

**Rehabilitation Plan: Kangra Coal
(Pty) Ltd –
Ballengeich Site
November 2024**



M²ENCO



Title:

Kangra Coal (Pty): Implementation of Rehabilitation Plan for the Ballengeich Site, Newcastle, KwaZulu Natal Province

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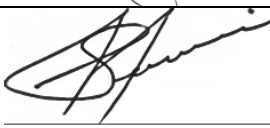
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November 2024



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LIST OF ABBREVIATIONS

BH	Borehole
BPG	Best Practice Guideline
CMA	Catchment Management Agency
DEAT	Department of Environmental Affairs and Tourism
DS	Downstream
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EISC	Ecological Importance and Sensitivity Category
ELU	Existing Lawful Use
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
EMS	Environmental Management System
ERA	Environmental Risk Assessment
ESM	Environmental Site Manager
FEPA	Freshwater Ecosystem Priority Area
GN	Government Notice
HPRI	High Potential Risk Incident
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
ISO	International Organization for Standardization
MAE	Mean annual evaporation
MAR	Mean annual runoff
MENCO	M2 Environmental Connections
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NEMWA	National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act, 1998 (Act 36 of 1998)
OEMPr	Operational Environmental Management Programme
OSHAS	Occupational Health and Safety Assessment Series
PPP	Public Participation Process
RQO	Resource Quality Objective
RWQO	Resource Water Quality Objective
SANAS	South African National Accreditation System
SANS	South African National Standard
SHE	Safety Health and Environment
SHEQ	Safety, Health, Environment and Quality



SWMP	Stormwater Management Plan
TDS	Total Dissolved Solids
US	Upstream
WM	With Mitigation
WMA	Water Management Area
WOM	Without Mitigation
WSP	Water Service Provider
WUL	Water Use License



1. INTRODUCTION

In accordance with Regulation 12 of the 2014 Environmental Impact Assessment Regulations, as amended, (GNR 326), M2 Environmental Connections (Pty) Ltd (hereafter referred to as MENCO) was appointed by Kangra Coal (Pty) Ltd as the independent environmental consultant responsible to compile an Environmental Management Programme (EMPr) in support of the implementation of the Rehabilitation at the Ballengeich Site near Newcastle in the KwaZulu Natal Province.

This EMPr should be implemented to ensure that sensitive features on and off-site are protected by the control of construction, operational and rehabilitation activities that may have adverse effects on the environment, and by preventing or minimising potential impacts. This EMPr is pertinent to all employees and contractors working on the pre-planning, construction, operation phases and maintenance as part of the implementation of the Ballengeich Action Plan dealing with the rehabilitation of areas contributing towards pollution of the Horn River. This document must be adhered to and updated as relevant throughout the project life cycle. The document complies with the requirement of the EIA Regulations, 2014, as amended as well as GN 4167 Regulations as promulgated on 8 December 2023 in terms of the National Water Act, 1998 (Act 36 of 1998).

The project proponent must establish equitable measures throughout the life cycle of this project to secure that any pollution, degradation, or deterioration of the environment associated with this project is averted, halted, or minimized as stated in the Duty of Care provision in Section 28 (1) of the National Environmental Management Act (Act 107 of 1998) (NEMA) Regulation. It has become the legal duty of a project proponent to acknowledge a project holistically and to consider the cumulative effects of a variety of impacts under NEMA.

The EMPr provides guidelines and directions to ensure that the implementation of the Ballengeich Action Plan is able to pursue its economic goals without impairing the long-term sustainability of the biophysical and cultural environment. The EMPr addresses the managerial and operational activities of the development during and after construction. Once approved by the authority (DWS), compliance is obligatory for developers, contractors, service providers and property owners.

2. ACTIVITIES COVERED BY THE EMPr

It is intended by Kangra Coal to commence with the implementation of the Action Plan (2022) stemming from a section 19 Directive issued by the Department of Water and Sanitation (DWS). The following actions have been documented by Kangra Coal for implementation:

Short-Term – Medium Term

- Pollution source detection in the Horn River
 - o Three main areas identified:
 - o Old Opencast mining area – 55% (Phase 1)
 - o Old underground mine area – 30% (Phase 2)
 - o Discard Dump – 15%
- Plug/Seal overflowing borehole at monitoring point VN3
- Pump excess water to PCD's
- Conduct scientific studies to determine extent of pollution
- Treatment of PCD and discharge treated water into Horn River

Phased approach to be followed:



Phase 1: Commenced during May 2014

- Clean of slurry from the eastern side
- Clay soils spread and profiled over the opencast area
- Underground sink holes filled
- Polluted water cut-off trenches installed
- Fill-up area between old and new channel of Horn River and plant trees
- Start construction of final covered discard dump

Phase 2:

- Complete cleaning of slurry dams
- Re-direct Horn River back into original position
- Construct present Horn River flow as the flood release for the Horn River
- Construct wetland with reeds

Phase 3:

- Rework existing discard dump into proposed final shape
- Progressively cover the dump with clay material

Phase 4:

- Evaluate water quality data
- Determine which additional measures are required for implementation

Long-Term

- Investigate engineering solutions for the treatment of polluted water with the implementation of the most cost-beneficial solution:
 - o Active treatment;
 - o Passive treatment; and
 - o Introduction of Histocol product to enhance sulphur consuming micro-organism into the water (biological treatment)

Progress to date:

- Need to present a practical, achievable and sustainable Rehabilitation Plan to DWS that will achieve Resource Quality Objective Standards for Closure
- Need to obtain agreement on the Rehabilitation Plan as presented
- Need to incorporate and address requirements and input from DWS:
 - o Kangra Coal to submit a concise and abridged Action Plan to indicate how the Rehabilitation Plan is going to be implemented
 - o A pilot scale constructed passive wetland system needs to be implemented to illustrate the efficiency and effectiveness of the treatment process

Due to delays in the execution of the Action Plan, an amended Implementation Plan was submitted following a DWS site inspection on 3 July 2023. The amended Implementation Plan focussed on the non-compliances as identified by the DWS. Specific mention was made to the implementation of a Pilot scale constructed wetland system to illustrate effectiveness and efficiency of such treatment.

During March 2021 a Rehabilitation Master Plan was compiled and it was required to refine the Plan based on the outcome of several specialist studies. The objective of the Rehabilitation Plan is based on improvement of water quality by means of passive treatment in the Ngagane River. The following Water Quality Management Strategy (WQMS) will assist Kangra Coal in achieving the goals as set out in the Rehabilitation Plan (refer **Table 2-1**).



Table 2-1: Amended Ngagane River WQ Management Strategy and action plan for implementation

Management Approach	Management Action	Function	Responsibility	Time schedule
<u>POLLUTION CONTROL AT SOURCE</u> Assessment of pollution sources	Identify and quantify possible sources of pollution in the Horn and Ngagane Rivers sub-catchments	Expand monitoring programme in Ballengeich area Identify new sources and report to DWS representative Routine inspections to identify and investigate new sources	Kangra Coal Community DWS representative	On-going
	Identify and quantify (as far as possible) diffuse sources of pollution associated with the salinity-problems experienced in the catchment directly associated with Ballengeich Colliery	Initiate water quality profile along Horn River Identify all unknown impacts/sources Conduct specialist studies in the field of assimilative capacity and available waste load	Kangra Coal Glencore Appointed Service providers	July 2022 – August 2023
	Installation of flow-measuring weirs at strategic points in the catchment to quantify the impact from various identified sources	<u>Horn River catchment</u> Install flow-measuring devices at Ballengeich Colliery – decant Calibrate flow-measuring device Continue monitoring on a monthly basis <u>Ngagane River catchment</u> Investigate suitable site for a flow-measuring weir u/s and d/s of confluence of Horn River with Ngagane River	Kangra Coal	Completed installation Calibration as soon as possible June 2025



Management Approach	Management Action	Function	Responsibility	Time schedule
	Verify the background TDS-values for the lower Ngagane River catchment	Expand monitoring programme in unpolluted sub-catchments on a monthly basis for one hydrological year	Kangra Coal Appointed service provider	January 2023 – December 2024
<u>POLLUTION CONTROL AT SOURCE</u> Development of land use and operational strategies	Implement land use strategies for afforestation and erosion control to minimise impact from these land use activities	Collect all available strategies/guidelines and develop a simplified summary thereof Key documents to be considered; KZN C-Plans, Amajuba District Municipality EMF and Umgeni Water Master Plan 2020/2021 – 2050/2051 for Buffalo System Distribute strategies/guidelines Audit implementation	Kangra Relevant landowners	October 2024 November 2024 On-going
	Develop and implement a strategy to conserve and rehabilitate the decant area in the upper reaches of the Horn River within the Ngagane River catchment	Develop strategy Audit implementation	Kangra Coal	March 2022 On-going
<u>RESIDUAL IMPACT CONTROL</u> Refinement of objectives	Determine the actual potential (commercial and economical) for the rework of the Coal discard dump	Complete survey report	Kangra coal	September 2024
	Determine the current and future class of the Ngagane River	Refer to Government Notice 1873 dated 11 March 2022 – Proposed Water Resource Quality Objectives for Thukela Catchment in the Pongola-Mtamvuna Water Management Area	DWS	Dependent on national priority



Management Approach	Management Action	Function	Responsibility	Time schedule
	Determine the resource quality objectives for the Ngagane River	Refer GN 1873 dated March 2022, Table 1 – Ngagane River: Recommended Water Resource Class III	DWS	Dependent on national priority
<u>RESIDUAL IMPACT REGULATORY CONTROL</u> Setting of compliance requirements	Set compliance requirements for sewage works, waste disposal sites, mining operations (both abandoned and operational)	Stipulate compliance requirements Revise water use licences Enforce requirements	DWS	Commence April 2013 and ongoing
<u>RESIDUAL IMPACT CONTROL</u> Treating of residual impact: Investigate available treatment options, selection of most feasible option and present as part of Project Feasibility	Development of a Master Rehabilitation Plan	To coordinate and align all regulatory requirements To ensure compliance with environmental legislation Obtain approval for envisaged Rehabilitation proposal	Kangra Coal DWS	Commence July 2023 End May 2024
	Develop and implement backup systems for AMD in the case of failure or emergency spills	Develop contingency plans to be integrated into IWWMP Pipeline to be installed to pump surplus water to PCD's Audit implementation	Kangra Coal DWS	July 2022 On-going
	Flood-releases during high-flow periods	Initiate investigation to evaluate the option of flood-releases from the Ntshingwayo Dam upstream of Ballengeich Colliery during high-flow periods in the Ngagane River	DWS (as part of WULA)	Commence April 2023



Management Approach	Management Action	Function	Responsibility	Time schedule
	Treatment options to reduce the residual impact from the coal mines situated in the upper reaches of the catchment	Initiate investigation to evaluate different treatment options to reduce the residual impact from the coal mines in order to obtain departmental consent	DWS Kangra Coal Appointed Service Provider	Commence April 2024
	Testing of proposed passive treatment scheme on pilot scale comprising an Anoxic Limestone Drain (ALD), Successive Alkaline Producing System (SAPS), Sedimentation/Oxidation Pond, and Aerobic Wetland units	Passive treatment of AMD from decant via full passive treatment train: ALD → SAPS → Sedimentation/Oxidation Pond → Aerobic Wetland (1,000 m ³ /day design capacity; GFK Consulting Engineers, March 2026) Terrain preparation to ensure clearance of 3 hectares to treat 1ML of AMD Eucalyptus plantation to be felled for organic material harvesting Engineering design report to be compiled for detail on locality, capacity, neutralisation dosage requirements and retention time	Kangra Coal Appointed Service Provider	Sep 2022 – Dec 2025
<u>COMPLIANCE WITH NWA</u> Obtain the required authorisations for identified water uses	Appoint suitable qualified professional service provider to conduct the required specialist studies and facilitate the application process	Collate all available information with regards to rehabilitation and mitigatory measures already implemented in order to delineate the scope of work for consideration of suitable AMD treatment technology	Kangra Coal Appointed Service Provider	Apr 2022 – Aug 2023



Management Approach	Management Action	Function	Responsibility	Time schedule
	Based on regulatory authority site inspection and outcome of Pre-feasibility study commence with the stipulated actions to comply with environmental legislation	Compliance with GN 267 Regulations Specialist studies in the field of geohydrology, wetland delineation, civil engineering and public participation Additional studies required to conduct the IWWMP and RSIP reports inclusive of aquatic ecology, hydrology, waste load allocation, catchment assessment, alien invasive control, storm water control -GN704 requirements	Kangra Coal Appointed Service Provider	Aug 2022 – Apr 2023
<u>REMEDIATION</u> Remediation of historical mining operations	Implementation and upgrading of pollution control structures in accordance with Kangra's Master Rehabilitation Plan	Implementation of pollution control structures if in absence Upgrading of existing pollution control structures Implementation of additional pollution prevention structures if inadequate On-going maintenance programme to ensure the functionality of the pollution control structures	Kangra Coal	On-going
	Develop and implement management plans to address impacts	Develop EMP's and closure plans to manage impacts (if not State responsibility) Audit implementation		June 2022 On-going



Management Approach	Management Action	Function	Responsibility	Time schedule
<u>ENSURE ADEQUATE SURFACE WATER FLOW</u> Ensure adequate surface water flow, to increase base-flow conditions	Re-evaluate the hydrology pattern of the Ngagane River catchment	Update flow records based on additional flow measurements obtained through the installation of flow-measuring weirs Minimum data required: one hydrological year	Kangra/DWS	Commence April 2023 and ongoing
	Determine the basic human needs Reserve and ecological Reserve for the Ngagane River catchment	Determine intermediate and/or full Reserve Determine desk top estimate in the interim	DWS	Dependent on national priority December 2022
	Quantify and assess water use and land use	Evaluate water use in the catchment in accordance to the Reserve determination and based on the refined hydrology pattern of the catchment Revise water use licences	DWS	Commence March 2022
	Implement land use strategies for afforestation, agricultural and impoundments to encourage unpolluted runoff	Collect all available strategies/guidelines to encourage runoff and develop a simplified summary thereof Distribute strategies/guidelines Audit implementation	Agriculture DWS	October 2022 November 2022 On-going
	Identify and remove alien vegetation in the catchment to increase the base-flow	Initiate survey in catchment to determine problem Initiate <i>Working for Water</i> programme if necessary	DWS SANRAL Kangra Coal	October 2022 and ongoing



Management Approach	Management Action	Function	Responsibility	Time schedule
<u>CREATE AN ENABLING ENVIRONMENT</u> Creation of an enabling environment to ensure successful implementation of the management strategy	Ensure suitable level of knowledge	Need to establish a Catchment Forum Develop and publish a simplified version of the WQMS Develop simplified summaries of all land use strategies and guidelines Initiate regular information sessions during the Forum meetings	DWS Kangra Coal Forum	September 2023 November 2024 On-going
	Ensure suitable level of skill	Involve the community during routine inspections in the catchment, thereby capacitating them to actively participate Identify and develop necessary management instruments and tools to assist stakeholders in implementing the WQMS Identify other stakeholders as the need arise, and empower them to participate in the implementation of the WQMS	DWS DMR Forum	On-going
	Ensure suitable level of cooperation	Continue with the capacity building program in the Ballengeich area initiated by stakeholders Maintain commitment to the WQMS	Forum	On-going



Management Approach	Management Action	Function	Responsibility	Time schedule
<u>IMPLEMENTATION ACTIONS</u> Strategic actions	Integrate future development in the Ngagane River catchment with the WQMS	Participate in future land use development projects as part of the EIA process or any other related process Provide input to ensure integration with the WQMS and management objective	Forum	On-going
	Cost-benefit analysis to determine the actual socio-economic impacts associated with each of the management actions	<i>[Dependent on finalisation of water quality simulation model – refer to page viii: Implementation actions]</i> <i>[Dependent on investigations with regard to treatment options – refer to page iii: Residual impact control]</i>	Kangra Coal	Commence April 2023 <i>On-going where major impacts already identified</i>
	Evaluation of the management actions by means of an appropriate water quality simulation model before implementation	<i>[Dependent on finalisation of water quality simulation model – refer to page viii: Implementation actions]</i> <i>[Dependent on investigations with regard to treatment options – refer to page iii: Residual impact control]</i>	Kangra Coal DWS	Commence April 2023 <i>On-going where major impacts already identified</i>
	On-going maintenance and revision of the WQMS	Update WQMS and action plan on an annual basis	Forum	On-going
<u>IMPLEMENTATION ACTIONS</u> Operational actions	Development and calibration of an appropriate water quality simulation model	Update Horn River water quality model for the Ngagane catchment Calibrate the model using the updated hydrological information	Kangra Coal DWS	Commence April 2023
	Management and dissemination of information	Registration of monitoring points on RQS database. Spatial orientation of data using GIS (Such as Planet GIS)	Kangra Coal	On-going



Management Approach	Management Action	Function	Responsibility	Time schedule
	Continued chemical, bacteriological and biological monitoring	Implement WQMP for the sub-catchment based on KPI for pollutants stemming from mining related activities	Kangra Coal	On-going
	Maintenance of awareness and communication	Maintain awareness with respect to progress on the implementation of the WQMS Develop a Communication Strategy to maintain communication of the above to all stakeholders	Kangra/Forum	On-going
<u>IMPLEMENTATION ACTIONS</u>	Evaluation and monitoring of implementation of the WQMS as applicable to Ballengeich Colliery	Bi-annual review at Forum meeting	Forum	On-going
Control actions	Audit achievement of in-stream water quality objectives	Bi-annual review at Forum meeting	Forum	On-going
	Audit achievement of compliance requirements and licence conditions	Bi-annual review at Forum meeting	DWS	On-going

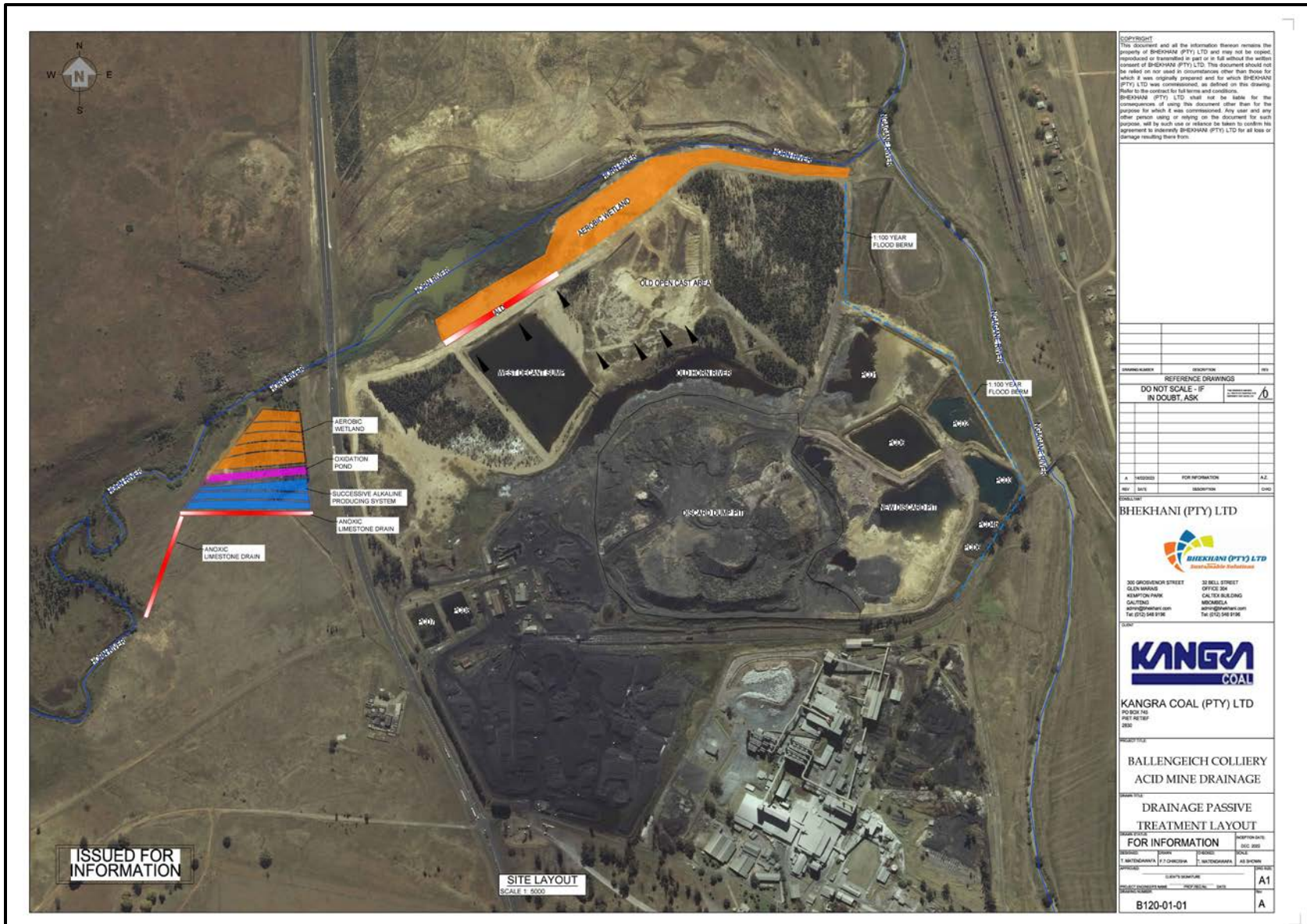


Figure 2-1: Areas at Ballengeich earmarked for rehabilitation



3. OWNER / DEVELOPER OF THE PROPERTY -

The owner of the property is Kangra who is ultimately responsible for:

- Commissioning the preparation, implementation and monitoring of the EMPr.
- Ensuring that the EMPr is submitted for approval with the Risk Assessment Matrix to quantify the identified Environmental Impact and that approval in the form of a Letter of Acknowledgement is given before rehabilitation commence.
- Appointing the Environmental Control Officer.
- Ensuring compliance by all parties and the imposition of penalties for non- compliance through the ECO.
- Bearing the costs of development and implementation.
- Implementing corrective action where required.
- After the rehabilitation has been completed and additional occupiers of the property take ownership, the above responsibilities devolve to the property owner or other appropriate organisation.

4. LEGISLATION

Management of the implementation of the Rehabilitation Plan during both the construction and the operational stages is subject to a suite of environmental law. Compliance with this legislation is an integral aspect of the EMPr. Examples of the some of the relevant legislation:

- National Environmental Management Act 107 of 1998;
- Development Facilitation Act 67 of 1995;
- National Water Act 36 of 1998;
- Atmospheric Pollution Prevention Act 45 of 1965;
- Local Government Municipal Structures Act 117 of 1998;
- Hazardous Substances Act 85 of 1993;
- Fire Services Act 99 of 1956;
- Occupational Health and Safety Act 85 of 1993;

Reference is made to specific requirements when engaged in section 21(c) and (i) water uses in terms of section 39 of the NWA. The requirements as depicted in paragraph 6 of GN 4167 Regulations are stated below:

- | | |
|---|--|
| 6 | (1) A person who -
(a) Owns or lawfully occupies property registered in the Deeds Office
(b) Lawfully occupies or uses land that is not registered or surveyed; or
(c) Lawfully has access to land on which the water use takes place
May on that property or land -
(i) exercise the section 21 (c) or (i) water use activities set out in Appendix D1 without being subject to the requirement of a Risk Matrix assessment in terms of this notice and subject only to conditions (4) to (12) listed under section 7 of this Notice;
(ii) All SOE's and other institutions specified in Appendix D2 having lawful access to that property or land may on that property use water in terms of section 21(c) or (i) as specified under each of the relevant institution without being subject to a Risk Matrix assessment and subject only to conditions (4) to (12) listed under section 7 of this Notice
(iii) use water in terms of section 21(c) or (i) water uses if it has a low risk class as determined through the Risk Matrix (Appendix A). (This Risk Matrix must be |
|---|--|



- completed by a suitably qualified SACNASP professional member).
- (iv) do maintenance work associated with their section 21(c) or (i) Existing Lawful Use that has a low risk class as determined through the Risk Matrix (Appendix A). (This Risk Matrix must be completed by a suitably qualified SACNASP professional member).
- (v) conduct rehabilitation of wetlands (read together with General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009) and/or rivers where such rehabilitation activities have a low risk class as determined through the Risk Matrix (Appendix A). (This Risk Matrix must be completed by a suitably qualified SACNASP professional member).
- (vi) conduct river and storm water management activities including maintenance of infrastructure as contained in a river management plan or similar management plan. Appendix B contains minimum requirements for such a plan to be approved by the relevant regional office or Catchment Management Agency (CMA). Once approved by the regional office or CMA these plans can be implemented in terms of this GA subject only to conditions (7) to (12) listed under section 7 of this Notice;
- (vii) conduct emergency work arising from an emergency situation and or incident associated with the persons' existing water use entitlement, provided that all work is executed and reported in the manner prescribed in the Emergency Protocol contained in Appendix C and subject only to conditions (7) to (12) listed under section 7 of this Notice.

In the instances referred to in section 6 (i) and (ii) herein, there is no requirement for compliance to all the conditions of this notice other than section 7(4)-(12) of this Notice.

In the abovementioned instances referred to in section 6(vi) and (vii) herein, there is no requirement for compliance to all the conditions of this notices other than section 7(7)-(12) of this Notice

Rehabilitation

- 4 (a) For rehabilitation as contemplated under paragraph 6(1)(v); the rehabilitation must be conducted in terms of a rehabilitation plan and implementation of the plan must be overseen by a suitably qualified SACNASP professional member or SACLAP professional. This includes rehabilitation being done for emergency alterations and/or the rectification of reportable incidents.
- (b) For all other construction or maintenance activities upon completion of the construction activities related to the water use—
 - (i) systematic rehabilitation must be undertaken to restore the watercourse to its condition prior to the commencement of the water use;
 - (ii) all disturbed areas must be re-vegetated with indigenous vegetation suitable to the area or according to a plant species plan;
 - (iii) active alien invasive plant control measures must be implemented to prevent invasion by exotic and alien vegetation within the disturbed area; and
 - (iv) The Master Layout Plan as was used during the risk assessment must ensure “Design with nature” principles by excluding sensitive area, provide erosion protection, upkeep and maintenance of structures
- (c) Following the completion of any works, or during any annual inspection to determine the need for maintenance at any impeding or diverting structure, the water user must ensure that all disturbed areas are -
 - cleared of construction debris and other blockages;
 - cleared of alien invasive vegetation
 - reshaped to free-draining and non-erosive contours, and
 - re-vegetated with indigenous and endemic vegetation suitable to the area.



- (d) Upon completion of any works, the water user must ensure that the hydrological functionality and integrity of the watercourse, including its bed, banks, course (flow regime), riparian habitat and aquatic biota is equivalent to or exceeds that what existed before commencing with the works.
- 5 (a) The water user must determine the in-stream baseline water quality for pH, EC, TSS, Turbidity, Temperature and Dissolved Oxygen ("DO") weekly for 1 month before commencement of the water use. This must include dated photographic records of all the sites. Thereafter in-stream water quality (same parameters) must be measured on a weekly basis during construction both upstream and downstream from the activities and continue until baseline values have been achieved. Baseline water quality levels and other resource quality characteristics must be reached and be maintained after construction and rehabilitation.
- (b) The water user must ensure the establishment and implementation of a monitoring program as required to measure the impacts on the resource quality as mentioned in 7(3)a-m.
- (c) Upon the written request of the responsible authority the water user must:
- (i) Ensure the establishment of any additional monitoring programmes or plan; and
 - (ii) Assess the water use measurements made in terms of this notice and submit the finding to the responsible authority for evaluation; and
 - (iii) Ensure environmental audits are conducted; and
 - (iv) Submit electronically as indicated under Record Keeping and Disclosure of Information under section 7(8) of this notice;
- (d) Upon completion of construction activities related to the water use, the water user must undertake an Environmental Audit by a suitably qualified person within 6 months of completion of the activities to ensure that the rehabilitation is stable. Should the Environmental Audit find that further remedial work is required to rectify any impacts it must be implemented.
- (e) Rehabilitation structures must be inspected monthly for the accumulation of debris, blockages, instabilities and erosion with concomitant remedial and maintenance actions until it is stable.
- (f) Copies of all designs, method statements, rehabilitation and monitoring plans and any other relevant reports as considered in the Risk Matrix, must be made available to the responsible authority as per section 141 of the Act as per request under paragraph (5)(c) iii.

Budgetary Provisions

- 6 (a) The water user must ensure that there is a budget sufficient to complete, rehabilitate, monitor and maintain the water use as set out in this Notice.
- (b) The Department may at any stage of the process request proof of budgetary provisions

Registration

- 7 (a) Subject to the provisions of this General Authorisation, a new water user must submit the relevant registration forms to the responsible authority.
- (b) The responsible authority must provide confirmation of registration to the water user within 30 working days of the responsible authority being satisfied that the submission complies to all the requirements of this notice.
- (c) On written receipt of a registration certificate/letter from the Department, the person will be regarded as a registered water user and can only then commence with the water use as contemplated in this Notice.
- (d) Upon change of ownership the successor in title must notify the region or CMA within 3 months to have the existing entitlement registered in his/her name.



Record-keeping and disclosure of information

- 8 (a) Subject to paragraph (5)(a) and (5)(c) above, the water user must, for at least the first five years, keep a written record of monitoring results and any other supporting documents related to the activity and its related risks and must be made available upon inspection or written request.

Water users are further required to register on www.dws.gov.za/dir_ws/wsmenu and upload all documents applicable to the full project lifecycle including baseline water quality data and monthly monitoring data against baseline as required in terms of paragraph (5) on the departmental Integrated Regulatory Information System (see information box below).

Inspection

- 9 Any property in respect of which a water use has been registered in terms of this Notice is subject to inspection as contemplated in sections 124 and 125 of the Act.

Offences

- 10 A person who contravenes any provision of this authorisation is guilty of an offence as set out in section 151 (1) of the Act and is subject to the penalty set out in section 151(2) of the Act.

Compliance with this Notice, the Act, Regulations under the Act, and other laws

- 11 The responsibility for complying with the provisions of this authorisation is vested in the water user and not any other person or body.
- 12 This authorisation does not exempt a person who uses water from compliance with any provision of the Act unless stated otherwise in this Notice, or any other applicable law, regulation, ordinance or by-law.

5. SCOPE OF WORK

The question was raised whether immediate remediation could be done in terms of section 19 of the NWA without the need for a WUL. It was agreed at the meeting held during October 2024 with representatives of the DWS, to apply the Rehabilitation requirements as depicted under paragraph 6(1)(v) of GN 4167 Regulations dated 8 December 2023. The Risk Assessment Matrix (RAM) was completed and all risks associated with the rehabilitation actions fluctuate from Low to Medium. The outcome of the RAM has delineated the following Scope of Work:

Rehabilitation activities and measures required in terms of Action Plan:

- (i) Installation of WQ monitoring stations;
- (ii) Rehabilitation of erosion areas;
- (iii) Implementation of biomonitoring points;
- (iv) Emergency maintenance of existing berms;
- (v) Instream weir rehabilitation;
- (vi) Construction of passive wetland system;
- (vii) Dust suppression
- (viii) Stormwater Management
- (ix) Decommissioning of existing Eucalyptus plantation to make space for passive wetland infrastructure; establishment of new 3.57 ha Eucalyptus SFRA plantation adjacent to West Decant Sump as AMD mitigation measure (Item 23; S21(d))
- (x) Rehabilitation of Old Discard Dump:
- (xi) Improving dongas and erosion channels on access road;
- (xii) Continual bi-annual ecological assessment
- (xiii) Surface water monitoring programme;
- (xiv) Rehabilitation and Post Closure Plan;
- (xv) Riparian Habitat Restoration;



(xvi) Stream/river channel restoration

Table 5-1: Legal status of planned rehabilitation actions

Rehab Action	Description	Legal Requirement	Remark
ii	Rehabilitation of eroded areas	Section 19 of the NWA	Allowable in terms of section 19(2) of the NWA Low Risk
iv	Emergency maintenance of existing berms	Section 19 of the NWA	Allowable in terms of section 19(2) of the NWA Low Risk
v	Instream weir rehabilitation	Section 21(c), (i)	Weir rehabilitation not seen as a high priority and could be part of the WULA. Low Risk
vi	Construction of passive wetland system	Subject to Section 21(c), (i), (f) and (g) WULA	The risk matrix has indicated a Moderate risk and as such not permissible under GN 4167 Regulation as a General Authorisation. The construction of the passive wetland system (ALD, SAPS, Oxidation Pond and Aerobic Wetland units) is subject to a Water Use Licence under Section 21(c), (f) and (g) of the NWA. The WULA (DWS Ref: WU33839) has been submitted for this purpose (Phase 2, June 2026).
ix	Eucalyptus plantation — decommissioning and new SFRA establishment	Needs a WUL for a section 21(d) water use as identified in terms of section 36(1) of the NWA	The existing Eucalyptus plantation on Portion 19 will be decommissioned to make space for the construction of the passive wetland treatment infrastructure. Felled material will be composted on site for use as the organic carbon layer in the SAPS. A new 3.57 ha Eucalyptus plantation (Item 23; S21(d) Streamflow Reduction Activity) will be established adjacent to the West Decant Sump on Portion 19 as part of the



Rehab Action	Description	Legal Requirement	Remark
			AMD mitigation programme. This water use is applied for under the current WULA (DWS Ref: WU33839; Phase 2, June 2026).
xi	Improving dongas and erosion channels on access road	Section 19 of the NWA	Allowable in terms of section 19(2) of the NWA Low Risk
xv	Riparian Habitat Restoration	Section 21(c), (i)	GN 4167 R states the need for an approved Rehabilitation and Implementation Plan. The minimum will be registration of the water use on WARMS. As per Section 141 of the NWA the DWS could request for designs, method statements, rehabilitation and monitoring plans or any other relevant report as considered in the Risk Matrix. The activity is likely to trigger Listing Notices 1 and 2 of NEMA. Kangra should include this remediation action as part of the WULA. According to the Risk Matrix the impact is Moderate and therefore likely to be subject to a section 21(c) and (i) WUL. Moderate Risk
xvi	Stream/river channel restoration	Section 21(c), (i)	GN 4167 states the need for an approved Rehabilitation and Implementation Plan. See comment above. Moderate Risk

6. PURPOSE AND OBJECTIVES OF THE REHABILITATION PLAN

The overall objective by Kangra is to reduce the waste load to the Horn River by implementing a passive wetland system to ameliorate the Acid Mine Drainage (AMD) entering the catchment. Water quality data is indicative of poor quality that enters the Horn River which could lead to an overall degradation of the Present Ecological Status of the catchment. The current PES of the Horn River is Class D/E (severely



modified) as confirmed by the November 2023 aquatic ecological assessment (MENCO). It is envisaged that the passive AMD treatment system will progressively improve the Horn River PES toward the target Recommended Ecological Category (REC) of Class C as set in GN 1873 (March 2022).

The sulphate concentration in the catchment is illustrated in **Figure 6-1**. Of importance is SW 3 and SW7 indicative of high SO_4 concentrations.

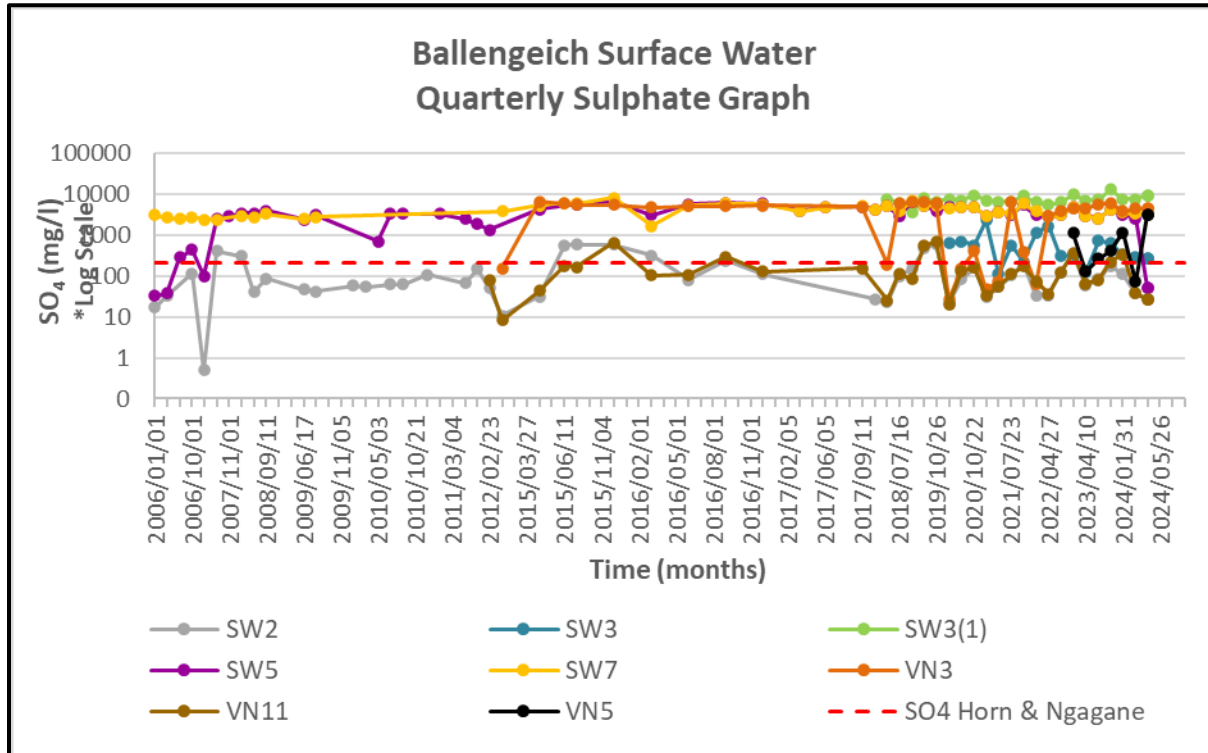


Figure 6-1: Sulphate concentration as measured at various points in the catchment

The detailed procedure to be followed by Kangra to ensure compliance with set RQO's for the catchment is described in the Engineering Design Report, which documents the construction procedure for the passive wetland systems to be implemented at Ballengeich. The document also addresses important issues such as risk and liability. A summary of the process followed for the engineering design is described below:

- A hydrological assessment is made to quantify the volume of water expected to be dealt with by the intervention for various recurrence intervals. The results of this assessment allow the engineer to select a design flow to be applied to the intervention.
- Soil types and their anticipated characteristics are assessed including geochemical results or geotechnical investigations where these have been undertaken.
- Construction materials are selected based on a range of site-specific criteria including expected velocities, availability of materials such as rock, labour intensive targets, maintenance requirements etc.
- Interventions are designed based on the above so that they will meet the objectives for wetland rehabilitation.
- The designs are drafted to show, at a minimum, a plan view, a longitudinal section and front elevation at appropriate scales, and appropriate dimensions. A legend indicating basket sizes is included for gabion structures to improve design clarity for the contractors.



- Bills of quantities are calculated for the designs and cost estimates made based on unit costs and norms for each project area.
- Maintenance requirements for existing interventions in the assessed wetlands are similarly detailed and costs calculated.

The Engineering Design Report as compiled by Bhekhani (Pty) Ltd (2023) entails the following designs:

- Anoxic Limestone Drain (ALD);
- Successive Alkaline Producing system;
- Sedimentation/Oxidation Pond
- Aerobic Wetland units (Unit 1: 1.3 ha and Unit 2: 4.4 ha)

The principles to be applied in riparian zone and wetland rehabilitation is listed in **Table 6-1**.

Table 6-1: Wetland and Riparian Area Restoration

Wetland Degradation	Impact	Mitigation	Management
Water Quality Impairment	Excess AMD, sediment and salts in runoff from adjacent area	Work to change local land use practices; install vegetated buffers/swales/constructed treatment wetlands; install sediment traps.	Sediment traps will need periodic cleaning; an expert may be needed to design buffers and swales.
	Excess sediments from eroding slopes along Horn River	Stabilize slopes with vegetation/ biodegradable structures.	Many corrective methods exist; look for most sustainable and effective methods
Altered hydrology	Historic diversion of Horn River	Fill or plug ditches or drains;	Organic soil may have decomposed so that the elevation of the site is lower than it used to be.
	Road crossing with undersized culvert	Replace with properly sized culvert or with a bridge.	Hydrologic expert needed to correct this
	Former wetland system fragmented with associated loss of ecoservices	Remove waste material and install stormwater control structures	Substrate elevation may not be correct for vegetation; add soil or control water level with low maintenance structures.
Raised soil elevation	Soil and waste material dumping or fill	Remove discard (waste) material and replace with topsoil.	Fill may have compressed soil to lower than initial elevation; take steps to avoid erosion
Subsidence	Soil removal; oxidation of organics; groundwater removal	Add fill; allow natural sedimentation.	Fill must support target wetland; test fill for toxic compounds.
Toxic Soils	By-product of on-site or offsite industrial process; dumping;	Treatment systems or methods appropriate to the soil / pollutants;	Work with experts to choose treatment methods that cause



Wetland Degradation	Impact	Mitigation	Management
	leaching and concentration of natural compounds.	remove material; cover with appropriate topsoil.	least amount of indirect damage; choose a different site to avoid serious toxin problems
Loss of Biodiversity	Change in original habitat	Restore indigenous plant and animal community using natural processes	Allow species to colonize naturally; import species as appropriate.
Loss of Indigenous Plant Species	Invasive and/or non-native plants; change in hydrology; change in land use	Remove invasive, non-native plants (allow indigenous plants to re-colonize); try to reverse changes in hydrology.	Pick lowest impact removal method; repeat removal as aliens re-invades; alter conditions to discourage non-native species.

Based on the Master Layout Plan as depicted in **Figure 6-2**, specific intervention requirements will be needed as part of the river restoration plan (refer **Table 6-2**). This component of the Rehabilitation Plan will be subject to DWS approval and cannot be implemented without departmental authorisation. A water use license (WUL) needs to be applied for by Kangra.

Table 6-2: River restoration intervention requirements

Site	Type	Description
	MacMat-R	MacMat-R with earthworks and rock packing; site rehabilitation with indigenous plant species
	Gabion weir	Gabion weir with MacMat-R, earthworks and rock packing; site rehabilitation with indigenous vegetation
	Stone Masonry weir	Stone masonry weir; site rehabilitation with indigenous vegetation
	Earth works	Cut and fill drainage channel; site rehabilitation with indigenous vegetation

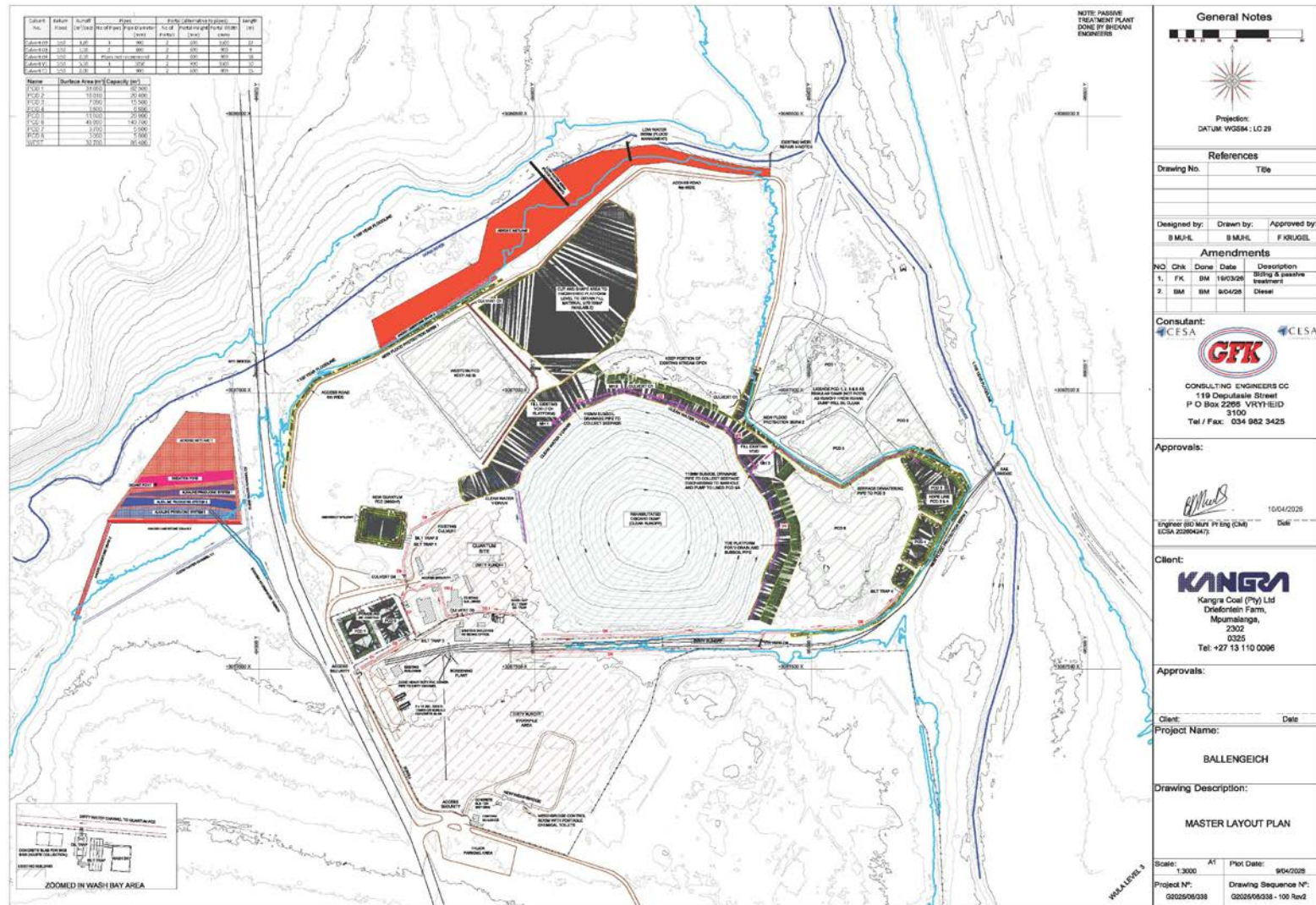


Figure 6-2: Master Layout Plan



7. GENERAL CONSTRUCTION NOTES

All contractors, sub-contractors are responsible for:

1. Occupational health and safety are a priority. All necessary precautionary measures must be undertaken to ensure safety of the team. Particular attention must be given to deep excavations where gentle sloping back of soil or shoring must be applied to prevent possible soil collapse. Where risks are foreseen, these must be reported to the Health, Safety and Environment Manager employed by Kangra, who may need to seek further advice. In addition, no excavated earth or other materials should be stockpiled within a distance of one metre from the edge of any excavation. The one-metre-wide strip along the edges of all sides of an excavation should at all times be kept clear of objects such as lumps of clay, rocks or tools that could injure workers in the excavation if they were to fall in.
2. Check all dimensions on site to determine if any amendments to the designs are necessary. Note the required final height of the structure relative to the original ground level. The responsible engineer must be consulted before any changes are made to dimensions.
3. Excavation must be carried out to the final levels. Soil must be placed in areas best suited for re-use, for example, when constructing an earthen diversion embankment, the soil excavated should be used immediately in building up the embankment (on condition the excavated soil is of suitable quality). The excavated soil should alternatively be stockpiled immediately upstream of the site of the proposed wall. The topsoil must be stockpiled separately from the subsoil.
4. Where soil is to be the foundation for non-soil structures (for example, gabions and swales), all sand deposits must be removed and the floor well compacted while the soil is at optimum moisture content.
5. In instances where the addition of lime has been specified for the amelioration of a contaminated soils, mixing must be carried out off site, after which it must be transported to the construction site.
6. When the final level of the soil construction has been reached the previously stockpiled topsoil must be added as an extra height and planted to suitable vegetation (unless other provision for protection of the structure has been specified).
7. When backfilling soil against concrete or gabion work, extra care must be taken to ensure that a waterproof joint with the structure is, as far as possible, achieved.
8. Compaction must be carried out in layers as specified by the engineer. Material containing organic matter must not be used for this backfilling purpose.
9. Note that when mixing concrete, it is preferable to use a full pocket of cement with each mix. The specified cement water ratio must be maintained at all times.
10. The poured concrete must be “rodded” to ensure proper compaction. Never add more than one metre height of concrete in any one day, and attempt to lay the concrete in even, horizontal layers throughout the length of any section. Check the specifications for any requirement of expansion joints. The shuttering should be left for at least two days before stripping. Wetting the concrete while it is curing will make for a strong construction. Backfilling of soil against the completed structure may only be done after a period of at least seven days.
11. The use of “plums” in concrete: in some instances, it may be feasible and economic to reduce the amount of concrete in mass gravity structures, by replacing up to 33% of the volume of concrete by the judicious use of suitable hand sized quarried rock. Where this is specified the rocks (purchased as handstone) must be so placed that there is always a minimum cover of 50mm between the rock and the shuttering, as well as between any two adjacent rocks. This should only be done where it is stated on the drawings that is permissible.
12. The standard procedures for the opening up and wiring together of gabion baskets and mattresses are well documented, and supplied with every delivery of the products. They must



be strictly adhered to in all respects. Ensure that the lids of the final (top) baskets are always folded down and wired in a downstream direction.

13. Where rock-filled gabion baskets are used for the construction of keywalls, the trenches must be dug wide enough so that sufficient access is available to properly backfill and compact all the way around them. Making the trench only wide enough to receive the baskets is not acceptable, as water will eventually find its way around the structures and cause problems.
14. Where structures are to be built in dispersive soils, the following should be noted:
 - a. Impermeable cut off wall (at least 500mm deep) to be constructed under spillway section of the structure
 - b. Key walls to be impermeable
 - c. Impermeable barriers to be constructed between key walls and spillway section of structures
15. Sloping and vegetating gully banks where specified:
 - a. Where the gully is no more than approximately 1.0 metre deep, and the catchment area small (say ten hectares), the topsoil of the site immediately adjoining the channel is removed and stockpiled in a safe place nearby. The subsoil thus laid bare is excavated at a slope not less than 1:3 (V:H) and deposited in the gully.
 - b. This deposit is carefully compacted while in a moist state. The topsoil is now returned to the sloped area, and spread as evenly as possible over it. Vegetation suitable to the site is planted. The additional advantage to this idea is that, as the channel cross section is made shallower and wider and established to vegetation, so the chances of floodwaters overflowing into the adjacent flood area will be that much greater.
 - c. Note that the base of the modified channel should be planted to strong, hydrophytic plants while the outer edges will require plants more suited to drier regimes. It must be emphasised that the stockpiling of the topsoil and its replacement is vital, especially where very erodible subsoil is present. Failure to do this will be tantamount to a waste of money and effort.
16. The orientation of all wetlands and interventions is to be taken facing downstream i.e. left bank and right bank are to be identified facing downstream.
17. The Bill of Quantities for the various rehabilitation interventions only included revegetation in those instances where the engineer considered the re-vegetation of the denuded area as important due to the size of the area affected or due to the risk associated with scouring and erosion.

8. ADMINISTRATION

8.1 Contractual Issues

The contract between the implementer and the contractor shall be readily accessible to project managers and contractors. The project manager must ensure that the contractor and workers understand the contract. Each contract shall be allocated a unique identity number.

The following shall form part of the contract between the implementer and contractors:

- Rehabilitation specifications;
- Technical drawings of the structures, including a list of the material required;
- Environmental management plan;
- Site plans

8.2 Records, data and quality control

Each contractor shall maintain an up-to-date timesheet of daily worker attendance. Details of new appointments shall be submitted to the implementer. Timesheets shall be available for inspection by



any Kangra staff member. A record shall be kept of equipment and consumables issued against the contract document. A quality control sheet completed by the implementer shall record on-going quality checks and the final check before payment. This shall certify that work done complies with contract specifications.

9. GENERAL ENVIRONMENTAL GUIDELINES FOR CONSTRUCTION

9.1 Environmental Control Officer (ECO)

The contractor shall direct all his/her queries regarding any environmental issues or aspects to the ECO. The ECO shall discuss the matter with the DWS as required and give feedback to the contractor. The ECO shall be responsible for evaluating compliance of all aspects of the CEMP. Monthly site audits shall be undertaken by the ECO and a detailed report submitted to Kangra Coal for review prior to the following audit. An annual overview report shall be submitted to the DWS. If queries or problems arise for issues that cannot be proficiently addressed by the ECO, the ECO shall seek advice from the Project Manager who shall seek assistance from a person or persons that are educated and experienced in the relevant field.

9.2 Feedback to the DWS

Any problems or areas of non-compliance with regard to the CEMP shall be communicated to the Contractor by the ECO, in addition to informing the DWS, who will decide on appropriate action.

9.3 Failure to comply with the Environmental Considerations

The ECO shall order the contractor to suspend part or all of the works if the contractor causes damage to the environment by not adhering to the specifications set in the CEMP. The suspension shall be enforced until such time as the offending party/ies' actions, procedure and/or equipment are corrected. No extension of time shall be granted for such delays and all costs shall be borne by the Implementer. The programme manager, technical advisors and regional coordinators of Kangra shall intervene to suspend operations at projects where clear violations of the environmental management plan and the best management practices are observed, and where these violations are having or have the potential to cause a significant environmental impact.

9.4 Environmental training program

The ECO, with the assistance of the contractor, shall communicate all aspects of the CEMP to the site staff (i.e. from site agents to labourers) prior to commencement of excavation or any other environmentally disturbing activity. Basic environmental awareness training shall be carried out for all employees and shall be included in safety training. A copy of the CEMP shall always be made available on site.

9.5 Progress / site meetings

Environmental issues shall be put on the agenda as a discussion point during progress/site meetings. The Implementer, or a designated person involved with environmental issues on the project, shall attend the progress and/or site meetings on a regular basis to provide feedback on any outstanding or contentious environmental matter.



10. SITE ESTABLISHMENT

10.1 Site plan

The project manager shall design a site plan for each site that identifies suitable locations for all work, storage, parking, toilet, processing and other areas prior to site establishment. The Contractor shall erect and maintain temporary boundary markers of the type and in the locations directed by the Engineer. Such markers, such as danger tape or suitable equivalent, shall be erected before undertaking designated activities.

10.2 “No-go” areas

The construction site shall be contained in an area required to undertake the works. Any area beyond shall be considered “no go” areas. The Contractor shall ensure that, insofar as she/he has the authority, no unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated “no go” areas.

“No go” areas shall be clearly demarcated with commercially available danger tape or suitable equivalent. The Contractor shall maintain the construction site boundary for the duration of construction and ensure that the danger tape does not become dislodged.

10.3 Waste currently on site

The site shall be cleared of all litter/waste prior to any construction related activities and the waste shall be disposed of at a registered waste disposal facility. This is to ensure that no waste is incorporated into the environment during the construction process. Recycling of waste material shall be encouraged.

10.4 Vegetation clearing

Vegetation on the site shall be removed prior to commencement of construction activities. However, care shall be taken to confine removal of vegetation during construction activities to within the boundaries of the development area. The removal, damage or disturbance of any flora and fauna outside the construction area shall not be permitted unless specifically authorised by the ECO.

No areas may remain cleared (bare soil exposed) for longer than 3 weeks. Efficient construction planning must ensure that all relevant materials, construction equipment and manpower are available upon commencement of construction in an area. Thereafter, the cleared areas must be suitably re-vegetated.

10.5 Biodiversity

Disturbance of indigenous plants and animals shall be minimised. Collection of indigenous plants, parts of plants or animals may only take place with the appropriate permits.

Bio-engineering methods that involve re-vegetation will, as far as possible, use individuals of local species taken from surrounding areas, in order to avoid or reduce genetic pollution. Collection must not lead to habitat destruction. Alien species may not be used for re-vegetation.



10.6 Removal of top-material

Prior to the commencement of construction activities top-material (up to a maximum of 30 cm) shall be removed from the work area and stockpiled for re-use in subsequent rehabilitation and landscaping activities. The top-material shall be stockpiled separately from the subsoil and construction materials. The contractor shall ensure that no remnants of stockpiles are left in positions or states that may be eroded during and after construction.

10.7 Defacement of natural features

Trees, natural vegetation, or any other natural features outside the work area, which will not be cleared for construction purposes, shall not be defaced or painted for benchmarks. No damage is permissible, not even for survey purposes. The latter shall only be undertaken if agreed to by the ECO. Any feature defaced by the contractor shall be reinstated to the satisfaction of the ECO.

Should any Red Data species be encountered, in situ conservation shall be undertaken if at all possible. Should this not be considered possible then a specialist shall be consulted for possible relocation. In addition, any bird nests encountered should not be interfered with. If impact is unavoidable the nest shall be relocated by a suitably qualified individual.

No pesticides of any description shall be used during the construction phase. Pesticides should also be discouraged from use during the operational phase of the project.

For the conservation of wildlife, should any be found, species may not be killed or otherwise deliberately disturbed. It is anticipated that as a result of the construction wildlife species will take shelter in neighbouring areas and reserves. Although highly unlikely, construction workers should be advised not to catch or kill any wild animals in the area, including snakes.

10.8 Stabilizing of steep slopes

The disturbance of steep slopes, for example by the removal of vegetation, may result in slope instability and erosion by rain and surface runoff. All slopes that are disturbed during construction shall immediately be stabilised to prevent erosion. The rehabilitation measures listed in Section 2 must be implemented in the rehabilitation.

10.9 Removal of alien vegetation

The contractor shall ensure that invasive alien vegetation is cleared from the entire site prior to the commencement of construction activities. Any species that are declared invasive species [according to the Conservation of Agricultural Resources Act (Act 43 of 1983)] must be removed from site. Follow up clearing may be necessary if the species re-establish following the initial clearing. No trees within environmentally sensitive areas may be removed, whether alien species or not, unless permitted by the ECO.

Other alien species (non-listed) occurring on site shall not be used for landscaping activities and shall be removed from site where possible.



10.10 Revegetation

Once construction is complete, rehabilitation (i.e. the planting of indigenous vegetation) of disturbed areas shall be undertaken immediately in order to restore the aesthetic and ecological value of the area. Only locally appropriate indigenous vegetation shall be utilised. Rehabilitation shall be undertaken according to the following schedule:

- Infilling of all excavation work. Subsoil shall be filled in first to ensure that topsoil is present on the surface to secure a suitable plant growth medium. Substrate that is not suitable for plant growth should not be used for infilling of excavations unless it is used at a suitable depth e.g. deeper than 2 m.
- Removal of all construction rubble from the site, including substances that cannot be used for infilling of excavations, shall be undertaken.
- Steep and unstable slopes shall have stabilising measures put in place to prevent collapse of the slopes or soil erosion. Slope stabilisation and soil erosion prevention measures include the placement of silt fences, staked grass sods and rows of sawdust filled onion bags.
- The exposed ground should be seeded and mulched with an appropriate stabilising grass mixture. A good stabilising grass seed mix should include:
 - o *Andropogon eucomus* (Snowflake Grass)
 - o *Aristida congesta* (Tassel Three-awn)
 - o *Cenchrus ciliaris* (Foxtail Buffalo Grass)
 - o *Cynodon dactylon* (Kweek/Couch grass)
 - o *Digitaria eriantha* (Common Finger Grass)
 - o *Eragrostis curvula* (Weeping Love Grass)
 - o *Imperata cylindrical* (Cottonwool Grass)
 - o *Melinis repens* (Natal Red Top)

11. ENVIRONMENTAL PLANNING

Please refer to **Appendix 2** for generic EMPr to deal with mitigatory measures related to section 21(c) and (i) water uses.

11.1 Hydrological impacts

The construction of interventions within the Horn River watercourse is likely to have difficulties associated with the presence of water, under both normal and wet conditions. In the event that the planned interventions are located within the seasonal and permanent zones of the wetland, diversions may need to be put in place to temporarily divert water away from the work site.

In order to reduce the requirements to divert water from the construction site, implementation of the rehabilitation activities within seasonal and permanent wetness zones shall take place within the dry season:

- Winter rainfall areas - November to March
- Summer rainfall areas - May to September

In those cases where working in wet conditions is unavoidable the following shall be implemented:

- Water shall be diverted away from the intervention site during the implementation of rehabilitation activities
- Diversions shall be temporary in nature (e.g. sand bags, eco-logs)
- Upon completion of the rehabilitation activities at the site, the diversions shall be removed to restore natural flow patterns



- In those instances where the impact of the diversions is negligible and removal may result in further disturbance, diversions structures shall be left in situ (this shall be decided in consultation with Working for Wetlands)

Water courses are subject to unanticipated flooding and adequate precautions shall be taken to avoid damage to facilities, equipment and wetland habitat:

- Ensure storage areas are located outside of floodable areas
- Minimise the extent of disturbed/exposed areas to reduce extensive damage during flood events

11.2 Disturbance of Vegetation

Disturbance of indigenous plants within the wetland and surrounding catchment shall be minimised. In the event that vegetation needs to be removed during construction, the vegetation shall be stored in a shaded and moist area, or at the Peninsula project's nursery site, for use in revegetation. Re-vegetation of all exposed soil must be done before the team leaves the site.

Bio-engineering methods involving the re-vegetation or planting of specified areas shall, as far as possible, use local plant species obtained from the following sources:

- vegetation removed during excavation,
- local 'borrow' sites, or
- naturally sourced seed mixes

This should limit the threat of introducing genetically-modified and genetically different species into the area. Non-invasive alien plant species shall not be used for re-vegetation unless approved by the Working for Wetlands (e.g. Vetiver grass).

The collection of indigenous plant or parts thereof shall only take place if the following guidelines are followed:

- Obtain the required collection permits
- Limit habitat destruction
- Implement 'mosaic' collection to ensure limited disturbance and adequate recovery of the 'borrow' site.

11.3 Local resources

In some instances, locally available resources may be utilised in the implementation of wetland rehabilitation activities. This would primarily be rocks for the construction of gabion structures. Prior approval of the technical advisor shall be obtained, with respect to:

- suitable rock types,
- suitable areas for collection, and
- appropriate collection methods

All purchased rock shall be from registered and approved crushers. Copies of the certificates shall be kept on file by the implementer. Any rock that is collected from quarries (eg AfriSam Newcastle) or mine dumps shall have the necessary documentation from the land owner.



11.4 Compaction

The storage of materials and access to the site is likely to result in the compaction of the soil around the site. This increases the risk of erosion and sediment generation originating from the site.

All impacted areas shall be rehabilitated (loosen soil and re-vegetate) once work has been completed and prior to the team leaving the site. These activities shall include the closure and rehabilitation of temporary access routes and addressing any potential erosion risks.

12. WORK METHOD STATEMENT

12.1 Verification of work

Actual work done (volumes and areas) shall be verified and recorded by the implementer, who is responsible for ensuring that contractors' invoices correspond to actual production. The implementer shall verify a minimum of 5% of work completed during the month. On completion of an intervention, a certificate of completion shall be submitted to the regional coordinator by the implementer.

12.2 Corrective action for sub-standard work

Payment shall not be made for work that does not comply with contract specifications. A record shall be kept of non-compliance to standards and poor performance. Copies of instructions issued to contractors to correct deficiencies shall be kept.

12.3 Minimum standards for construction

Gabions

Gabion work shall be done according to design specifications.

Minimum 2.5mm double galvanised wire shall be used, with a mesh size that is appropriate to the size of the rock being used. Support and binding wire shall be a minimum 2.2 mm. Lacing will be done according to specification. Support wires shall be in place (bracing). All adjoining baskets shall be laced together. Geotextile shall line all faces of the gabion baskets that are exposed to earth and certain water exposed sides.

Water corrosivity shall be determined at each site; if necessary, PVC coated gabions shall be used.

Soil dispersivity shall be determined at each site. If dispersive soils are detected, the technical advisor shall be contacted.

Density of fill material shall satisfy the gabion design. Clay bricks, weathered rock and sandstone and shale shall not be used as fill material. Any unconventional fill material shall be approved by the technical advisor. Fill material shall not be smaller than mesh size. Where fill material is hauled to its point of placement by means of wheelbarrows, the haul distance shall not be greater than 150m.

Workers shall be trained in gabion construction by an accredited organisation.

Cement and concrete batching

Concrete mix shall be according to specifications and correct MP A concrete must be used. Manufacturer's directions for mixing, consistency and treatment after pouring will be complied with.



Cement shall be stored in dry conditions for no longer than six weeks after delivery. When cement is stored temporarily infield it shall be kept on a dry waterproof base with a waterproof cover.

A demarcated site at least 20m away from water/wetland edge shall be used for cement mixing. No batching activities shall occur directly on unprotected ground. The batching plant shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand). The area shall be bunded and sloped towards a sump to contain spillages of substances. All wastewater resulting from batching of concrete shall be disposed of via a contaminated water management system and shall not be discharged into the environment. Contaminated water storage areas shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented

Empty cement bags shall be stored in weather proof containers to prevent windblown cement dust and water contamination. Empty cement bags shall be disposed of on a regular basis via the solid waste management system, and shall not be used for any other purpose. Unused cement bags shall be stored so as not to be affected by rain or runoff events. In this regard, closed steel containers shall be used for the storage of cement powder and any additives. The Contractor shall ensure that sand, aggregate, cement or additives used during the mixing process are contained and covered to prevent contamination of the surrounding environment.

The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system.

Construction using shuttering shall not take place at more than 1m height increments. Reinforcing shall be used according to specification. Concrete will be mixed and used on the same day. Where sand, stone and cement are hauled to their point of placement by means of wheel barrows; the haul distance may not be greater than 150m.

Where applicable, the location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the Engineer. The concrete/cement batching plant shall be kept neat and clean at all times.

Geo cells

Geo cells shall not be used in conditions that exceed their design specifications. Geo cell material shall be UV resistant. Geo cells shall be anchored in by the "trench" method and in such a way that prevents undermining of the cells. Fill material shall conform to the design specifications. The following general rules shall be applied:

- If soil is used to fill the cells, it shall be re-vegetated immediately,
- If concrete is used to fill the cells, some degree of permeability of the structure shall be permitted. If concrete is used as fill, concrete baffles shall be inserted. Rock is not suitable for this purpose.

Earth works

Excavations may not exceed 1.5m depth without shoring and reinforcement. Excavation and compaction must comply with design specifications. The technical advisor must be consulted for work undertaken in dispersive, unstable and organic soils. Backfilling in trenches must be done in layers of thickness not exceeding 100mm before compaction.



Each layer shall be compacted using hand compactors. Where excavation material is hauled by means of wheelbarrows, the haul distance may not be greater than 150m.

All earthworks shall be undertaken in such a manner so as to minimise the extent of any impacts caused by such activities, particularly with regards to erosion and dust generation. No equipment associated with earthworks shall be allowed outside of the Site and defined access routes unless expressly permitted by the Engineer.

13. ENVIRONMENTAL CONTROL MEASURES

13.1 Control of working hours

Working hours for all operations shall be limited to between 08h00 and 17h00 on weekdays. No work shall take place on a Saturday, Sunday and or Public Holidays. Any deviations to these work hours shall be cleared with the ECO prior to implementation.

13.2 Control of runoff that could cause pollution

Pollution may result from the release, accidental or otherwise, of chemicals, oils, fuels, sewage, wastewater containing organic kitchen waste, detergents, solid waste, litter and other such substances. The contractor shall ensure that rainwater does not run into areas containing cement, oil, diesel and other such substances as this could result in a pollution threat to sensitive environmental areas. Storage areas for these substances shall be placed on high lying ground and contain a bunded area in case of a spill. The bunded area shall be covered if deemed appropriate by the ECO.

Berms must be constructed to direct all runoff into the storm water system. The engineers shall prepare temporary storm water channels for unexpected rains during construction. Erosion control measures shall be placed in areas where runoff concentrates in order to detain the sediment load and slow down the runoff. Erosion controls shall be put in place on all drainage channels that drain into water resources. These measures shall include, but not be limited to, silt fences, brushwood and rows of sawdust-filled onion bags. No wastewater shall run freely into any of the surrounding environment. Runoff containing high sediment loads shall not to be released directly into natural or municipal drainage systems or nearby water resources. Should sediment occur in runoff, an attenuation pond shall be constructed to allow solids to settle out prior to leaving the site.

Runoff from the site itself shall be free from oil, waste and litter before joining the storm water system or streams. This shall be ensured by securing any hazardous substances containers in order to prevent runoff and by cleaning up any refuse and construction material from the site on a regular basis.

Litter management in the storm water system or channels that lead to streams and or wetland shall be implemented. It is outside the scope of this document to prescribe litter trap designs, but the important aspect is that it shall be incorporated into the design of the development. Litter traps shall prevent solid waste from entering the storm water system.

The contractor shall only be allowed to draw water from the source/s designated by the client and the ECO. The client shall ensure that the contractor is aware of the designated water sources, and the ECO shall ensure that this is adhered to. Personnel shall not use natural hydrological features for any purpose, including recreation. These areas shall be considered “no-go” areas.

In the event of any pollution entering an environmentally sensitive area and/or buffer zone as a result of the contractor's actions, the contractor shall be responsible for all costs incurred to assist in pollution control and/or to clean up the polluted area. Damage to the wetland as a result of the project operations



shall be for the contractor's account. The responsibility of the remediation of the pollution/erosion event will ultimately lie with the contractor.

13.3 Pollution control

The contractor/s shall ensure that pollution of surface and/or groundwater does not occur as a result of site activities.

In the event of pollution caused as a result of construction activities, the contractor, according to Section 20 of the National Water Act (Act No. 36 of 1998), shall be responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas. The public shall not call upon any organisation to assist with clean-up activities before the matter has been discussed with the contractor. The ECO shall be notified immediately following any pollution event.

The ECO shall ensure that the contractors are aware that shallow groundwater is susceptible to contamination from spills. Therefore, good management practices (in accordance with local bylaws) are required to reduce the impact of the waste generation potential.

Builders' rubble and other debris shall be confined to the building site and shall not be stored/discarded on any open space outside the development area. The status of the hydrological features on or near to the site shall be monitored by the ECO to ensure that pollution does not occur in these areas.

13.4 Erosion control

The contractor shall take reasonable measures (to the satisfaction of the ECO) to prevent erosion caused by work, operations and activities undertaken during excavation and construction activities. The contractor shall ensure that disturbance on steep slopes is kept to a minimum, thus reducing the potential for erosion. The contractor is responsible for rehabilitating all disturbed areas in such a way that no future erosion will occur.

Erosion may occur in the event of rain during the excavation and construction period. Any erosion that occurs during a heavy rainfall event shall be remediated at the expense of the project budget. This shall include clean-up of the silt deposited and filling up of erosion channels that may form. Construction in sensitive areas shall be undertaken during the dry season if possible.

13.5 Dust control

The contractor shall take into consideration that there may be residential areas surrounding the building site and that dust could be a major disturbance, especially during the dry season.

The contractor shall take appropriate and reasonable measures to minimise the generation of dust as a result of his/her works, operations and activities. Particular attention shall be given to preventing dust generation during excavation and stockpiling activities. The contractor shall be responsible for educating the employees to report any excessively dusty conditions to the contractor, the ECO or responsible representative.

Corrective and preventative measures shall include (but not be limited to) regular and effective treatment of working areas using water sprays and appropriate scheduling of dust-generating activities. The contractor shall ensure that transported materials do not escape from the construction vehicles by providing adequate covering for all load beds.

13.6 Hazardous materials control

All relevant national, regional and local legislation with regard to the transport, use and disposal of hazardous materials shall be strictly complied with. The contractor shall obtain the advice of the manufacturer (Material Data Sheets) with regard to the safe handling of hazardous materials.



The contractor shall ensure that there is an emergency procedure in place to deal with accidents and incidents (e.g. spills) arising from hazardous substances.

The contractor shall ensure that all personnel on site are properly trained concerning the proper use, handling and disposal of hazardous substances.

The contractor shall report incidents to the ECO immediately. Any spill incidents shall be cleaned up immediately in accordance with the emergency procedure.

The contractor shall supply the ECO with a list of all hazardous materials that would be present on site during the construction period. The same applies to any sub-contractor who shall provide the contractor with this information.

14. STORMWATER MANAGEMENT

14.1 Storm water

Natural (storm water) runoff shall be diverted away from the construction area towards the storm water drains or channels. In addition, it shall be ensured that storm water is not allowed to collect to form ponds or excessively muddy conditions.

Special care shall be taken in areas susceptible to erosion, e.g. steep slopes. The contractor shall ensure that excessive quantities of sand, silt and silt-laden water do not enter the storm water system. Design of the storm water drainage system so as not to contaminate the natural drainage system is important. Appropriate measures, e.g. erection of silt traps, or drainage retention areas, to prevent silt and sand entering drainage lines or watercourses shall be taken.

The contractor shall clear any partial or complete blockage of the storm water drainage system as a result of construction activities at his own expense.

15. SITE REHABILITATION

All working areas shall be rehabilitated once work has been completed and before the team leaves the site. This includes closure and rehabilitation of temporary access routes. All foreign material not utilised in the rehabilitation activities shall be removed from the site. Re-vegetation of all exposed soil shall be done before the team leaves the site. Any potential erosion risks shall be addressed before the team leaves the site.

Any areas that the Engineer believes may have been impacted upon or disturbed, shall be rehabilitated to the satisfaction of the Engineer, which includes all areas where Top material has been stripped. Once construction is complete the Contractor shall clear everything from the Site not forming part of the Permanent Works. The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction. The composition of vegetation to be used for any rehabilitation shall be as specified in **Section 10.10**.

The Contractor shall not use herbicides, pesticides, fertilisers or other poisonous substances for the rehabilitation process unless otherwise agreed with the Engineer.

All rehabilitated areas shall be considered “no go” areas and the Contractor shall ensure that none of his staff or equipment enters these areas.



The Contractor shall undertake to remove all alien vegetation re-establishing on the area and shall implement the necessary temporary or permanent measures to combat soil erosion.

15.1 Removal of materials

After construction, any area cleared or disturbed (as a result of the activity) within and outside the boundaries of the construction site shall be rehabilitated to a state as agreed by the DWS and according to the specifications of the ECO.

All construction equipment and excess aggregate, gravel, stone, concrete, bricks, temporary fencing and the like shall be removed from the site upon completion of the work. No discarded materials of any nature shall be buried on the site, or on any vacant or open land in the area and shall only be disposed of at the appropriate registered waste disposal site.

15.2 Control of alien vegetation

Where project activities include the eradication of invasive alien plants, Working for Water guidelines and policies shall be adhered to. Any invasive alien plant clearing undertaken through Working for Wetlands projects shall be registered on the Working for Water Information Management System.

15.3 Landscaping and preparation for planting

Top material that is disturbed or removed during construction and excavation shall be replaced, preferably using topsoil stockpiled prior to excavation activities, or with topsoil sourced from another reputable source. However, where possible, soils from different areas should not be mixed. Care shall be taken not to mix the topsoil with the subsoil during shaping operations.

Indigenous plants shall be used in the landscaping of the site. Plants that are proclaimed as problem plants or noxious weeds are to be excluded from the landscaping plan and these should be removed immediately, should they occur on site.

16. MANAGEMENT AND MONITORING

16.1 Location of the construction environmental management plan

All contractors on site shall at all times have a copy of the CEMP in their respective site office (located in the construction camp).

16.2 General monitoring and reporting

The ECO and contractors on site are responsible for ensuring compliance with the CEMP. Monthly site audits shall be undertaken by the ECO and a Project Inspection Report submitted to Kangra Coal for review prior to the following audit.

A Compliance Audit Report shall be submitted to the DWS collating the year's completed checklists. It is the responsibility of the ECO to report any non-compliance, which is not correctly rectified to the DWS.

Interested and Affected Parties must be allowed access to the CEMP document. They have the right to monitor specific aspects of the CEMP (e.g. noise regulations, working hours stipulated) in conjunction with the contractor in a reasonable and formal manner without unreasonably disrupting construction activities. However, no member of the public shall enter the mining site without prior approval from the contractor.

The contractor shall keep a record of all complaints received from the community in the complaints register and communicate them to the ECO. These complaints shall be addressed and mitigated within reason. Records relating to the compliance/non-compliance with the conditions of the CEMP as well as



audits reports, shall be kept in good order and shall be made available to the DWS within seven days after a written request has been received. It is suggested that all records be kept for at least two years following construction activities for reference purposes.

16.3 Fixed-point photography

Monthly fixed-point photography monitoring information shall be undertaken by the project management for each problem site.

Locating photo-points

The following guidelines should be followed when locating photographic points across the wetland system for fixed-point photographs:

- photo-points should be selected at various locations throughout the rehabilitation site and at points that will be easily accessible at all times;
- record the geographical co-ordinates of each point, with a mapping grade Global Positioning System (GPS), accurate to less than 2 metres. This provides any individual with the information required to navigate to the exact location of each photo point;
- a permanent field marker must be placed in the ground at each point, to ensure that photos are always taken from exactly the same point. If possible, the orientation of the photo at the point should be recorded on the marker.

16.4 Specific roles and responsibilities

The Contractor is responsible for complying with the CEMP during the construction phase of the development. The Contractor is responsible for ensuring that his/her contractors, employees and sub-contractors appointed by him/her are familiar with the CEMP and that they abide by it. The Contractor shall be responsible for any non-compliance with the CEMP and shall pay for any remedial work that may result from non-compliance resulting directly from his/her negligence.

The ECO is responsible for communicating environmental issues associated with the site to the Contractor. Should any non-compliance with the CEMP take place, the ECO shall communicate this with the party responsible for the non-compliance as well as the Contractor and Kangra. If the non-compliance continues after written request by the ECO to rectify the situation, the ECO must inform the DWS in writing. The ECO is responsible for the explanation of environmental issues contained in this CEMP to anyone working on the site. Should any issues arise on the site of an environmental nature or concern, the ECO shall be responsible for taking the appropriate action.

The Project Manager is responsible for communicating any issues or concerns of the surrounding community regarding the rehabilitation of the Ballengeich Site or other responsible party and visa-versa.

The DWS is responsible for taking action against any non-compliance with the CEMP by the Contractor and or any of his/her subcontractors. The DWS may request a compliance audit to be undertaken on the site at any time during or after the construction phase of the project.



18. UNDERTAKING

The EAP herewith confirms:

- a) The correctness of the information provided in the reports;
- b) The inclusion of comments and inputs from stakeholders and I&AP's;
- c) The inclusion of inputs and recommendations from the specialist reports where relevant; and
- d) That the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein.



19. DECLARATIONS

19.1 Design Engineer

The work described in this EMPR/Work Method Statement, if carried out according to the methodology described, is satisfactorily mitigated to prevent avoidable environmental harm.

Signed

Print Name

Date

19.2 Environmental Site Manager

I understand the contents of the EMPR/Work Method Statement and the scope of works required from me.

Signed

Print Name

Date

19.3 Environmental Control Officer

The works described in this EMPR/Work Method Statement are approved.

Signed

Johan Maré

Print Name

27 March 2023

Date



20. REFERENCES

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- Department of Water Affairs and Forestry. (2005). A practical field procedure for identification and delineation of wetlands and riparian areas.
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- Eco-Pulse Environmental Consulting Services (2016), Integrated Water Use License Application (IWULA) for the Ballengeich mine near Newcastle, KwaZulu-Natal: Wetland Delineation Report. Specialist report prepared by Eco-Pulse Environmental Consulting Services for GCS Water & Environment (Pty) Ltd. Revision No.: 2. September 2016.
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APPENDIX 1

Environmental Consultant CV and Qualifications



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Johan Maré

Personal data:

ID: 5901255094082

Date of Birth: 25 January 1959

Sex: Male

Marital status: Married, two children

Driver License: Code A and EB

Criminal Offences: None

Health: Excellent

Experience:

1985–1986 University of Stellenbosch

Research Assistant

- Research on the bacterial oxidation of pyrite and concomitant acid mine drainage.
- Tested slow release systems on the inhibition of microbial oxidation at Douglas Colliery.

1987–1990 University of Western Cape, Bellville

Lecturer

- Joint responsibility for the implementation of the curriculum for Microbiology at UWC
- Initiated the Science Awareness project at disadvantaged schools to promote Science.
- Project leader for various research studies conducted by post graduate students.

1991–2000 Department of Water Affairs

Assistant Director: Water Quality Management

- Responsible for the management of the Olifants River Catchment, as well as management of the Jukskei, Hennops, Apies and Pienaars River catchments.



- Evaluation, assessment and approval of Environmental Management Programmes for coal, gold, vanadium, chromium and platinum mines.
- Steering Committees / Co-ordinating Committees and Task Groups:
 - o Northern Province Water Quality Liaison Committee
 - o Northern Province: Steering Committee on Health Related Water Quality Monitoring and Assessment
 - o Co-ordinating committee for Integrated Water Quality Monitoring and Assessment for Water and Sanitation Schemes
 - o Task Group for the Upper Olifants River Water Quality Management Plan
 - o Task Group for the Klein Olifants Water Quality Management Plan
 - o Interim Task Team for the Loskop Dam Catchment
- Departmental Task Groups for the development of Operational Guidelines for River Diversions, Mine Closure, Financial Provision and BATNEEC
- Compiling of technical reports for the issuance of permits in terms of Sections 12(1), 20 and 21 of the Water Act, 1956 as well as Section 20 on the Environmental Conservation Act, 1989.
- Liaison with consultants, project management and co-ordination of studies and projects aimed catchment management, environmental impact assessments and EMPR's.
- Responsible for personnel management, budget and general office administration for the Sub-directorate: Water Quality
- Chairperson for various established forums in the catchment dealing with aspects of establishing CMA's.
- Chairperson for the waste reduction initiative at the Phalaborwa Mining Complex. Intensively involved with all environmental issues e.g. EIA for the Maputo Iron and Steel Project (MISP).

2001–TO DATE

M2 Environmental Connections
(MENCO)

Director

- Contractual work for Department of Water Affairs including management support services for Chief Director: Water Use Regulation, Northwest and Gauteng Regional Offices
- Evaluation of Technical Reports for D: RPW and the implementation of WULA.
- DWA and Randwater: *Harties Metsi a Me* Bioremediation Project: Responsible for First Order Monitoring Framework, Continuous Monitoring at Kalkheuwel, Biological Monitoring, Telemetric Data System Maintenance, Compliance and Enforcement (Licenses), Development of the Integrated Shoreline Assessment Methodology and Piloting of the Waste Discharge Charge System.
- Various other environmental projects for DWA varying from water use licence application assessment to waste management and waste delisting applications.
- Project management for DWA in the compilation and finalisation of the Best Practice Guideline series for the mining industry as well as the Waste Discharge Charge System.



Education:

- Development of the External and Internal Guidelines: Water Use Authorisation Application Process and training of DWA employees on national level (Head Office and all Regional Offices)
- Responsible project manager and co-author of the “*Operational Guideline: Integrated Water and Waste Management Plan*”, dated February 2010
- Surface water monitoring, bio-monitoring and toxicity for clients such as DWA: Northwest Regional Office, Heineken Sedibeng Brewery, Vesuvius, Samancor, Richmond Mining and Exploration, Highveld Steel and Vanadium, Xstrata, Afrisam, Sasol Mining, Eskom, Mvelase Mining, Usuthu Colliery, Chevron SA (Pty) Ltd, Coastal Fuels and others
- Conducted numerous specialist studies in the field of WULA, IWWMP, surface water, hydrology, aquatic ecology, wetland delineation and bio-monitoring for clients inclusive of Afrisam, African Explosive Limit (AEL), Samancor, Heineken, Sasol Synfuels, Sasol Mining, Sasol Gas Limited, Eskom, Exxaro, Xstrata and ArcelorMittal

1981 Potchefstroom University Potchefstroom

BSc, Microbiology, Zoology and Chemistry

1982 Potchefstroom University Potchefstroom

B.Sc Hons (Microbiology)

1989 University of Stellenbosch Stellenbosch

M.Sc (Microbiology)

Distribution and inhibition of *Thiobacillus ferrooxidans* in relation to acid mine drainage from coal waste dumps

Courses:

- Basic Principles in GC Analysis, Department of Analytical Technology, Cape Town Technicon. 1987
- Training course in HPLC analysis, System Gold, Beckman Instruments, Midrand. 1990
- Arc Info and GIS training, Dept of Water Affairs, Pretoria. 1994
- Water Quality in Catchments: Department of Chemical Engineering, University of Pretoria. 1994
- Water Quality Management: Pollution Prevention and Control Technology, Department of Chemical Engineering, University of Pretoria. 1995
- Water Quality Management: Techniques, Methods, Aids and Application, Department of Chemical Engineering, University of Pretoria. 1995
- Watermarque: GIMS Training, Midrand. 1996
- An Introduction to Groundwater and Pollution Monitoring, Parsons and Associates, IWQS, Roodeplaat, 1997
- Introduction to Bio-monitoring, CSIR, Pretoria. 1998
- Noise Measuring Instrumentation, M and N Acoustics, 2010



	Advanced Wetland Course, Department of Continuing Education, University of Pretoria, February 2016
Affiliations	Water Institute of South Africa (WISA) (26251) SACNASP Registered (400092/91)
Interests:	Running, cycling, angling, scuba diving.
Publications:	Loos, M.A., J.M. Conradie, P.A. Whillier, J. Maré and C. Bosch 1990. Research on the inhibition of bacterial oxidation of pyrite and the concomitant acid mine drainage: Part 1. Investigations on gold mine sand dumps. WRC Report No. 132/1/90 Loos, M.A., J. Maré and C. Bosch. 1990. Research on the inhibition of bacterial oxidation of pyrite and the concomitant acid mine drainage: Part 2. Investigations on coal waste dumps. WRC Report No. 132/2/90. Maré, J. 1989. Distribution and inhibition of <i>Thiobacillus ferrooxidans</i> in relation to acid mine drainage from coal waste dumps. MSc thesis, University of Stellenbosch. Bosch, C., J. Maré and M.A. Loos. 1988. Ineffectiveness of sodium lauryl sulphate as an inhibitor of acidification in South African coal waste. Paper presented at Fifth Biennial Microbiology Congress, CSIR, Pretoria Loos, M.A., C. Bosch, J. Maré and E. Immelman. 1989. Evaluation of sodium lauryl sulphate, sodium benzoate and sorbic acid as inhibitors of acidification of South African coal waste. Groundwater Symposium: Groundwater and Mining, Randburg. Maré, J., C. Bosch and M.A. Loos. 1986. Chemical inhibition of <i>Thiobacillus ferrooxidans</i> coal waste including a pilot study of acidification and its inhibition by sodium lauryl sulphate. Paper presented at Microbiology Congress, Wits University, Johannesburg. Maré, J. and P.S. Venter. 2010. Implementing the Waste Discharge Charge System in the Crocodile (West) River Catchment. Paper presented at WISA, ICC, Durban.



 Maré, J., P.S. Venter, Z. Cukic and S. Morar. 2012. Hartbeesport Dam Integrated Biological Remediation Programme: Implementation and Extension of Integrated Catchment Management and Water Use Authorisations. Paper presented at WISA, Cape Town



I, the undersigned, **JOHAN MARE** do hereby declare that the facts contained herein are within my personal knowledge and are true and correct.



APPENDIX 2

Generic EMPr: Section 21(c) and (i) water uses



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
Road Construction	Soil compaction and erosion due to vehicle access	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage - Soil compaction due to vehicle access"
	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage Soil compaction and erosion due to trampling"
	Temporary stream diversion	Maintain viable connectivity and flow for aquatic species movement and migration	Comply with impact management actions under general interventions section "general actions – Temporary stream diversion"
	Waste pollution	No waste to remain on site	Comply with impact management actions under general interventions section "general activities – Waste pollution diversion"
	Pollution due to fuel, oil or hydrocarbon spills	No fuel or hydrocarbon spills on site	Comply with impact management actions under general interventions section "general activities – Pollution due to fuel, oil or hydrocarbon spills"
	Impacts on fauna and flora	Prevent impacts on flora and fauna to minimise disturbance	Comply with impact management actions under general interventions section "general activities – Impacts on fauna and flora"
	Impeding aquatic species migration and species isolation could lead to habitat fragmentation	Maintain viable connectivity and flow for aquatic species movement and migration	Apply site specific engineer-approved design based on ecologist input in the rehabilitation plan
Impeding water flow	Soil compaction due to vehicle access	Maintain soil character and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			site and vehicle usage- Soil compaction and erosion due to vehicle access"
	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage- – Soil compaction and erosion due to trampling"
	Soil disturbance and erosion	Minimise disturbance and erosion of soil	Comply with impact management actions under general interventions section "Access to site and vehicle usage- – Soil disturbance and erosion"
	Erosion, sedimentation and watercourse damming	Reduce impacts to watercourses	Comply with impact management actions under general interventions section "general actions – Erosion, sedimentation and watercourse damming"
	Downstream siltation	Minimise downstream siltation	Comply with impact management actions under general interventions section "general actions – Downstream siltation"
	Temporary stream diversion	Maintain viable connectivity and flow for aquatic species movement and migration	Comply with impact management actions under general interventions section "general actions – temporary stream diversion"
	Waste pollution	No waste remains on site	Comply with impact management actions under general interventions section "general actions – Waste pollution"
	Impacts on fauna and flora	Prevent impacts on flora and fauna to minimise disturbance	Comply with impact management actions under general interventions section "general actions – Impacts on fauna and flora"



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
	Impeding aquatic species migration and species isolation could lead to habitat fragmentation	Maintain viable connectivity and flow for aquatic species movement and migration	Ensure that migratory connectivity and stream continuity is maintained in diversion and constructed intervention designs
Erosion control structure: Concrete weir	Downstream siltation	Prevent downstream siltation	Comply with impact management actions under general interventions section “general activities – Downstream siltation”
	Impacts on fauna and flora	Prevent impacts on flora and fauna to minimise disturbance	Comply with impact management actions under general interventions section “general actions – Impacts on fauna and flora”
	Temporary stream diversion	Maintain viable connectivity and flow for aquatic species movement and migration	Comply with impact management actions under general interventions section “general actions – temporary stream diversion”
	Pollution due to cement and concrete batching	Avoid contamination of the soil and water resulting from cement and concrete batching	Comply with impact management actions under general interventions section “general actions – pollution due to cement and concrete batching”
	Dust fall out	Reduce dust generation and dispersal	Comply with impact management actions under general interventions section “Access to site and vehicle usage – dust generation”
	Impact on biodiversity	Prevent contamination of ecologically sensitive environments	Comply with impact management actions under general interventions section “pollution due to cement batching”
	Erosion and undercutting	Stable soils and weir	Prevent sliding, tilting, slumping or overturning of the structure Ensure the apron is adequate and wider than overflow to prevent scouring downstream Follow engineering designs and rehabilitation plan



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
Erosion control structure: Gabion weir	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage- Soil compaction and erosion due to trampling"
	Soil disturbance and erosion	Minimise disturbance and erosion of soil	Comply with impact management actions under general interventions section "Access to site and vehicle usage- – Soil disturbance and erosion"
	Erosion, sedimentation and watercourse damming	Reduce impacts to watercourses	Comply with impact management actions under general interventions section "general actions – Erosion, sedimentation and watercourse damming"
	Downstream siltation	Minimise downstream siltation	Comply with impact management actions under general interventions section "general activities – Downstream siltation"
	Temporary stream diversion	Maintain viable connectivity and flow for aquatic species movement and migration	Comply with impact management actions under general interventions section "general actions – temporary stream diversion"
	Offcuts / remaining materials	No waste to remain on site	Comply with impact management actions under general interventions section "general activities - Waste pollution"
	Pollution due to fuel, oil or hydrocarbon spills	No fuel, oil or hydrocarbon spills on site	Comply with impact management actions under general interventions section "general activities - Pollution due to fuel, oil or hydrocarbon spills"
	Pollution due to cement and concrete batching	Avoid contamination of the soil and water resulting from cement and concrete batching	Comply with impact management actions under general interventions section "general actions – pollution due to cement and concrete batching"



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
	Impacts on fauna and flora	Prevent impacts on flora and fauna to minimise disturbance	Comply with impact management actions under general interventions section "general actions – Impacts on fauna and flora"
	Damage to infrastructure	Protect man-made infrastructure	Mark all existing infrastructure on the site plan Demarcate no-go areas according to the site plan
	Disturbance of cultural and archaeological heritage resources	Prevent the disturbance of any cultural and archaeological heritage resources	Comply with impact management actions under general interventions section "general activities - Disturbance or damage to archaeological and heritage resources"
	Disturbance or damage to paleontological resources	Prevent the disturbance of any fossils	Comply with impact management actions under general interventions section "general activities - Disturbance or damage to paleontological resources"
	Disturbance or loss of important species and their habitat	Minimal habitat and species disturbance during and after rock collection	Comply with impact management actions under general interventions section "Removal of rock, sand or soil for construction of soil conservation works - Disturbance or loss of important species and their habitat"
Vegetation management: Alien Invasive Control Mechanical AIP control	Soil compaction due to vehicle access	Maintain soil character and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage - Soil compaction and erosion due to vehicle access"
	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage – Soil compaction and erosion due to trampling"



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
	Impacts on fauna and flora	Prevent impacts on flora and fauna to minimise disturbance	Comply with impact management actions under general interventions section "general actions – Impacts on fauna and flora"
	Bio-mass causing re-infestation	Reduce re-infestation potential	Manage the debris according to the site-specific plan per species and the site instruction Do not stack removed plants on top of indigenous flora
	Dust generation	Reduce dust generation and dispersal	Comply with impact management actions under general interventions section "Access to site and vehicle usage – dust generation"
	Soil disturbance and erosion	Minimise disturbance and erosion of soil	Comply with impact management actions under general interventions section "Access to site and vehicle usage- – Soil disturbance and erosion"
	Downstream siltation	Minimise downstream siltation	Comply with impact management actions under general interventions section "general activities – Downstream siltation"
	Pollution due to fuel, oil or hydrocarbon spills	No fuel, oil or hydrocarbon spills on site	Comply with impact management actions under general interventions section "general activities - Pollution due to fuel, oil or hydrocarbon spills"
	Loss of biodiversity and non-targeted plant species	Minimise loss of biodiversity and prevent impacts on natural resources including flora and fauna to minimise disturbance	Correctly identify targeted species and orientate the team Demarcate the project area to work in management units Under supervision to ensure non-targeted species are not removed Comply with impact management actions under general interventions section "general activities - Impacts on fauna and flora"



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
Manual AIP control	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage – Soil compaction and erosion due to trampling"
	Bio-mass causing re-infestation	Reduce re-infestation potential	Manage the debris according to the site-specific plan per species and the site instruction Do not stack removed plants on top of indigenous flora
	Downstream siltation	Minimise downstream siltation	Comply with impact management actions under general interventions section "general activities – Downstream siltation"
	Loss of biodiversity and non-targeted plant species	Minimise loss of biodiversity and prevent impacts on natural resources including flora and fauna to minimise disturbance	he approved contractor must ensure all operators are able to correctly identify targeted and protected species The operator shall supply supervision to ensure non-targeted species are not controlled or to stop operations during unfavourable weather conditions Comply with impact management actions under general interventions section "general activities - Impacts on fauna and flora"
Chemical AIP control: Herbicide application to prevent re-coppicing /regrowth	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage – Soil compaction and erosion due to trampling"
	Water and soil pollution by chemicals	Avoid spillage onto soil or into water while mixing or using chemicals	Comply with impact management actions under general interventions section "general activities – Water and soil pollution by chemicals"



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
	Impact on biodiversity	Prevent contamination of ecologically sensitive environments	Comply with impact management actions under general interventions section “general activities – Water and soil pollution by chemicals”
	Spillage or drift during mixing of chemicals	Prevent loss of biodiversity and non-targeted plant species (damage to indigenous trees)	Do not apply foliar hand spray chemical applications under conditions where chemical drift may impact non-targeted species (as indicated on the manufacturer's directions for use on the herbicide label) Demarcate areas for mixing and ensure ground cover Use Working for Water guidelines for approved herbicides Comply with impact management actions under general interventions section “general activities - Waste pollution” Comply with impact management actions under general interventions section “general activities - Impacts on fauna and flora”
	Vegetation debris accumulation that may cause a fire hazard	Prevent fire risk	Debris from the invasive vegetation clearing must be stockpiled in the demarcated areas for further action by the landowner Comply with impact management actions under general interventions section “general activities - Fire damage to surrounding environment”
	Injury to workers	No injuries or deaths occur	Comply with impact management actions under general interventions section “general activities - Occupational health and safety”



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
	Bio-mass causing re-infestation	Reduce re-infestation potential	Manage the debris according to the site-specific plan per species and the site instruction Do not stack removed plants on top of indigenous flora
	Bio-mass being washed into watercourses causing channel blockages and erosion	Prevent debris washing into the river	Stack debris away from watercourse
	Disturbance of cultural and archaeological heritage resources	Prevent the disturbance of any cultural and archaeological heritage resources	Comply with impact management actions under general interventions section "general activities - Disturbance or damage to archaeological and heritage resources"
	Disturbance or damage to paleontological resources	Prevent the disturbance of any fossils	Comply with impact management actions under general interventions section "general activities - Disturbance or damage to paleontological resources"
Landscaping/Earthworks: Chute construction	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section "Access to site and vehicle usage – Soil compaction and erosion due to trampling"
	Dust generation	Reduce dust generation and dispersal	Comply with impact management actions under general interventions section "Access to site and vehicle usage – dust generation"
	Erosion during construction	Prevent erosion	Schedule work outside predicted rainy days (consider weather conditions) Secure excavations by shuttering as required Follow design drawing and site instructions
	Erosion, sedimentation and watercourse damming	Reduce impacts to watercourses	Comply with impact management actions under general



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			interventions section “general actions – Erosion, sedimentation and watercourse damming
	Downstream siltation	Minimise downstream siltation	Comply with impact management actions under general interventions section “general activities – Downstream siltation’
	Pollution due to fuel, oil or hydrocarbon spills	No fuel, oil or hydrocarbon spills on site	Comply with impact management actions under general interventions section “general activities - Pollution due to fuel, oil or hydrocarbon spills”
	Pollution due to fuel, oil or hydrocarbon spills	No fuel, oil or hydrocarbon spills on site	Comply with impact management actions under general interventions section “general activities - Pollution due to fuel, oil or hydrocarbon spills”
	Loss of biodiversity and non-targeted plant species	Minimise loss of biodiversity and prevent impacts on natural resources including flora and fauna to minimise disturbance	Comply with impact management actions under general interventions section “general activities - Impacts on fauna and flora”
	Injury to workers	No injuries or deaths occur	Comply with impact management actions under general interventions section “general activities - Occupational health and safety”
	Impacts on fauna and flora	Prevent impacts on flora and fauna to minimise disturbance	Comply with impact management actions under general interventions section “general activities - Impacts on fauna and flora”
	Noise pollution	Noise generation is minimised	Comply with impact management actions under general interventions section “general activities – Noise pollution”
Cut and fill (for excavations, narrow or shallow erosion gullies)	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Comply with impact management actions under general interventions section “Access to



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			site and vehicle usage – Soil compaction and erosion due to trampling”
	Dust generation	Reduce dust generation and dispersal	Comply with impact management actions under general interventions section “Access to site and vehicle usage – dust generation”
	Loss of topsoil	Conserve topsoil for use during re-vegetation and rehabilitation	Comply with impact management actions under general interventions section “General activities - Loss of topsoil”
	Soil degradation and increased erosion	Intended function of intervention is achieved and landscaped area is stable	Cut and fill as per engineered design, rehabilitations plan and engineering drawings Stabilize and re-vegetation as per rehabilitation plan
	Expansion of gully extent	Ensure Landscaped area is stable	Cut and fill gullies as per engineering design Do not work in wet weather Rehabilitate and re-vegetate surrounds
	Erosion, sedimentation and watercourse damming	Reduce impacts to watercourses	Comply with impact management actions under general interventions section “general actions – Erosion, sedimentation and watercourse damming
	Downstream siltation	Minimise downstream siltation	Comply with impact management actions under general interventions section “general activities – Downstream siltation’
	Impacts on fauna and flora	Prevent impacts on flora and fauna to minimise disturbance	Comply with impact management actions under general interventions section “general actions – Impacts on fauna and flora”
	Injury to workers	No injuries or deaths occur	Comply with impact management actions under general interventions section “general



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			activities - Occupational health and safety"
Sloping	Erosion and sedimentation	Stable slopes	According to engineering design
Ponding	Dust generation	Reduce dust generation and dispersal	Comply with impact management actions under general interventions section "Access to site and vehicle usage – dust generation"
	Erosion and siltation	No silt movement, erosion, sedimentation	Apply rehabilitation plan/engineer-approved design
	Downstream siltation	Minimise downstream siltation	Comply with impact management actions under general interventions section "general activities – Downstream siltation"
	Injury to workers	No injuries or deaths occur	Comply with impact management actions under general interventions section "general activities - Occupational health and safety"
	Disturbance of cultural and archaeological heritage resources	Prevent the disturbance of any cultural and archaeological heritage resources	Comply with impact management actions under general interventions section "general activities - Disturbance or damage to archaeological and heritage resources"
	Disturbance or damage to paleontological resources	Prevent the disturbance of any fossils	Comply with impact management actions under general interventions section "general activities - Disturbance or damage to paleontological resources"
Access to site and vehicle usage	Soil compaction and erosion due to vehicle access	Maintain soil character and avoid or minimise the degradation of vegetation	Access roads, parking areas and turning circles are pre-planned to be located as per site plan The access roads are physically marked on site Vehicle movement is restricted to demarcated routes and turning areas



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			On the location of routes ensure the optimal use of already disturbed areas to minimise vegetation destruction and soil compaction Routing of access roads to follow contours in hilly areas
	Soil compaction and erosion due to trampling	Maintain soil characteristics and avoid or minimise the degradation of vegetation	Identify and avoid no-go areas or areas sensitive to compaction on the site plan Demarcate no-go areas on site and restrict access All activities remain strictly within demarcated routes and areas Once the intervention has been completed, break the crust on bare compacted areas to enhance vegetation establishment
	Degradation and destruction of surrounding areas	Reduce damage to ecologically sensitive environments	Restrict access to demarcated access routes and working areas as indicated in the site plan
	Dust generation	Reduce dust generation and dispersal	Restrict access to demarcated access routes and working areas as indicated in the site plan Implementing the speed limit on dirt roads Reduce speed where activities and roads are close to buildings and/or dwellings
	Impacts to landowner(s) and property	Minimise impacts to landowner and property Minimise impacts to conservation areas	Use existing routes as per site plan Work within identified areas as specified in the rehabilitation plan
General activities within the working area	Soil disturbance and erosion	Minimise disturbance and erosion of soil	All activities remain strictly within demarcated routes and areas Rehabilitate disturbed soil according to the rehabilitation plan The intervention strictly follows instructions as indicated in the rehabilitation plan



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			Do not work during wet weather
	Loss of topsoil	Conserve topsoil for use during re-vegetation and rehabilitation	Remove topsoil and store separately from subsoil layers Cover topsoil if it is going to be stored for extended periods Cover re-vegetated area with topsoil that was removed and stored prior to rehabilitation
	Erosion, sedimentation and watercourse damming	Reduce impacts to watercourses	Install temporary erosion protection measures Reinstate areas eroded due to work undertaken Remove cut AIP material (biomass) at least 30m away from a flood zone to prevent damming and secondary erosion Apply stream diversion according to the engineering and work instructions if any work will be conducted in the river-stream bed with surface flow present Deactivate diversion channels after implementation
	Downstream siltation	Minimise downstream siltation	Do not work during wet weather Secure excavations by shuttering as required Construct temporary berms up-slope to divert runoff around work site and temporary sediment traps (sandbags / hay-bales bio-engineered structures) Construct temporary berms immediately downstream of work area to trap the sediment collected from the work area Excavated soil must not be stored in the watercourse Exposed and/or compacted soil is re-vegetated/covered as indicated on the rehabilitation plan



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
	Temporary stream diversion		Where applicable, remove sediment traps after intervention has been constructed and work area is stabilised
		Plan construction to minimize the time needed for the temporary stream diversion	Planning input by wetland ecologist Rehabilitation interventions such as gabions, Reno mattresses, concrete road strips are constructed in situ
		Ensure continued stream functioning and connectivity	Plan stream diversions at times when the flow is low
		Maintain downstream PES and river condition	Implement and complete intervention activities as soon as diversion is implemented Implement water diversion before conducting work in the main river / stream bed
		Ensure intended function of temporary stream diversion is achieved	Apply stream diversion according to the engineering drawings and work instructions if any work will be conducted in the river-stream bed with surface flow present
	Water and soil pollution by chemicals	Avoid spillage onto soil or into water while mixing or using chemicals	Staff using chemicals are trained and aware of the risks of using chemicals; Chemicals are mixed on impermeable and level surfaces as per the manufacturer's instructions; All waste material and containers are safely and properly removed after use
		Prevent contamination of ecologically sensitive environments	Chemicals are stored, mixed and used in demarcated areas
	Waste pollution	No waste to remain on site	Provide waste containment; No burying or burning of waste on site;



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			Remove all residual waste / material on completion of work
	Pollution due to hydrocarbon spills	No fuel, oil or hydrocarbon spills on site	Only vehicles and machinery without fluid leaks are to be used on site; Daily demarcate an area for storage equipment, ensure ground protection is provided; Vehicles and machinery are checked for fluid leaks daily and leaking equipment is removed from site to facilitate repair; Provide temporary drip trays where fluid leaks are detected and/or emergency repairs need to be undertaken; Use a mobile refuelling unit and ground protection such as drip trays if on-site refuelling is required in emergency situations; No scheduled maintenance may take place on site
	Pollution due to cement and concrete batching	Avoid contamination of the soil, air and water resulting from cement and concrete batching	Store sand, stone and cement in demarcated areas; Do not handle dry material during extremely windy conditions; Mix cement on a level impermeable surface (e.g. shutter board); Mix cement on the day of intended use; Mixing of cement or concrete batching to be undertaken at specifically identified areas outside of drainage lines; The mixing of cement or concrete is to be done at specifically selected sites outside drainage lines from riparian areas, to contain run-off;



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			Water use to clean of cement mixing and handling equipment is to be contained and reused for mixing where possible; Secure empty cement bags to prevent spread of cement dust prior to disposal; All empty cement packaging is stored in a dedicated area and removed from the site for disposal at an appropriate waste facility; Do not construct with, or lay, concrete when extended rain periods is expected; Do not leave any cement spill at the work locations
	Impacts on natural fauna and flora	Prevent impacts on natural fauna and flora	Demarcate the work area as per site plan and ensure activities stay within demarcated areas; Activities to avoid drainage lines, where they cannot be avoided, they should be marked on the site plan; Ensure the optimal use of already disturbed areas to minimise vegetation destruction and soil compaction; Collection of indigenous plants, for rehabilitation may only take place where identified within the site plan; Do not deface natural features (e.g. don't paint on rock faces, or carve trees); Do not use watercourses or no-go areas for recreational or other personal purposes; Check excavations daily for trapped animals and release them;



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			Fill open excavations as soon as possible after excavation; Health and safety representative must inspect the site and notify the workers if there are dangerous or problem animals; Record sightings and encounters with dangerous or problem animals; No collection of firewood; No littering on the site or surrounding areas; Keep food and rubbish out of reach of scavengers, e.g. monkeys and birds; Poaching/hunting/intentional killing of any animal is strictly forbidden as is trapping of animals; Do not disturb nests or roosts; If work is to be undertaken in the vicinity of nest or roosts of species of conservation concern the scheduling of work must be planned outside of the breeding season of the nesting bird; Do not leave residual material on site
	Fire damage to surrounding environment	No fire damage to take place on site due to project-related activities	Set up and enforce use of designated smoking area(s); No cooking or other fires allowed on site; Develop an emergency evacuation plan and communicate it to workers; Maintain basic fire-fighting equipment at the work site and ensure that personnel are trained in the use of such equipment;



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			All workers are aware of the risk of run-away fires and informed on the actions needed to prevent and control run-away fires as per the training
	Occupational health and safety	No injuries or death occur	Comply with the Occupational Health and Safety Act; Before construction takes place, induction training must be provided to all staff working on the site which covers the following: • Description of the environment; • Responsibility of all people to the environment; • how construction activities can impact on the environment, and what measures can be taken to mitigate against these impacts • measures to prevent pollution and litter control • social responsibility (no excessive noise, a “clean site” policy, no alcohol / drugs and no firearms permitted on site, no harvesting of fruit or firewood from the site or from areas adjacent to it) • procedure to be followed should heritage resources be uncovered during all phases of the development • Details of the EMPr • Use of relevant PPE • Use of the necessary safety equipment e.g. when climbing



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			ladders, fuel operated equipment and chainsaws etc. • Demonstration on the handling of herbicides and hazardous substances for the safe use of the substance and awareness of the potential impacts and follow safety measures • Basic fire safety • Emergency and response procedures • Roleplay to respond calmly and quickly in emergency situations; • First aid • Snake awareness training as well as any other locally dangerous animals • General health and safety Document training sessions and maintain a training register; All unattended open excavations are to be demarcated; A first aid kit must always be accessible on site and must include the number of the local emergency service; A fire control officer and certified first aider must be appointed and the names document in the site file with a copy of their certification; A designated eating area must be identified with access to a refuse containment; A temporary toilet facility must be provided and maintained



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			throughout the construction period; No temporary toilet facility must be placed within 100m from any watercourse; Drinking water must always be available to the workforce on site; Implement the following restrictions on all staff operating on the site: • No work may be done without the use of PPE • No alcohol or illegal substance use on site • No firearms permitted on site • No excessive noise
	Noise pollution	Noise generation is minimised	Minimise noise impacts through keeping operations to working hours; Machinery to have mufflers; Limit unnecessary noise, especially loud talking, shouting or whistling, radios, sirens or hooters and motor revving; Maintain all vehicles and machinery in a good working order to reduce noise pollution
	Disturbance of cultural and archaeological heritage resources	Prevent the disturbance of any cultural and archaeological heritage resources	Demarcate declared and potential heritage resources as indicated on the rehabilitation plan before activities start; Report any finds of human remains to the nearest police station and cease work immediately; Should any archaeological artefacts be exposed during construction activities, work in the area where the artefacts were



Activity / Intervention	Impact	Impact Management Outcome	Impact Management Action
			found must cease immediately and the local SAHRA authorities informed within 24 hours; Do not apply herbicides within any of the demarcated heritage resources burial grounds or rock art sites; Under no circumstances must archaeological artefacts be destroyed or interfered with; Where relevant, obtain permits from SAHRA / the PHA prior to commencing an intervention action within a heritage resources
	Disturbance or damage to rock, sand or soil for paleontological resources	Prevent the disturbance of any fossils	Demarcate known fossil sites and prevent all staff from accessing this area; Under no circumstances must a fossil be destroyed or interfered with; Should a fossil be found, all construction activities in the vicinity must be stopped, contact SAHRA within 24 hours
General removal of rock, sand or soil for construction of soil conservation works	Disturbance or loss of important species and their habitat	Minimal habitat and species disturbance during and after activity	Minimise impact of rock, sand or soil removal through spreading the extent of collection area
		Minimise disturbance of soil	Only collect loose rocks



APPENDIX 3

Incident Log Sheet

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