and enforcement of environmental and social controls (including health and safety) will need to be designated to individuals with the capacity and capabilities to undertake the work. The EMP has been outlined in the following sub-sections:

- Pre-construction Phase
    - This section of the EMPr provides management principles for the planning and design phase of the project. Environmental actions, procedures and responsibilities as required from NRF & SARAO during the planning and design phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfaction of the Project Coordinator and Environmental Control Officer.

- Construction Phase
    - This section of the EMPr provides management principles for the construction phase of the project. Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfaction of the Project Coordinator and Environmental Control Officer.

- Operational Phase.
    - This section of the EMPr provides management principles for the operation phase of the project. Environmental actions, procedures and responsibilities as required from NRF & SARAO during the operation phase are specified.

1.2 PURPOSE OF REPORT

This EMPr provides a description of the methods and procedures for mitigating and monitoring impacts. The EMPr also contains environmental objectives and targets which the project proponent needs to achieve in order to reduce or eliminate negative environmental impacts. Monitoring methods and performance indicators are also included.

The purpose of the EMPr is to provide specifications for "good environmental practice" for application during construction. This EMPr informs all relevant parties (the Project Coordinator, the Contractor, the Environmental Control Officer (ECO) and all other staff employed by NRF/& SARAO at the site) as to their duties in the fulfilment of the legal requirements for the construction and operation of the construction of the New EOC Buildings with particular reference to the prevention and mitigation of anticipated potential environmental impacts.

All parties should note that obligations imposed by the EMPr are legally binding in terms of the environmental authorisation granted by the relevant environmental permitting authority.

An EMPr represents a detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the lifecycle of a project. The EMPr must be clear on the commitments made on which mitigation measures will be implemented in a document that is to be enforced as part of a legal requirement during the lifespan of the proposed project.

The scope of the EMPr for the proposed construction works is as follows:

- Establish management objectives during the project lifecycle in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMPr;
- Provide legislative framework; and
- Description of requirements for record keeping, reporting, review, auditing and updating of the EMPr.

The primary objectives of the EMPr are to:

- Provide mitigation measures to limit environmental impacts and improve management of activities thereby reducing the probability of impacts occurring; and
- Define organisational and administrative arrangements for environmental management and monitoring of the work contract, including defining the responsibilities of staff and co-ordination, liaison and reporting procedures.
- Ensure compliance with regulatory authority stipulations and guidelines which may be local, provincial, national and/or international;
- Verify environmental performance through information on impacts as they occur;
- Provide feedback for continual improvement in environmental performance;
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Identify measures that could optimize beneficial impacts;
- Create management structures that address the concerns and complaints of I&APs with regards to the development.

1.3 EMPR ADMINISTRATION

A Copies of this EMPr must be always kept at the site office. Copies thereof must be distributed to all senior contract personnel. All senior personnel involved in the

operation of the development and must familiarise themselves with the content of the EMPr.

A detailed induction protocol, incorporating the conditions of the EMPr must be developed and all contractors and future permanent staff must be subjected to stringent training on these environmental (bio-physical and socio-economic) requirements and responsibilities.

1.4 STRUCTURE OF REPORT

The report comprises the following sections:

- Section 2: Definitions
- Section 3: Proposed activity
- Section 4: Organisational requirements
- Section 5: Roles and responsibilities
- Section 6: Method statements
- Section 7: Environmental awareness training
- Section 8: Legislation
- Section 9: Planning and Design Phase
- Section 10: Pre-construction phase
- Section 11: Construction phase
- Section 12: Operational phase
- Section 13: Conclusion

2 DEFINITIONS

Table 2-1: Definitions

Contractor (C)	A person or company appointed by the client to carry out stipulated activities.
Domestic Waste	Waste, excluding hazardous waste that emanates from premises that are used wholly or mainly for residential, educational, health care, sport or recreational purposes.
Emergency	An undesired event that does result in significant environmental impacts and requires the notification of relevant statutory body such as a local or provincial authority.
Environmental Management Programme (EMPr)	A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive environmental impacts and limiting or preventing negative environmental impacts are implemented during the life-cycle of the project.
Environment	The surroundings within which humans exist and that are made up of: • The land, water and atmosphere of the earth • Micro-organism, plant and animal life • Any part or combination of (i) and (ii) and the interrelationships among and between them, and • The physical, chemical, aesthetic, and cultural properties and conditions of the foregoing that influence human health and well-being.
Environmental Control Officer (ECO)	A person appointed by the client to monitor environmental compliance of the contractor and produce monthly environmental compliance reports.
Environmental Impact	A change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.
Hazardous Waste	Hazardous waste means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste have a detrimental impact on health and the environment.
Mitigation	The implementation of practical measures to reduce the adverse effects or enhance the beneficial effects of an action
Rehabilitation	Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement re-vegetation of a disturbed area and the insurance of a stable land surface. Re-vegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way.

Run-off	The total water yield from a catchment, including surface and subsurface flow.
Stormwater	Water resulting from natural precipitation and/or the damming up or accumulation thereof and includes groundwater and spring water ordinarily conveyed by the stormwater system, but excludes water in a drinking water or waste water reticulation system.
Surface Water	Permanently or seasonally flooded areas characterized by the absence (or low abundance) of emergent plants.
Topsoil	The upper soil profile irrespective of the fertility, appearance, structure, agriculture potential and composition of the soil, usually containing organic material and which is colour specific.
Watercourse	A geomorphological feature characterized by the presence of a stream flow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water.

3 PROPOSED ACTIVITY

Environmental Management Programme (EMPr) must include:

- A detailed description of the aspects of the activity that are covered by the draft environmental management programme as identified by the project description;
- A map at an appropriate sale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;

3.1 DESCRIPTION OF PROPOSED ACTIVITY

3.1.1 NEW MAIN BUILDING

The new proposed EOC Main Building will be a double story that consist of 72 rooms and will accommodate the reception area offices, meeting rooms, server rooms, ablutions and general breakout area. The building shall make provision for one housekeeping cupboard per floor with an area of 15m^2.

The EOC Main Building ground floor will consist of 33 rooms with a total area of 1467m^2, while the first floor of this building will consist of 39 room with the total area of approximately +886 m^2 exclusive of the area of two rooms (SARAO Infrastructure Site Operations Open Plan & SARAO Infrastructure Site Maintenance Open Plan) as the total area for these rooms is not stipulated.

3.1.2 NEW EOC WORKSHOP BUILDING

EOC Workshop Building will have 18 rooms with a total area of 1488 m^2.

3.1.3 NEW EOC VEHICLE WORKSHOP BUILDING

The EOC Vehicle Workshop Building will have consist of 4 rooms (wash bay, vehicle service office, store and workshop), with a total area of 235 m^2.

3.1.4 NEW EOC GENERATOR & DIESEL STORAGE BUILDING

The new EOC Generator and Deisel Storage Building will have Three (3) diesel tank storage, a pump room, generator room and UPS room with a total area of 160 m^2.

3.1.5 TELECOMS MAST

Telecom Mast will entail a 2.2m x 2.2m base, 112W HD galvanised steel cable gantry supported by 50dia galvanised steel supports, with a 75dia Optex sleeve for FO & and power cable feed from the admin centre, an additional 2.5m x 2.5m plinth and equipment container of 2.1 x 1.8 x 2.1h with A/C (alternating current).

3.1.6 HYDROGEN INTENSITY AND REAL TIME ANALYSIS EXPERIMENT (HIRAX) PROTYPE

It is planned that 1024 small radio telescopes will be installed on the SKA Site – Swartfontein farm as part of the Hydrogen Intensity and Real Time Analysis eXperiment (HIRAX). The design, installation, commissioning and operation of the system is expected to take eight years.

A two-element prototype will be designed and built at Klerefontein Support Base before construction begins. The prototype will comprise two 6m diameter dishes. The dishes will be connected through trenched fibre and power cabling to a container approximately 20m away from the prototype dishes. The container will be 3x6m in size (±18m2) and will store processing equipment.

3.1.7 RADIO FREQUENCY INTERFERENCE (RFI) CHAMBER

The Karoo Measurement Facility will consist of a modular building for environmental protection that will contain a reverberation chamber (RVC) and an equipment chamber, that are both shielded rooms made up of steel modular panels. In order to measure radiation from the equipment and workstations, an RCV is used. The modular building will cover an area of 150 m2, and the weight is unknown, but the shielded rooms alone will weigh about 8 – 9 tons on an area of 61 m2.

4 ORGANISATIONAL REQUIREMENTS

During construction, all instructions and official communications regarding environmental matters shall follow the organisational structure shown in Figure 4-1. The organisational structure identifies and defines the authority's structure, and the communication structure for the various parties involved in the construction of the proposed development.

The client (NRF &/ SARAO) shall appoint an independent ECO to oversee the implementation of the EMPr onsite. It will be the responsibility of the ECO to consult with the RE regarding instructions pertaining to contravention, corrective actions, and penalties or working methods.

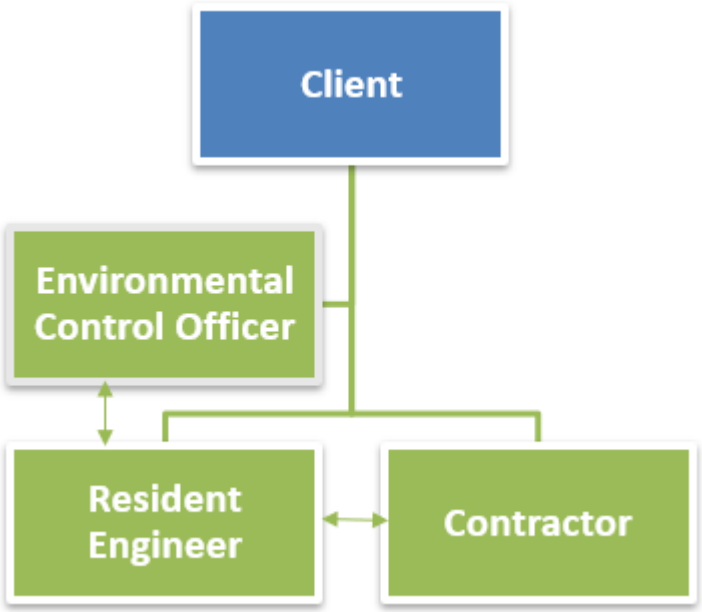

Figure 4-1: Organisational Hierarchy

5 ROLES AND RESPONSIBILITIES

The following list of roles and responsibilities is required for the successful implementation of the EMP.

5.1.1 ENVIRONMENTAL AUTHORITY (DFFE)

DFFE is the designated authority responsible for approving this EMPr and has overall responsibility for ensuring that the Applicant complies with the EMPr and shall also be responsible for approving any substantive amendments that may be required to the EMPr and may also perform random site inspections to check compliance with the EMPr.

5.1.2 CLIENT

The Client (NRF & SARAO) will be responsible for the overall implementation, administration, and enforcement of the EMPr. The developer shall:

- Ensure that the EMPr specifications are included in all tender documents issued for the development works and activities on site, and shall ensure that the prospective Tenders / Contractors abide by the provisions thereof,
- Appoint an ECO to monitor implementation of and compliance with the EMPr for the duration of the works. The resident engineer (RE) may be required to fulfil this function when the ECO is not available,
- Be liable / accountable, to the relevant authority, for any contravention / non-compliance by any Contractor under their supervision, and
- Through the RE issue fines or stop works orders for contravention of the EMPr and give instruction regarding corrective action.

5.1.3 ENVIRONMENTAL CONTROL OFFICER

The ECO will be responsible for monitoring, reviewing, and verifying compliance with the EMPr by the Contractor. In particular, the ECO shall:

- Be appointed by the Client to monitor all activities on site.
- Visit / inspect the site regularly, to ascertain the level of compliance of works
- Assist the RE in ensuring that necessary environmental authorisations and permits have been obtained.
- Review and approve construction Method Statements together with the RE
- Assist the Contractor in finding environmentally responsible solutions to problems.
- Provide material/manuals and assistance for the environmental awareness courses.
- Maintain a photographic record of the site before, during and after construction.
- Ensure that activities on site comply with legislation of relevance to the environment.

5.1.4 RESIDENT ENGINEER

The Engineer shall assign a Resident Engineer (RE) to act as on-site implementing agent. The RE shall ensure that the Engineer's responsibilities are executed in compliance with the EMPr. Any on-site decisions regarding environmental management are ultimately the responsibility of the RE.

The RE will be responsible for monitoring, reviewing and verifying compliance with the EMPr by the Contractor when the ECO is not available. The RE's duties, over and above his contractual obligations, will include the following:

- Comply with the contents of this document as well as with the EMPr specifications in the Contract Document to ensure that the requirements of the EMPr are met.
- Monitor and verify that the EMPr is adhered to at all times and take action if the specifications are not followed.
- Monitor and verify that environmental impacts are kept to a minimum.
- Review construction Method Statements in conjunction with the ECO.
- Assist the Contractor in finding environmentally responsible solutions to problems with input from the ECO.
- Inspect the site and surrounding areas regularly with regard to compliance with the EMPr.

The Engineer shall address any site problems pertaining to the environment at the request of the Project Environmental Manager (PEM) and/or ECO. The Engineer shall also be responsible for ensuring that any contraventions of the EMPr are addressed in the most appropriate manner.

5.1.5 PROJECT ENVIRONMENTAL MANAGER (PEM)

PEM must be appointed by the client for planning and construction phases of the project. The PEM must be an independent consultant and must be permanently on the site during the period of construction. The qualifications and terms of reference of the PEM shall include the following:

- Have a tertiary qualification in the natural sciences and a proven track record in environmental contract management on large projects. Formulate the most effective and structured monitoring and reporting strategy, tailored to the conditions of the contract;
- Review the Method Statements prepared, in terms of compliance with the final construction EMPr, and ensure that these are sufficient to meet the outcomes that are required. This must be done before the method statements go to the ECO;
- Report to and discuss with the relevant authorities any significant non-compliance and the steps to be taken to rectify this;
- Be responsible for the further development and finalisation of this EMPr in consultation with the client (NRF &/ SARAO);

- Be responsible for the overall implementation of the EMPr in accordance with the requirements of DFFE;
- Ensure that adequate and competent environmental staff is on site at any construction activity during construction works;
- Ensure that all third parties who carry out all or part of NRF & SARAO obligations comply with the requirements of the EMPr;
- Ensure that any further environmental approvals/licences/permits required for the design, construction and operation of the proposed construction of the New EOC Buildings are obtained, as appropriate.
- Assisting the Contractor and/or the RE in finding environmentally acceptable solutions to construction problems;
- Recommending additional environmental protection measures should this be necessary;

5.1.6 CONTRACTOR

The Contractor shall:

- Ensure that the environmental specifications contained in the EMPr are effectively implemented. This includes the on-site implementation of steps to mitigate environmental impacts.
- Ensure that all employees and sub-contractors employed comply with the requirements and provisions of the EMPr.
- Monitor environmental performance and conformance with the specifications contained in this document during daily site inspections.
- Discuss implementation of and compliance with the EMPr with staff at routine site meetings.
- Report progress towards implementation and all non-compliances with the EMPr at site meetings.
- Notify the ECO of the detailed anticipated programme of works to take place.
- Ensure all required records are kept and all documentation is available to the ECO.
- Notify the ECO of all incidents, accidents, and transgressions on site with respect to the environmental management as well as the requirements of the EMPr.
- Inform the ECO of problems arising when implementing the EMPr and recommended ways of improving it.
- Inform the ECO of any complaints received, and maintain complaints register on site.

5.1.7 ENVIRONMENTAL MONITORING COMMITTEE (EMC)

It is recommended that the client (NRF & SARAO) establish an EMC for the duration of the construction phase.

- The EMC must meet on a quarterly basis or as decided by the members of the EMC;
- The EMC must be chaired by an independent chairperson appointed by the EMC and must consist of representatives of the key authorities (i.e. DFFE, relevant provincial environmental authorities, DWS and relevant local municipalities etc.), the ECO(s), a representative of the Tribal Authorities and the main contractor;
- NRF & SARAO must supply the secretariat services for the EMC;
- The EMC must report to the Director: Environmental Impact Management at DFFE from the start of the project until completion of the construction phase; and
- All costs associated with the functioning of the EMC and secretariat services shall be borne by NRF &/ SARAO.

The purpose of the EMC would be to execute the following:

- To monitor and audit the project compliance, using an independent ECO, with specific conditions of the environmental authorisation and the requirements of the approved EMPr;
- To make recommendations to the Director at DEA on issues related to the monitoring and auditing of the project implementation; and
- To advise DFFE on issues related to non-conformance reports raised against NRF &/ SARAO by the ECO(s)

5.2 REPORTING

5.2.1 LINES OF COMMUNICATION (REPORTING)

Open and clear lines of communication shall be established and maintained between the contractor, client and any further parties to be appointed by the applicant (e.g., Independent ECO, etc.).

5.2.2 COMPLIANCE MONITORING

The contractor is to ensure that employees and all sub-contractors onsite are familiar with the requirements of the EMPr and conditions stipulated in the relevant environmental authorisations (i.e. NEMA EA) issued for the project. Therefore, the contractor should implement a management system reviewing compliance to these.

The applicant must appoint an internal, permanent ECO on site who will be monitoring the site and submitting monthly monitoring reports to the applicant.

Monitoring reports are to be sent to the relevant authorities by the client or the appointed independent ECO, as per the specific requirements set in the project's environmental authorisations.

5.2.3 COMMUNICATION WITH AUTHORITIES

Only the client and the appointed independent ECO are to liaise with Authorities, except if the contractor has to report Occupational Health and Safety incidents / accidents to the Department of Labour.

5.2.4 INCIDENTS REPORTING

The contractor is to conduct incident investigations immediately after occurrence. If an incident is identified as being a major incident, the contractor is to inform the applicant without delay.

The contractor is to ensure all employees are made aware on the relevant incident reporting procedures. The contractor must ensure that all relevant appointments are in place. An Incident Register must be kept on site and up to date at all times.

5.2.5 LEGAL NON-COMPLIANCE

Any legal non-compliance which may have a significant detrimental impact on the environment must be reported by the client to the relevant Authority within 24 hours, unless otherwise stipulated.

5.2.6 NON-COMPLIANCE WITH CONDITIONS

Any legal non-compliance that may have a significant detrimental impact on the environment with conditions stipulated in any Authorisation / License / Permit, to be reported by the applicant to the relevant Authority within 24 hours, unless otherwise stipulated.

5.2.7 COMPLIANCE MONITORING

Compliance monitoring will be done against, inter alia:

- Conditions of any authorisations acquired;
- The current EMPr;
- Specialist Reports;
- Applicable Environmental Legislation:
    - National Environmental Management Act, 1998 (Act No. 107 of 1998);
    - National Heritage Resources Development Act, 1999 (Act No. 25 of 1999);
    - National Water Act, 1998 (Act No. 36 of 1998);
    - Occupational Health and Safety Act, 1993 (Act No. 85 of 1993); and
    - Hazardous Substances Act, 1973 (Act No. 15 of 1973)
    - Hazardous Chemical Substances Regulations, 1995
- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
    - Regulation 1031; and
- Procedures and policies prescribed and amended from time to time by the applicant.

The responsibilities in terms of Environmental Compliance Monitoring are as follows:

- The client will be responsible for the appointment of a suitably qualified Environmental Assessment Practitioner (EAP) as an independent Environmental Control Officer (ECO) for the construction phase of the project.
- A management team must be appointed to ensure compliance with the Environmental Management Program (EMPr) during the operational phase.
- The PM will be responsible to ensure all contractors receive a copy of this document and understand its contents.
- The ECO will ensure that all contractors / subcontractors / employees are fully aware of their environmental responsibilities.
- Contractors must ensure that all the environmental and safety precautions contained in the Environmental Authorisation, mitigating measures included in the Specialist Studies as well as this EMPr are adhered to, at all times.
- Compliance monitoring will take place by means of regular site visits and reporting by the ECO, for onwards transmission to the applicant and the relevant Government Departments for their information and record keeping.

6 METHOD STATEMENTS

The contractor / operator shall submit written method statements to the ECO and Resident Engineer for approval.

The method statements should provide a step-by-step description in order for the ECO and the Engineer to understand the contractor's proposed actions.

Method statements should indicate the following:

- **What**: A description of the work to be undertaken
- **How**: A description of the process of work, methods and materials to be used
- **When**: An estimate of the commencement and end dates
- **Who**: The people that will be undertaking the activity

The method statement should also detail the control measures that will be put in place to ensure correct environmental management.

The Method statement should be approved by the ECO and Resident Engineer prior to works being carried out.

The following Method Statements should be provided by the contractor and submitted to the ECO and Resident Engineer at least seven days prior to site establishment.

6.1 SITE CLEARANCE, PREPARATION AND EARTHWORKS.

The method to be undertaken during vegetation clearance for site establishment.

6.2 TOPSOIL

Method of clearing topsoil and location of topsoil stockpiles and the methods that will be implemented to avoid erosion.

6.3 FUEL STORAGE

The location and specifications of the fuel storage area where re-fuelling will be undertaken.

6.4 SOLID WASTE CONTROL SYSTEM.

Expected solid waste types, quantities, disposal procedures.

6.5 STORAGE AND USE OF HAZADOUS SUBSTANCES

Specifications of the hazardous materials to be used and the storage, handling, and disposal of such materials. The location of cement and concrete mixing areas and the methods that will be used to undertake this.

6.6 FIRE CONTROL AND EMERGENCY PROCEDURES

The emergency procedures that will be followed in the event of fire, accidental leaks, and the spillage of hazardous substances (firefighting equipment, spill kits, etc.)

6.7 SITE LAYOUT AND ESTABLISHMENT.

The site areas should preferably be located on level ground in a previously disturbed area of vegetation approved by the Environmental Control Officer (ECO).

6.8 STORAGE AND RELEASE/COLLECTION OF EFFLUENT.

Toilets shall be serviced regularly, and the ECO shall inspect toilets regularly.

6.9 EQUIPMENT AND VEHICLE MAINTENANCE.

All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.

6.10 CONSTRUCTION STORMWATER MANAGEMENT.

An in-depth Stormwater Management Plan (SWMP), which must be driven by a risk-averse approach, must be drafted for all aspects of the proposed development and over different hydrological cycles.

6.11 INCIDENT RESPONSE AND MANAGEMENT.

The Client must appoint an occupational health and safety officer (OHSO) and ECO to oversee the safety and environmental aspects of the project, respectively.

6.12 REHABILITATION AND LANDSCAPING.

The method to be undertaken during rehabilitation, post – construction for the proposed development.

7 ENVIRONMENTAL AWARENESS TRAINING

Construction personnel shall be adequately trained with regard to the implementation of the EMP, as well as regarding environmental legal requirements and obligations. All construction personnel shall attend an induction course presentation on environmental awareness.

Where possible, presentations need to be conducted in the language of the employees. The environmental training should, as a minimum, include the following:

The Environmental awareness training should cover topics such as:

- What is the environment?
- Why the environment needs to be protected.
- The regulatory implications of detrimental actions to the environment.
- How proposed construction can impact on the environment.
- Measures to mitigate against environmental impacts.
- Awareness of emergency spill procedures.

Environmental awareness should be provided as part of toolbox talks.

- Topics to be covered include, inter alia:
    - Reason for conservation and protection of the environment (EMPr objectives)
    - Identified impacts of construction activities on the environment.
    - Mitigation measures in respect of these impacts.
    - Emergency spills, awareness thereof and response there to.
    - Hydrocarbon spills and clean-up procedures.
    - Potential environmental emergencies.
    - Various sections of the EMPr.
    - Roles and Responsibilities.
- Attendance registers and training material must be filed for every session.
- Training must be given prior to commencement of construction regarding safety for dealing with wild animals such as snakes, scorpions etc.

Environmental awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. The Contractor shall ensure that records of all training interventions are kept as set out in this EMPr. The training records shall verify each of the targeted personnel's training experience.

8 LEGISLATION

Table 8-1: Legislation

LEGISLATION	DESCRIPTION
Astronomy Geographic Advantage Act [AGA], 2007 (Act No. 21 of 2007)	The Astronomy Geographic Advantage (AGA) Act of 2007 is a legislation that gives the Minister of Science and Technology the power to protect areas, through regulations, that are of strategic national importance for astronomy and related scientific endeavours. An area can only be protected after it has been declared as an Astronomy Advantage Area (AAA). The Minister must undertake an extensive and consultative public participation process with all interested and affected parties, recorded on a permanent data base. Once the Minister has declared a AAA, detailed regulations that flesh out what is and isn't allowed in the area, must also be published. The promulgation of these regulations must also follow an extensive public participation process.
Constitution of the Republic of South Africa [CARA], 1996 (Act No. 108 of 1996)	Section 24 places people and their needs at the forefront of environmental management. The Constitution provides a right to "an environment that is not harmful to human health or well-being" and to have the environment protected, for the benefit of present and future generations, through reasonable legislative measures. These measures include the prevention of pollution and ecological degradation, the promotion of conservation, the securing of ecologically sustainable development and the utilization of natural resources while promoting justifiable economic and social development.
National Environmental Management Act [NEMA], 1998 (Act No. 107 of 1998)	The NEMA EIA Regulations, 2014 (as amended) list activities which require environmental assessment and authorisation prior to construction. These activities are known as 'listed activities', and must be authorised by the Department of Environmental Affairs (DEA).
National Environmental Management: Waste Act [NEM:WA], 2008 (Act No. 59 of 2008)	The National Environmental Management Waste Act seeks to reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

LEGISLATION	DESCRIPTION
National Heritage Resources Act [NHRA], 1999 (Act No 25 of 1999) and regulations	The South African Heritage Resources Act, Act No. 25 of 1999 deals with aspects concerning the conservation of cultural resources. The Act stipulates that all cultural and heritage resources are the property of the State and may not be disturbed without authorization from the relevant heritage authority. Cultural and heritage resources include graves, paleontological and archaeological remains, structures older than 60 years and other items of historical significance.
National Environmental Management: Air Quality Act [NEM:AQA], 2004 (Act No 39 of 2004)	The National Environmental Management Air Quality Act seeks to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development.
National Environmental Management: Biodiversity Act [NEM:BA], 2004 (Act No. 10 of 2004)	The purpose of the National Environment Management Biodiversity Act (NEM BA) is to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act (107 of 1998). This includes: the protection of species and ecosystems, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources, and the establishment of a South African National Biodiversity Institute.
National Water Act [NWA] (Act No. 36, 1998)	The National Water Act, 1998 (Act No. 36 of 1998) (NWA) aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected, as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed, and controlled in responsible ways. Of specific importance to this application is Section 19 of the NWA, which states that an owner of land, a person in control of land or a person who occupies or uses the land which thereby causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing, or recurring and must, therefore, comply with any prescribed waste standard or management practices

LEGISLATION	DESCRIPTION
Infrastructure Development Act, 2014 (Act No. 23 of 2014)	The Infrastructure Development Act 23 of 2014 aims: • To provide for the facilitation and co-ordination of public infrastructure development which is of significant economic or social importance to the Republic; • to ensure that infrastructure development in the Republic is given priority in planning, approval and implementation; • to ensure that the development goals of the state are promoted through infrastructure development; • to improve the management of such infrastructure during all life-cycle phases, including planning, approval, implementation and operations; and • to provide for matters incidental thereto.

9 PRE-CONSTRUCTION PHASE

Table 9-1: Pre-construction Phase

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
Planning	Notify all stakeholders of the proposed project.	• Notify all key stakeholders of the project.	Contractor	Prior to the start of the works
	Ensure compliance with legal and other permitting requirements.	• Ensure that relevant legal requirements have been met. • It is the duty of the responsible person to ensure that all requirements pertaining to the operation of the facility are complied with. • Resources should be made available to ensure the operation of the site is carried out as per the relevant legislative requirements. • This EMP is binding and should form part of all agreements between the applicant and Contractors.	Contractor	Prior to the start of the works
	Schedule site preparations	• Prepare a project schedule to coordinate vehicle movements, deliveries and construction activities to minimise noise emissions and minimise traffic congestion.	Contractor	Prior to the start of the works
	Northern Cape critical Biodiversity Area 2016 (NCCBA)	• The planning and design of the proposed study area must adhere to the recommendations of the NCCBA, where possible	Contractor	Prior to the start of work / Once-Off

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
Method statements	Draft and approve method statements	The following method statements are required: • Site layout and establishment. • Site clearance, preparation and earthworks. • Storage and use of hazardous substances. • Storage and release/collection of effluent. • Solid waste control system. • Equipment and vehicle maintenance. • Construction stormwater management. • Incident response and management. • Fire control and emergency procedures. • Rehabilitation and landscaping.	Contractor	Prior to the start of the works
General compliance reporting	Correct reporting of compliance	• The Client must appoint an occupational health and safety officer (OHSO) and environmental control officer (ECO) to oversee the safety and environmental aspects of the project, respectively. • The OHSO and ECO must form part of the project management team and must attend all project meetings. • They will both be required to supply the project manager with a monthly report on the compliance or non-adherence of the Contractors and subcontractors to the environmental and safety guidelines contained in this EMP. An incident log must be used to keep record of non-compliance.	Contractor	Continuous

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
Limit footprint of construction	Reduce the compaction and destruction of natural vegetation	• The approved method statement must be available on site for reference purposes. • Demarcate the construction footprint prior to commencement of construction and ensure that all workers and Contractors are aware that access beyond the demarcated areas is not allowed. • Ensure that a copy of this and other applicable documents are available on site and that all workers and Contractors are aware of it. Implementation thereof should be monitored by the appointed Environmental Control officer (ECO). • As the property is sensitive for the most part the applicant must conduct activities carefully and reuse or relocate as much bulk plant material as is practical prior to construction.	Contractor/ECO	Once-off
Limit footprint of access roads and construction camps	Reduce the compaction and destruction of natural vegetation	• Make use of existing roads in such a way as to minimise impact on the surrounding environment. • Limit the footprint of disturbance as far as possible.	Contractor/ECO	Once-off
Appointments and duties of project team	Contingencies for minimising negative impacts anticipated to occur during the construction phase	• A document containing the contact details for the ECO, ER, EO, Contractor and ESO must be kept on site. This document must be made available to the approving authority on request.	NRF &/ SARAO	Once-off/Prior to the start of work/as and when is required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		• Before construction activities commence, role players must have a clear indication of their role in the implementation of this EMP. • Subcontractor(s) contracts with the principle contractor must contain a clause to the effect that the disposal of all construction-generated refuse / waste to an officially approved dumping site is the responsibility of the subcontractor in question and that the subcontractors are bound to the management activities stipulated in this EMP.		
Ecological Environment	Removal and management of alien vegetation	• A Rehabilitation and Alien Vegetation Management Plan must be designed to reduce the establishment and spread of undesirable alien plant species. • Alien vegetation management must be ongoing during all phases of the development.	Contractor/ECO	Prior to start of the work /As and when is required/Continuous

10 CONSTRUCTION PHASE

Table 10-1: Construction Phase

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
Employment	Empower local employment	• The Contractor/applicant shall ensure that local labour is used where possible in order to improve the local economy of the area. • The Contractor/applicant shall adequately train all personnel on the project to promote skills development.	Contractor	Once-off
Environmental educational and Training	Environmental training	• Environmental Training should be provided to the staff members through toolbox talks. • Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks. Proof of training to be kept on file. • The Environmental Site Agent must be conversant with all legislation pertaining to the environment applicable to this contract and must be appropriately trained in environmental management and must possess the skills necessary to impart environmental management skills to all personnel involved in the contract. • Construction staff should be made aware of the sensitivity of the site in the form of a short verbal induction and only conduct activities within the development footprint area for construction.	Contractor/ECO	Continuous

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
Site clearing and establishment	Designated site areas	• The location of the site camp (if required) should be agreed on by the Contractor and ECO. • The site camp should not be located on any incline slopes; it should be further away from any water resources and should not be located anywhere near environmentally sensitive areas. All areas that are environmentally sensitive, including the site camp should be demarcated. • The site camp should contain waste storage areas and should be able to accommodate all other equipment required or to be used for the construction activities. • All no-go areas within an outside the boundary should be indicated and the personnel on site should be made aware of such areas. • There should be an area designated for maintenance of construction vehicles. However, this area should have an impermeable lining so as to contain any spillages during servicing and to prevent soil contamination as well. • A suitable area should be allocated where personnel should take their breaks. • Vehicles should try and stick to existing access points, travelling along the tracks if possible, and material stockpiles should be kept to previously disturbed areas at as few points as possible. • Prior to excavation, topsoil should be removed and	Contractor/ECO	Once-off

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		stockpiled in a designated area not susceptible to erosion. • All excavated areas should be stabilised to avoid erosion. • Waste should be properly managed to keep the area aesthetically pleasing. • Excavation and earthworks proposed to be conducted must remain within the development footprint and be demarcated from the remaining areas.		
Waste management	Proper management of waste material on site	• Some of the construction waste (excavated material) can be used as fill material at other sites where required or disposed of at the licensed landfill site. • Construction waste, for instance unused concrete, must be disposed of at a licensed waste disposal facility or landfill site. • No construction phase waste must be stockpiled on site. • Litter bins must be provided at the site for waste generated by construction personnel. • An area for disposal of waste should be allocated and demarcated on site. • Where possible, separation at source of waste should be carried out. • No waste should be burnt on site. • All hazardous waste should be separated from	Contractor	As and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		general waste; in addition, the hazardous waste (contaminated soils) should be disposed of at any licensed hazardous waste disposal facility.		
	Contamination of the area as a result of leaking portable toilet facilities.	• Only portable chemical toilets with a sealed reservoir will be allowed on site. • All portable chemical toilets must be located further than 30m away from the delineated edges of the buffers around the riparian and wetland edges. • The capacity of the reservoirs in the portable chemical toilets must be monitored on a daily basis to ensure that they can be serviced timeously. • All removal of the collected sewage waste from the portable chemical toilets must be conducted by a registered service provider for disposal at a municipal wastewater treatment facility. • No onsite disposal of sewage will be allowed.	Contractors	Continuous; as when required
	Solid wastes can be unsightly and even dangerous. Uncured concrete is toxic to aquatic life.	• Provision must be made for a Waste Management Strategy to be implemented during the construction phase of the development. • This strategy must make provision for the on-site collection of construction and domestic waste materials in designated containers (skips, etc.). • The collected waste must be disposed of at a Municipal Landfill Site. • If the design parameters allow, preference should be	Contractors	As and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		given to "pre-cast" components to be used. This will decrease the risk of contamination of the aquatic system by uncured concrete		
	Contamination of the area by domestic waste.	• A designated eating area must be established within the construction site. • Covered domestic waste bins must be present at the eating area to receive all the domestic waste generated by the labour. • The capacity of these domestic waste bins must be monitored on a daily basis to ensure that they are emptied timeously. • The domestic waste from these waste bins must be removed off site and disposed of at a municipal landfill site on a weekly basis or more regularly if the bins fill up quicker. • The burying and burning of domestic waste on site will not be allowed.	Contractors	As and when required; continuous
	Contamination of the area by construction waste.	• Skips must be made available on-site into which all construction waste can be discarded. • All construction waste must be cleared from the site on a daily basis and placed in these skips. • The capacity of these skips must be monitored on a daily basis to ensure that a replacement skip can be arranged on the same day as the filled skips are removed.	Contractors	As and when is required; continuous

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		• The disposal of the content of these skips must be done at a municipal landfill site. • No dumping of construction waste on open areas on the property will be allowed. • The burying of construction waste on the development site will not be allowed.		

Impact on soil	Ensure no pollution or degradation of geology or soil	• Proper design, monitoring and management.
		• Building foundations must be reinforced.
		• Ensure that pipeline is installed above-ground as opposed to in a trench.
		• If pipelines are trenched, it must be done:
		  ○ At least 32m away from any watercourse.
		  ○ Downslope from any watercourse (as far as possible).
		  ○ Encased in an impermeable membrane layer (if possible).
		• Exposed surface should be covered to prevent loss of soil by natural wind and water erosion.
		• Topsoil removed must not be used for building or maintaining access roads but must be imported.
		• Existing sections of erosion should be protected from further erosion through the correct installation of supporting materials such as gabions under the railway line.
			Contractor	As and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
Surface and groundwater	Prevent pollution of water resources	• Construction vehicles must be serviced to avoid leakages of fuels and lubricants to the soil. No servicing of construction vehicles must take place within the site, to avoid soil contamination with hydrocarbons or oils. • Chemical portable toilets provided by Contractors must be maintained for the duration of the construction phase. • Mixing of cement must take place on impervious surfaces and the areas for mixing must be controlled by berms. • Pollution spills entering Die Leegte River must be immediately managed using spill kits. .	Contractor	Continuous
	The spilled goods could be toxic to aquatic life.	• In the event that any hydrocarbon materials are to be stored within the site during the construction phase, provision must be made that the storage facility is fully bunded in a bund that has a volume of 110% of the total volume of hydrocarbons that are stored. • The bund must be provided with a closable drainage tap for use when fluid needs to be drained from the bund. • The hydrocarbon storage facility may not be located within the 40m buffer from the delineated riparian edge of the Die Leegte River. • A Spill Contingency Plan must be in place for the construction phase that details the management and mitigation actions that needs to be undertaken in the event of any spillages from the hydrocarbon storage facility.	Contractor	Continuous/As and when is required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
Air quality/dust	Mitigate excess dust	• All surfaces that are not paved and generate dust should be sprayed using a water tank continuously, or other dust suppressing agents can be used to limit the generation of dust. • Vehicular speed to the construction site should be regulated, in order to limit the generation of dust on houses along the access route to site. • A dust monitoring process needs to be undertaken during the construction phase. • Any rubble generated during construction should not be left on site for more than two weeks as it will become susceptible to wind action. • Unnecessary movement of construction vehicles must be avoided. • Vehicles that will be transporting building materials such as sand or rubble need to be covered or wet down to avoid the material being blown by air during windy conditions. • The topsoil removal must be done in a phased manner so that large areas of unconsolidated soils are avoided. • A register must be made available for reporting any excess dust from construction activities.	Contractor	as and when required
Noise management	Reduce noise levels	• Activities which involve excessive noise must be prohibited at certain times during construction. • All construction work must be conducted only during regular business hours.	Contractor/ECO	as and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		• When required, the community must be made aware of any planned noise disturbances outside of normal working hours. • Should it happen that construction takes place after working hours, the neighbours need to be notified. • On-site personnel should be provided with PPE to assist in reducing noise level impacts. • Machines and equipment will be maintained in good working condition and inspected regularly as per a schedule. • Equipment and vehicles will be selected in accordance with best available techniques for noise reduction.		
Visual and Landscape	Ensure the works are aesthetically pleasing	• site camps (if required) and stockyards should be located out of the visual field of highly sensitive visual receptors such as residents and communities. • The construction sites should be kept neat, clean and organised in order to portray a general tidy appearance. • Rubble and other building litter should be removed off site as soon as possible or placed in a container in order to keep the construction site free from additional unsightly elements. • If construction is necessary during night time, light sources should be directed away from residents and roads to prevent glare. • Dust suppression measures should be implemented; this includes regulating speeds along access routes to site.	Contractor/ECO	Continuous

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		• Regular clean-up of illegal dumping and littering around the site will mitigate eyesores and improve the environment.		
	Landscape enhancement	• While not a specific requirement, to better align with the local and regional planning for the greater SKA to be a tourist destination, a tourist information area at the gate would add value to the 'science' as well as provide a low-cost explanation/ information point of the SKA 'cosmic karoo' landscape tourism.	Contractor	As and When required
	Tree planting along the edge of the large vehicle parking areas	• To reduce visual intrusion as seen from the adjacent road that has potential to be a future tourism route, soften the visual intrusion of the store houses and vehicle parking areas with the planting of 'windrow' trees. These can be poplar as these trees have been incorporated in the local landscape context and would add to not detract from the cultural landscape significance. o A two-management plan would need to be set in place to ensure that the trees grow to suitable size. o The mitigation trees would need to be managed under the same landscape management planning for the vehicle parking trees and general landscaping around the structure. o The trees to the east of the large vehicle parking area need to be planted on the same height as the parking (not on top of the cut bank), so that they are initially protected from the elements and can be easily watered.	Contractor	As and When required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
	Lights at night mitigation with no overhead flood lights	• To ensure that a negative precedent is not set for development in deep rural areas where there is a strongly experience dark night sky, light spillage mitigations should be implemented such that light for security and operations at night are localised without compromising security or operational integrity. No overhead flood lighting should be used.	Contractor	As and When required

Fire management	Ensure proper fire management and equipment are on site	• No fires are permitted on site.
		• Burning of waste on site is prohibited.
		• Compliance reports must be compiled regularly by both ECO and OHSO to ensure full compliance with the EMP.
		• The facility must be equipped with firefighting equipment which will include:
		  ○ Flame arresters.
		  ○ Water sprinklers.
		  ○ Gas/fire detection equipment.
		  ○ Nitrogen and carbon dioxide blanketing equipment.
		  ○ Foam spraying.
		• The fire-fighting equipment should be satisfactory to the local fire services.
		• Key personnel should be allocated (and trained) to manage fire emergencies.
			Contractor/ECO/OHSO	as and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
Safety and security	Ensure safety on site	• Trenches which have been excavated must be cordoned off and signposted to prevent injury to people who are not aware of their existence. • Emergency contact information should be provided and displayed at the Contractor's office and site entrance. • The use of PPE should be enforced on site at all times. • The construction site must be adequately demarcated or access must be restricted to prevent unauthorised persons from entering the construction site. • Appropriate medical equipment must be placed on site and made accessible at all times. • The appropriate number of staff members must be adequately trained in first-aid in accordance with the Health and Safety Regulations. • Compliance reports must be compiled regularly by both the ECO and OHSO to ensure full compliance with the EMP. • 24-hour security must be provided at the construction site. • Suitable barricades must be erected to secure the site and to avoid unrestricted access to the site during construction activities.	Contractor/ECO/OHSO	Continuous
Heritage resources	Ensure proper heritage protocols	• Any heritage resources encountered during the construction phase of the proposed development should be reported to the relevant Heritage Agency. • Should any heritage resources including evidence of graves and human burials, archaeological material, and	Contractor/ECO	As and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		paleontological material be discovered, all works must be stopped immediately, and Heritage Western Cape must be notified without delay. • All activities should stop for further indication in terms of commencement from the competent authority after investigations have been commissioned and concluded with recommendations. • All personnel should be made aware of any existence of heritage resources and the procedure to follow when encountering such resources. • All existing significant historical trees and landscaping must be protected during construction activities to ensure they are not damaged. Where trees are missing, Digby Wells recommends planting new ones. • The new infrastructure must be contemporary in their architectural language to allow for easy identification as a new historic layer in the development of the Klerefontein property. • New infrastructure must highlight the identified heritage buildings and be sympathetic to the existing context and cultural significance. • The landscaping, historical layering and the development of the site must remain legible following the establishment of the Project infrastructure. • SARAO must re-evaluate the location of the radio mast located north of the Klerefontein farmhouse to avoid any indirect impacts such as material building up on the walls of the farmhouse.		

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING

		• If direct or in direct impact from and by the radio mast cannot be avoided, SARAO must obtain a Section 34 with the relevant Heritage Resources Authority to mitigate impacts on the farmhouse.
		• An ECO must monitor the installation of two additional diesel storage tanks between the shed and the Klerefontein kraal. To avoid direct impact to the west wall of the kraal a 5 m buffer zone must be maintained with a danger tape during the installation of the storage tanks.
		• SARAO must avoid potential direct impacts to heritage structures during construction by:
		  ○ Erecting hoarding around the site during construction activities to protect neighbouring heritage structures. This hoarding must be erected 5 m away from the structure to create a construction buffer zone;
		  ○ Ensuring access, parking and holding facilities for large construction vehicles is designed to avoid potential direct impacts to the heritage structures; and
		  ○ Where intrusive methods such as deep-level compacting or piling are necessary for construction, a responsible person must monitor the heritage structures to ensure they are not damaged;
		• A responsible person must monitor and photograph the heritage structures regularly during the construction		

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		phase of the Project to ensure that these structures are not damaged. • The landscaping, historical layering and the development of the site must remain legible following the establishment of the Project infrastructure. To achieve this, SARAO must implement the following: o The historic structures and landscaping must retain their historic architectural language, materiality and identity; o The new infrastructure must be contemporary in their architectural language to allow for easy identification as a new historic layer in the development of the Klerefontein property; o New infrastructure must highlight the identified heritage buildings and be sympathetic to the existing context and cultural significance; and o All existing significant historical trees and landscaping must be protected during construction activities to ensure they are not damaged. Where trees are missing, Digby Wells recommends planting new ones; • The existing Chance Finds Procedure (CFP) for the SKA Project must be applied to the Project and implemented during the Project lifecycle.		
	Indirect impact to Heritage Resource	• Earthworks near the kraal must be avoided to prevent direct impact or the build-up of material against the stone walls. Implements a 30 m no-go buffer zone around this resource.	Contractors	Once off; as and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		• The implementation of the Conservation Management Plan (CMP) will be considered a minor change to a heritage resource of medium significance.		
	Damage to or destruction of Klerefontein Kraal and Outhouse	• Project redesign to avoid the heritage resource and implement a 30 m no-go buffer zone around the resource.	Contractors	Once off; as and when required
	Indirect impacts to Klerefontein Werf	• Maintain sense of place, historical layering, landscaping and history of development.	Contractors	As and when required
	Damage to structures associated with the Klerefontein Werf	• Regular photographing and inspecting of the heritage structures to ensure damage is avoided	Contractors	Continuous; as and when required
	Damage to or destruction of previously unidentified heritage resources.	• Update existing CFP to apply to the Project.	Contractors	Once off; as and when required
	Damage to or destruction of previously unidentified heritage resources.	• Implement updated CFP.	Contractors	Once off
Alien invasive and indigenous vegetation	Control of alien vegetation	• Implement an alien plant control plan. • Caution must be taken to minimise disturbance in this vegetation. • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/earthworks in that area and returning it where possible afterwards. • Monitor the establishment of alien invasive species within the areas affected by the construction and	Contractor/ECO	Once-off; as and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		maintenance and take immediate corrective action where invasive species are observed. • Rehabilitate or revegetate disturbed areas. • Indigenous vegetation, including dead trees, outside the limits of disturbance indicated in site plans, must not be removed from the site. • Prevent the spread of Invasive Alien Species from entering or dispersing from the set aside natural areas. • Removing of Invasive Alien Species must be done carefully without the use of heavy machinery or disturbance of the indigenous vegetation by removing IASs in a phased approach.		
	Spreading of alien invasive plant species	• The construction footprint must be clearly survey and demarcated before any construction of the components of the development is to commence. • This must be done to ensure that areas to be cleared are limited to only the areas that are necessary. • The cleared areas must be regularly monitored for the establishment of alien plant species. These must be cleared when they appear. • Identification and eradication methodologies of any alien plant species that establish on the site. • The rehabilitation of these cleared areas must commence as soon as practically possible after construction activities have ceased.	Contractors	Once off; Continuous; as and when is required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
	Loss of indigenous vegetation	• The areas that will require the clearance of vegetation must be limited to as small a footprint within the construction site as possible. • The footprint must be survey and clearly demarcated to ensure that the area to be cleared will be limited to the area required. No operations must be allowed outside of the demarcated areas. • The areas that have been cleared of vegetation during the implementation of the project must be revegetated with grasses that occur naturally in the area.	Contractors	Once off; Continuous; as and when is required
Construction footprint	Limit the footprint, reduce compaction and destruction of vegetation	• Contractors should refrain from impacting areas beyond the demarcated construction area. • The Contractor must avoid traffic or storing of equipment and material in vegetated areas that will not be cleared.	Contractor	Once-off
Pollution	Prevention of pollution	• Drip trays (minimum of 10 cm deep) must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised. • Drip trays must be utilised during repairs and maintenance of all machinery. The depth of the drip tray must be determined considering the total amount/volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle. • Provision of adequate sanitation facilities throughout the site.	Contractor/ECO	Once-off; as and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
	Hydrocarbons are toxic to aquatic plants and animals and are readily spread by flowing water.	• All plant and equipment that will be used in the construction activities must be inspected on a regular basis to ensure that any leaks are detected as soon as possible. • Any leaking plant and equipment must be removed from the construction site and only be allowed to return when the leaks have been addressed. • A Spill Contingency Plan must be in place for the duration of the construction phase that details the steps that needs to be taken if spills of various sizes are to occur. • No plant or equipment will be allowed to be parked within a 40m buffer from the delineated edge of the Die Leegte River riparian edge.	Contractor/ECO	Once-off; as and when required
	Spillage or leakage could impact on the water quality that moves through the Die Leegte River, which will negatively impact on the PES.	• All portable ablution facilities that will be used on site must be located 40m away from the delineated riparian edge of the Die Leegte River. • The portable ablution facilities must be provided with sealed wells in which the sewage is collected. • The servicing of these portable ablution facilities must be conducted by a registered service provider who must dispose of the material at a Municipal facility. • A Spill Contingency Plan must be put in place to provide the appropriate management and mitigation measures to be implemented in the event of any spillages from these ablution facilities.	Contractor/ECO	Continuous; as and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
	Contamination of the area by petrochemical spillages.	• All plant and equipment that make use of petrochemical substances must be checked for leakages on a daily basis before operations commence. • All plants and equipment that are found to be leaking must be removed from the site and only returned once the leakages have been addressed. • If any petrochemical substances are stored on the site, this storage must be done on an impermeable surface in a bunded area that makes provision for 110% of volume of the substances that are stored. • All refuelling of plant and equipment must be conducted over a drip-tray. • If any plant or equipment is to be parked on the site, these must be parked within the demarcated construction footprint that has been cleared. • If any spillages from plant or equipment occur, the spill must be contained immediately, the contaminated soils must be collected and bagged in impermeable bags and stored on site to be removed and disposed of by a registered service provider.	Contractors/ECO	As and when required; continuous
	Higher sediment loads could impact on the aquatic biodata in the Die Leegte River which can further reduce the PES of these features.	• If the construction plan allows, construction should be conducted during the dry season. • The construction footprint required for each of the construction footprints must be determined and clearly demarcated before construction can commence. This will limit the area of movement associated with the construction which will limit the impact on the riparian		

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		habitat which in turn will limit the risk of siltation from bare areas.		
Stormwater management	Maintaining proper stormwater management	• The velocity of stormwater discharges must be attenuated. • Stormwater leaving the development area must in no way be contaminated by any substance, whether such substance is a solid, vapour, gas or a combination thereof which is produced, used, stored or spilled on the premises.	Contractor/ECO	Once-off
	The increased runoff from the hard surfaces might result in increased levels of silt to be washed into the Die Leegte River.	• The civil works associated with the earthworks must be prioritised for the dry season to limit the risk of runoff from these areas entering the river area. • A Stormwater Management Plan must be developed for the construction phase of the development that will ensure that the stormwater runoff into the river will not exceed the pre-development levels. • The Stormwater Management Plan must also make provision for the specification of measures to limit/capture silt moving into the river during rainfall events. • The areas to be cleared for construction must be limited as far as possible. Once the areas have been determined they must be clearly demarcated to ensure that no increase in construction footprints is allowed.	Contractor/ECO	Continuous/As and when required
Traffic and Transportation Activity	Ensuring an efficient flow of traffic and transportation.	• Only designated roads and routes must be used within the facility. • These areas should be cordoned on site for easy visibility.	Contractor/OHSO	Once-off; as and when required

ACTIVITY/ASPECT DESCRIPTION	OBJECTIVE	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/ TIMING
		• The transportation of large equipment must be done in a safe manner and all site personnel must be made aware of this occurrence.		
Health and Safety	Worker's safety	• Implementation of safety measures, work procedures and first aid shall be implemented on site. • A health and safety plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) shall be drawn up to ensure worker safety. • Contractors shall ensure that all equipment is maintained in a safe operating condition. • A record of health and safety incidents shall be kept on site. • Any health and safety incidents shall be reported to the project manager immediately. • First aid facilities shall be available on site at all times. • Workers have the right to refuse work in unsafe conditions. • Material stockpiles or stacks shall be stable and well secured to avoid collapse and possible injury to site workers.	Contractors/ECO	Continuous

11 OPERATIONAL PHASE

Table 11-1: Operation Phase

ACTIVITY/ASPECT	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT	RESPONSIBILITY	FREQUENCY/TIMING
DESCRIPTION	COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS		
General requirements	• The records and administration process should be maintained, this must include but not be limited to: ○ Emergency preparedness plan, rehabilitation plan, operational plan, service plan, health safety and security plan. • Records of environmental awareness trainings should be kept. • The EMP is a dynamic document that can be amended when a need arises, thus should be reviewed and amended/updated when a need arises. • Internal and external audits should be performed annually or as and when required by the competent authority. • The audit reports should be submitted to the competent authority. • The operational plan must be in place and complied with.	NRF & SARAO	Continuous
Employment	• Local labour employment should be encouraged, provided that personnel have the appropriate qualifications.	NRF & SARAO	As and when required
Air quality/dust	• All surfaces that are not paved and generate dust should be sprayed using a water tank continuously, or other dust suppressing agents can be used to limit the generation of dust.	NRF & SARAO	As and when required

ACTIVITY/ASPECT	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT	RESPONSIBILITY	FREQUENCY/TIMING
DESCRIPTION	COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS		
	• Vehicular speed to the construction site should be regulated, in order to limit the generation of dust. • A dust monitoring process needs to be undertaken. • Unnecessary movement of construction vehicles must be avoided. • Vehicles that will be transporting building materials such as sand or rubble need to be covered or wet down to avoid the material being blown by air during windy conditions. • A register must be made available for reporting any excess dust from operational activities.		
Safety and security	• Emergency contact information should be provided and displayed on site (administration office). • The use of PPE should be enforced on site at all times. • Appropriate medical equipment must be placed on site and made accessible at all times. • The appropriate number of staff members must be adequately trained in first aid in accordance with the Health and Safety Regulations. • 24-hour security must be provided at the construction site.	NRF & SARAO	Once-off; as and when required

ACTIVITY/ASPECT	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT	RESPONSIBILITY	FREQUENCY/TIMING
DESCRIPTION	COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS		
Vehicle, equipment maintenance and fuelling	• Minor maintenance of equipment and/or vehicles must be restricted to designated areas which are established and managed for maintenance, i.e., workshops. No major maintenance must be carried out on site. • All designated maintenance areas must be equipped, designed and constructed to facilitate vehicle and equipment maintenance, e.g., maintenance to be carried out on a concrete slab, and refuelling must be done above drip trays to reduce the risk of contamination of soil by harmful chemicals and oil. • The vehicular and equipment service plan must be adhered to.	NRF & SARAOOHSO	Once-off; as and when required
Waste management	• No waste should be dumped indiscriminately on site. • All vehicles transporting waste should be well suited for the transportation of the class and type of waste. • There must be sufficient waste bins around the site which must be easily accessible. • A waste collection schedule should be implemented for general and construction waste to ensure the site is always clear of excess waste build up. • All waste must be handled and disposed of in a safe and appropriate manner.	NRF & SARAO	Daily
Fire management	• Fires must be made in designated areas only, thus away from any flammable material or an area with a high fire risk. • Open fires must not be left unattended. • Burning of waste on site is prohibited.	NRF & SARAOOHSO	Once-off; as and when required

ACTIVITY/ASPECT	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT	RESPONSIBILITY	FREQUENCY/TIMING
DESCRIPTION	COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS		

	• Compliance reports must be compiled regularly by both the ECO and OHSO to ensure full compliance with the EMP.
	• The plant must be equipped with firefighting equipment which will include.
	  ○ Flame arresters.
	  ○ Water sprinklers.
	  ○ Gas/fire detection equipment.
	  ○ Nitrogen and carbon dioxide blanketing equipment.
	  ○ Foam spraying.
	• The fire-fighting equipment should be stored to the satisfactory of the local fire services.
	• Key personnel should be allocated for fire emergencies.
	• All staff should be trained on the operation of safety equipment.		

Noise management	• The service plan for all vehicles and equipment on site should be maintained. • All construction work must be conducted only during regular business hours. • When required, the community must be informed of any planned noise disturbances outside of normal working hours. • A register for all noise complaints should be kept and corrective actions need to be applied to issues raised.	NRF & SARAO	Continuous

ACTIVITY/ASPECT DESCRIPTION	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS	RESPONSIBILITY	FREQUENCY/TIMING
Management of flora	• Any landscaping implemented in the development must make use of indigenous vegetation to limit or eliminate the introduction of alien and/or invasive species.	NRF & SARAO	Continuous
Geology and soil **Loss of soil and change in the geology of the area**	• Stormwater management plan must be implemented on site, to avoid erosion and sedimentation. • Maintain the bulk sewer infrastructure as required and maintain the undeveloped areas for conservation of biodiversity and related ecological processes and functioning.	NRF & SARAO	Continuous
Visual and aesthetic impact	• Areas should be landscaped using indigenous vegetation. • Operation activities must observe good housekeeping principles and the site must be kept neat at all times.	NRF & SARAO	Daily, as and when required
Environmental awareness	• Environmental awareness and training should be provided to all personnel on site. • No protected flora or fauna found on site should be removed or damaged/killed. If these are found during construction the necessary permits should be obtained, as applicable prior to relocation or removal. • Health awareness programmes should be implemented and held on site.	NRF & SARAO	Once-off

ACTIVITY/ASPECT	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT	RESPONSIBILITY	FREQUENCY/TIMING
DESCRIPTION	COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS		
Heritage resources	• Any heritage resources encountered during the construction/operational phase of the proposed development should be reported to the relevant heritage agency. • All activities should stop for further indication in terms of commencement from the competent authority after investigations have been commissioned and concluded with recommendations. • All personnel should be made aware of any existence of heritage resources and the procedure to follow when encountering such resources.	NRF & SARAO	As and when required
Safety and security	• Any unauthorised entry of the public to the site must be restricted. • The fence must be inspected, and its integrity maintained on a monthly basis.	NRF & SARAO	Continuous; Monthly
Stormwater Management	• The stormwater outlet design of all the stormwater outlets must make provision for energy dissipation to ensure that the velocity of the discharge is controlled. • Provision must be made during the routine maintenance and management of the facility that these outlets be inspected for any blockages. If any blockages occur, these must be cleared.	NRF & SARAO	Continuous; as and when is required
Spreading of alien invasive vegetation.	• Regular monitoring of the areas surrounding the constructed facilities for the presence of any alien invasive plant species.	NRF &/ SARAO	Continuous; as and when is required

ACTIVITY/ASPECT	ACTIONS TO BE UNDERTAKEN TO MITIGATE ENVIRONMENTAL IMPACT	RESPONSIBILITY	FREQUENCY/TIMING
DESCRIPTION	COMMITMENT/ACTIONS REQUIRED/KEY CONTROLS		
	• If these species are found near the facilities, they should be removed and disposed of at a garden refuse facility or by a professional plant/tree removal service provider. • No burning of this plant material will be allowed on site.		
Contamination by domestic waste generated by the operations.	• The facility must be serviced by covered domestic waste bins for use by the employees at the facility. • The capacity of these domestic waste bins must be monitored on a daily basis to ensure that they are emptied timeously. • The domestic waste from these waste bins must be removed off site and disposed of at a municipal landfill site on a weekly basis or more regularly if the bins fill up quicker. • The burying and burning of domestic waste on site will not be allowed.	NRF &/ SARAO	Continuous; as and when is required

12 MONITORING PLAN

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr 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, the client will determine and stipulate the frequency of monitoring required in consultation with the relevant authority. The contractor project manager will work with the site manager of the contractor to ensure that monitoring is conducted and reported.

An independent ECO must be appointed to carry out monitoring and auditing against the conditions in the EMPr. The ECO will undertake site inspections on a monthly basis or as specified in the environmental authorisation once issued. The ECO will report all non-compliances to the Site Manager and submit such reports to the competent authority. This will ensure the environmental compliance of the site.

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.
- These points should be permanently marked and assigned a unique identify number to ensure continual relocation and accuracy of the photographs. GPS coordinates should be recorded of each site. This is to ensure if any markers are removed or vandalised then they can be replaced.
- Photo point locations should be easily relocated and accessible and must not be obscured by future vegetation growth.
- The level of detail captured must be appropriate to the area that has undergone rehabilitation.
- Photo record forms must be development and utilised for every photo taken. The information required will be project name, location, unique identity number, directional point (e.g. North, South), date, time, photographers name and additional comments.

- Qualitative ecological information that must be visually interpreted and recorded at the same time as taking the photograph include:
    - Extent of the site vegetation ground cover.
    - General level of plant growth, substrate levels, and water levels.
    - General observations of water quality such as clarity and presence of litter.
    - Evidence of anthropogenic presence and bird species.
    - Vegetation condition, extent of AIPS; and
    - Evidence of erosion and close monitoring of the post-construction erosion-control measures which must be implemented.

The following monitoring requirements must also be put in place.

- Identify a surface water monitoring point in the Die Leegte River, upstream of the Klerefontein Support Base where bi-annual (twice a year) water samples can be taken. This point will be the control point. These samples must be collected bi-annually during the construction phase and annually (in the wet season) during the operational phase.
- Identify a surface water monitoring point on the Die Leegte River immediately downstream of the Klerefontein Support Base where bi-annual (twice a year) water samples can be collected. These samples must be collected bi-annually during the construction phase and annually (in the wet season) during the operational phase.
- These water samples must be analysed for key determinants which must include, total dissolves salts, petrochemical traces, N, P and K and *E. coli* levels.
- It is recommended that a biomonitoring event is scheduled for the Die Leegte River at points upstream and downstream of the Klerefontein Support Base. This biomonitoring events must take place during the wet season and must be conducted annually during the construction and operational phase until such time that the results show a stable trend. At this stage the sampling events can be discontinued.

It is recommended that the historical structures associated with the Klerefontein Werf are monitored and photographed regularly during the construction phase of the Project to ensure these structures are not damaged during these activities.

A monitoring programme must be in place to ensure compliance with the EMPr and document any issues identified onsite during the construction, operational, rehabilitation, decommissioning and closure phase.

Table 12-1: Monitoring Plan

ACTIVITY/ASPECT	OBJECTIVE	KEY CONTROLS	RESPONSIBILITY	FREQUENCY
Employment	Provide opportunities to local communities to enhance income levels and skills/employability and improve quality of life.	• Ensure local labour is employed. • Ensure local vendors are contracted for goods and services.	Contractor	Quarterly reports
Waste Management	Ensure that all site areas are clear of general and construction waste.	• Weekly inspections of site areas. • Daily clean-up of litter. • Ensure that all bins are emptied on a regular schedule to avoid spilling. • Ensure all construction waste is collected and disposed of appropriately. • Ensure that there are adequate portable toilets and that they are regularly serviced.	Contractor	Weekly inspections and monthly reports
Construction footprint	Ensure that all construction activities occur only within the designated construction footprint.	• Corden off the site to illustrate the footprint. • Demarcate no-go areas. • All trenches must be demarcated, and appropriate signage must be placed.	Contractor	Start of project; on-going
Dust and erosion control	Ensure no excess dust on site during the construction phase.	• Dust suppression measures such as watering the site must be instilled. • Loose areas must be compacted. • Erosion control measures, such as gabions and reno mattresses, must be installed at steep embankments and erosion prone areas.	Contractor	Continuous

ACTIVITY/ASPECT	OBJECTIVE	KEY CONTROLS	RESPONSIBILITY	FREQUENCY
Noise management	Ensure that noise during the construction and operational phases are kept to a minimum.	• Ensure that construction works occur only within the designated working hours (07:00 to 17:00). • Site personnel to have ear plugs during operations involving loud noises. • Vehicles and equipment must be well maintained to ensure their efficient working order.	Contractor	Continuous
Visual	Ensure the works are aesthetically pleasing.	• The site must be continuously cleared of debris and litter. • Indigenous vegetation must be used for any landscaping post-construction.	Contractor	Daily inspections
Fire management	Ensure proper fire management and equipment are on site.	• Ensure that no fires are lit on site. • No waste is permitted to be burnt on site. • All fire equipment must be regularly inspected. • All site personnel must be trained for fire related emergencies.	Contractor	Monthly inspections for equipment with reports; continuous inspections for site operations
Safety and security	Ensure the safety of all site personnel.	• All site personnel must be adequately trained in OHS protocols. • Daily toolbox talks on OHS protocol must occur. • An emergency contact list must be placed at multiple, easily accessible locations around the site.	Contractor	Daily toolbox talks with registers; Monthly fence inspections

ACTIVITY/ASPECT	OBJECTIVE	KEY CONTROLS	RESPONSIBILITY	FREQUENCY
		• The site must have 24-hour security for not only the site personnel but also the equipment. • Fences around the site must be regularly inspected for weaknesses and breakages. • All site personnel must wear appropriate PPE at all times.		
Alien invasive vegetation	Ensure that no alien invasive vegetation grow within the site.	• Regularly inspect the site to identify any occurrence of alien invasive vegetation. • Remove these identified species and dispose of them according to the alien invasive control plan. • Once removed these areas should be revegetated with indigenous vegetation and closely monitored for any recurrences.	Contractor	Monthly inspections
Vehicle and equipment maintenance	Ensure that all vehicles and equipment are well maintenance.	• All vehicles and equipment must be serviced at the necessary intervals. • All vehicles and equipment must be inspected regularly to ensure that they efficient enough to carry out the tasks. • Any vehicle or equipment must never be used if it does not pass the inspections and must be repaired immediately.	Contractor	Weekly inspections with report
Stormwater management	Ensure that stormwater is efficiently managed on site.	• A stormwater management plan is recommended to manage this aspect.	Contractor	Weekly inspections with report

ACTIVITY/ASPECT	OBJECTIVE	KEY CONTROLS	RESPONSIBILITY	FREQUENCY
		• Any hazardous materials should be kept away from stormwater flow as this could contaminate the water. • All stormwater infrastructure must be regularly inspected for damages and blockages.		
Independent ECO	Monitor the site and compile audit report.	• Ensure all conditions of the EMP and environmental clearance certificate are adhered to. • Inform the applicant and Contractor of potential environmental issues and propose mitigation measures. • Compile audit report of findings and recommendations.	Contractor/Applicant	Monthly inspections with report or as required by the competent authority

12.1 POST-CONSTRUCTION AUDIT

A post-construction audit must be carried out for submission to NRF & SARAO and the relevant Government Departments for their information and record keeping. Objectives should be to audit compliances with the key components of the EMPr, to identify the main areas requiring attention and recommend priority actions. The audit should be undertaken annually and should cover a cross section of issues, including implementation of environmental controls, environmental management and environmental monitoring. Results of the audits should inform changes required to the specifications of the EMPr or additional specifications to deal with any environmental issues which arise on site and have not been dealt with in the current document.

13 CLOSURE PLANNING

13.1 FINAL SITE RESTORATION

The Contractor must clear and restore the site and ensure that all excess building material and construction debris is removed from site once the construction phase has been completed.

13.2 REHABILITATION

The Contractor (landscape architect/horticulturist) will be responsible for the rehabilitation and revegetation of all disturbed areas earmarked for conservation during construction to the satisfaction of the Applicant's Project Manager and/or the ECO.

13.3 POST-CONSTRUCTION AUDIT

A post-construction audit must be carried out for submission to NRF & SARAO and the relevant Government Departments for their information and record keeping.. Objectives should be to audit compliances with the key components of the EMPr, to identify the main areas requiring attention and recommend priority actions. The audit should be undertaken annually and should cover a cross section of issues, including implementation of environmental controls, environmental management and environmental monitoring. Results of the audits should inform changes required to the specifications of the EMPr or additional specifications to deal with any environmental issues which arise on site and have not been dealt with in the current document.

14 CONCLUSION

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

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards that would be required to minimise the negative impacts and maximise the positive benefits of the construction and operational activities.

The EMPr will be reviewed by the ECO on an on-going basis. Based on observations during site inspections and issues raised at site meetings, the ECO will determine whether any procedures require modification to improve the efficiency and applicability of the EMPr on-site. Any such changes or updates will be registered in the ECOs records, as well as being included as an annexure to this document.