Eskom	Scope of work	Kusile Power Station

Title: **Kusile Power Station Surface Groundwater and Aquatic Monitoring Scope of Work**

Document Identifier:	**240-129306525**
Alternative Reference Number:	**N/A**
Area of Applicability:	**Kusile Power Station**
Functional Area:	**Environmental Management**
Revision:	**4**
Total Pages:	**18**
Next Review Date:	**July 2028**
Disclosure Classification:	**Controlled Disclosure**

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Introduction

Kusile Power Station obtained the Water Use License (WUL) for stream diversion, water abstraction and water pipeline crossing as well as for “disposing of waste in a manner which may detrimentally impact the water resource. The conditions of the license require Kusile Power Station to conduct surface, groundwater and aquatic monitoring at specified monitoring points to determine the impact of the facility and other activities on water quality and aquatic ecosystem.

The monitoring will benefit Kusile Power Station to:

a) Comply with the water use licence requirements.

b) Early detection of non- compliance to legislative requirements.

c) Decrease risk of penalties from Authorities.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to define the scope of work for surface, groundwater and aquatic monitoring at Kusile Power Station. The surface and groundwater and aquatic monitoring will be for five (5) year period.

2.1.2 Applicability

This document is applicable to Kusile Power Station

2.1.3 Effective Date

The scope of work shall be effective immediately after signature.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems

[2] 32-727 Safety, Health, Environmental and Quality (SHEQ) Policy

[3] 32–288 Policy Procurement and Supply Chain Management Standard

[4] 32-599 Standard Procurement and Supply Chain Management Standard

[5] Kusile Power Station Environmental Management Plan for Operation and Maintenance

[6] Groundwater Governance Guideline 240-8569743

2.2.2 Informative

[7] ISO 9001 Quality Management System

[8] ISO 14001 Environmental Management System

[9] National Water Act 36 of 1998

[10] National Environmental Management Act No 107 of 1998

[11] Kusile Power Station Water Use Licenses

2.3 Definitions

2.3.1 Contractor

Selected service provider employed to provide a specific service to Eskom, Kusile Power Station.

2.3.2 Approved

Acknowledged and authorized in accordance with authoritative governing body/ies i.e. SANS

To add more applicable definitions

2.4 Abbreviations

Abbreviation	Explanation
ADDD	Ash Dump Dirty Dam
DWS	Department of Water & Sanitation
EMC	Environmental Monitoring Committee
GGG	Groundwater Governance Guideline
HRD	Holding Recycling Dam
SANS	South African National Standards
SDD	Station Dirty Dam
SHEQ	Safety, Health, Environment and Quality
WUL	Water Use Licence

2.5 Roles And Responsibilities

The Employer

The responsibilities of the Employer include the following:

a) Informing and issuing the Contractor with the scope of work and relevant documentations

b) Measure performance against those areas which contribute to the Employer's business.

c) Issue instruction to contractor where adhoc activities are required.

Contractor

a) The contractor will be responsible for routine monitoring of surface, groundwater and aquatic environmental at Kusile Power Station as per the scope of work.

b) Analyse results and look at possible environmental impacts from Kusile Power Station construction and operations activities .

c) Prepare bi-weekly, monthly, quarterly, annual report and submit to the employer.

d) Attend and present at Environmental Monitoring Committee (EMC) meeting

e) In cases where abnormalities are found from the monitoring reports, the contractor is expected to undertake full investigation on root cause and provide recommendations in a form of a report.

f) Present the surface and groundwater performance to Kusile on a monthly

g) Submit the monitoring protocol before the commencement with monitoring.

h) Submit the safety file for approval before commencement with monitoring activities.

2.6 Process For Monitoring

This specification will be reviewed during reviews or internal audits

2.7 Duration of contract

The contract will be for five (5) years

2.8 Scope Of Work Monitoring Requirements

a) Carry out specific surface and groundwater samples analysis in accordance with monitoring plan requirements. This monitoring should be undertaken bi-weekly, monthly, quarterly and annually at specified points as stipulated in Section 6.1 and 6.2.

b) Collect and record specific surface and groundwater information in accordance with the monitoring plan requirements showing dates, location and time of monitoring and groundwater levels.

c) Bi-annual bio-monitoring analysis must be carried out on 10 monitoring points located upstream and downstream of the Kusile Power Station in order to monitor the effect on the aquatic ecosystem as stipulated in Section 6.3.

d) Surface water flow measurements every month on stream diversion monitoring points (2 points).

e) Inspect the functioning of stormwater infrastructure and turbidity level once every year.
f) Soil sampling required upstream and downstream of Kusile Power Station footprint (12 Monitoring points) when required.
g) Stakeholder notification in cases where water quality objectives/target are exceeded (microbiological analysis).
h) Prepare presentation on surface, ground and aquatic water quality and present it to the EMC on quarterly basis.
i) Geohydrological model based on latest disposal and stockpiling annually.
j) Purging of boreholes using potable pumps once a year.
k) Surface water flow rates must be determined monthly at every sample point (inflow and the exit of each of the sub-catchments) at the same time as the collection of the samples.
l) Surface water quality impacts must be determined by comparing up and downstream samples locations and by comparing the quality returned with the RWQO for the quaternary catchment and the baseline water quality.
m) Contaminant loading concentrations must be calculated and reported on each report to assist with determining the contribution by the Kusile Power Station operation to the water quality of the catchment it impacts.
n) Inflow and outflow turbidity levels must be measured to identify the Kusile Power Station's specific contribution of turbidity levels to its downstream users taking into consideration the background levels.
o) All surface and groundwater samples must be submitted to SANAS accredited laboratories for analysis. The accreditation certificate must be attached to the reports as they are submitted.
p) Site walkdown by an Ecologist during growing season (October to March) to identify bulbous plant species.
q) Provide recommendations to improve the water quality around Kusile Power Station or to address the non-compliances.
r) Maintenance of monitoring network which includes replacing of destroyed and lost monitoring points.
s) Conduct a source apportionment study - to determine load (from simultaneously measured flow and concentration) in each reach of the spruit and in relevant reaches of the river and consult other sources where necessary and department of water and sanitation.

t) Meetings with the client to provide progress and presentation to management on monthly basis.
u) Conduct wetland delineation study for Kusile Power Station
v) Update the Water Conservation & Water Demand Plan annually and review the plan once in five (5) years.
w) Annually assess the habitat to monitor the sustainability of the stream diversion
x) Update the Integrated Waste and Water Management Plan & RSIP
y) Update the Master Layout Plan as per the WUL requirements as and when necessary

2.9 Data Capturing

a) Keep and update the electronic surface and groundwater database after every monitoring run and submit raw data in a WISH format on monthly basis.
b) Provide data interpretation and trend analyses.
c) Contamination levels are to be measured and flagged against site specific water quality standards and DWS targets ranges.

2.10 Reporting

The reports must include:

a) Bi-weekly reports which include compliance status of water quality, water quality maps and identify appropriate mitigation measures should the aquifer be found vulnerable to pollution. The bi-weekly report must be submitted a week after sampling was done.

b) Monthly surface water (including pollution control dams) reports which include compliance status of water quality, water surface monitoring maps, possible pollution sources and identify appropriate mitigation measures should the aquifer be found vulnerable to pollution. The monthly report must be submitted a month after sampling was done.

c) Quarterly groundwater reports which include compliance status of water quality, water quality maps and identify appropriate mitigation measures should the aquifer be found vulnerable to pollution. The monthly report must be submitted a month after sampling was done.

d) Bi-annual aquatic reports which show trends and recommended action plans, integrated aquatic monitoring findings, reviewed constituents and standards and recommended mitigation measures.

e) Annual reports which include time dependant analysis of water quality trends, water quality status and recommended mitigation measures and give solutions should water quality be impacted by Kusile Power Station.

f) Any other reports as per the requirements e.g. Geohydrological model etc.

g) Soft copy should be submitted to the client.

h) The date, time, monitoring point and groundwater level in respect of each sample taken shall be recorded together with the results of the analysis.

i) Annual Ecologist report identifying bulbous plant species.

2.11 Resources

- Project Director - Professional Geohydrologist
- Specialist x 2 - Geologist/Environmentalist and Wetland specialist
- Junior x 1
- Assistant x 1

2.12 Adhoc Services

The adhoc services will include but not limited to:

i. Review of existing monitoring methodology, network and amendment if necessary.
ii. Drilling additional boreholes when required by the employer.
iii. Adhoc Environmental Monitoring Committee meeting when required.
iv. Conduct risk analysis and pollution source investigations should the need arises, this is related to upstream mining activities, agricultural impacts on water resources around and within the Kusile Complex.
v. In cases where abnormalities are found from the monitoring reports, the contractor is expected to undertake full investigation on root cause and provide a way forward.
vi. Training to be done on an “as and when required” basis to Kusile Power Station personnel for a better understanding of the total monitoring system ensuring capacity to proactively minimise any environmental issues that could arise from any of the Kusile Power Station activities.
vii. Conduct other water management related studies when required (e.g. any interventions or studies required by DWS)
viii. Emergency sampling as and when required e.g. dam overflow

3. Groundwater Monitoring Specification

a) Review of a site-specific sampling and monitoring procedure:

The contractor shall evaluate and review the above-mentioned regulatory and other Eskom requirements and develop or amend the existing Kusile Power Station site-specific groundwater monitoring and sampling procedure considering the requirements of the Eskom GGG, Groundwater Monitoring (GWG05a) and Groundwater Sampling (GWG05b) Guidelines as the basis for the development of the site-specific monitoring and sampling procedure.

The contractor shall update the site-specific monitoring procedure if and when the need arises (e.g. amendment of WUL, waste licence, EIA and EMP approvals, changes in risk e.g. sensitive receptors, etc). This shall be done within a reasonable timeframe from changes incurred ensuring that regulatory compliance to the frequency, sampling points, elements to be analyzed for and reporting timeframes are met at all times.

b) Geophysical surveys. Refer to Eskom, 2014 Geophysical Survey Guideline (GWG02):

The contractor shall undertake a geophysical survey and ensure that all legal requirements regarding the survey on the property are reviewed and complied with. This shall include both surface rights, e.g. as defined by local by-laws and the property title deed, and subsurface rights, e.g. such as relate to the intended exploitation of the groundwater resource in terms of the requirements of the National Water Act, 1998 (Act 36 of 1998).

c) Test pumping, Refer to Eskom, 2014 Test-pumping Guideline (GWG04):

The contractor shall conduct Aquifer test pumping of a borehole in order to obtain information about aquifer parameters and its possible flow rates as per GWG04 but the most appropriate procedure shall be identified by the Contractor pertaining to:

i. Slug Test;
ii. Tracer Test;
iii. Packer Test; and
iv. Pump Test

d) Hydrocensus, Refer to Eskom, 2014 Hydrocensus Guideline (GWG07):

A hydrocensus is essentially a site familiarisation involving the collection of important groundwater data from the study area and surrounding environments to an Eskom facility such as a power station. It comprises a census of key boreholes, springs and any other groundwater-related information. The objective is to identify the potential (pollution) risk and depletion risk to receptors – particularly groundwater users such as communities and farmers.

The contractor shall conduct a hydrocensus as per GWG07 and the boundaries should be far enough to include sensitive environments/users relevant to Eskom, potential Eskom

groundwater impacts as well as impacts from neighbouring landowners such as mining and industrial activities.

A hydrocensus should be done for all operations that have waste or products stored on a temporary or permanent basis that could have potential impact on surface or groundwater quality and quantity, by leaching into or coming in contact with water or any large scale dewater activities.

e) **Design, drilling and construction of boreholes. Refer to Eskom, 2014 Borehole Drilling Construction and Design Guideline (GWG03):**

The contractor shall drill boreholes when required by the employer as per GWG03.

f) Sampling and monitoring: large phase with complete chemical data evaluation/small phase with limited chemical data evaluation, Refer Eskom 2014 Groundwater Monitoring Guideline (GWG05a) Eskom, 2014, Groundwater Sampling Guideline (GWG05b)

A comprehensive overview is provided in GWG05a and GWG05b on groundwater monitoring and sampling principles.

The contractor shall evaluate all relevant regulatory and other requirements (e.g. WUL, EIA, EMP, Waste License Conditions, Closure and Land Use Objectives, IWWMP, Directives etc.) and develop a Kusile Power Station Project site specific monitoring and sampling procedure considering the requirements of the Eskom Groundwater Governance Framework and Guidelines (GGF&G) Groundwater Monitoring (GWG05a) and Groundwater Sampling (GWG05b) Guidelines as the basis for the development of the site specific monitoring and sampling procedure.

g) **Risk Assessment Eskom, Refer Eskom 2014 Risk Assessment Guideline (GWG10)**

The contractor shall conduct a complete groundwater risk assessment; should assess the three components, which are the source, the pathway and the receptor as per GWG10. The contractor will allow for the numerical ground water modelling to be done and update it annually.

h) **Groundwater remediation Eskom, Refer Eskom 2014, Groundwater Remediation Guideline (GWG12**

The contractor shall propose remediation plans. The remediation objectives or the ultimate goals of any remediation should be defined by the consequence to the critical receptor based on the toxicology and likely dependence/intake as per GWG12.

3.1 General Information Regarding Health and Safety

i. Kusile Power Station is fully committed to protecting the health and safety of employees, consultants, visitors and members of the public. Occupational health and safety are core values in Eskom, and the belief is that all unsafe acts and incidents are preventable and this belief guides our approach to safety across our business activities.
ii. The Eskom Safety, Health, Environment and Quality policy is available from the Kusile Safety Department.

3.2 Eskom Sheq Policy And Life Saving Rules

i. There are **6 lifesaving rules** that have been identified by Eskom. Failure to adhere to these rules by any Eskom employee or employee of any Principal Consultant or Consultant will be considered a serious transgression. These rules are being implemented to prevent serious injury or death of any employee, labour broker or consultant working in any area within Eskom.
ii. Kusile Management team will take a stance of zero tolerance on these rules.
iii. The Consultant shall at all times comply with the health and safety requirements prescribed by law as they may apply to the services.
iv. This is to ensure that every person who works in or visits Kusile Power Station returns home safety to his or her family.
v. The Consultant shall at all times comply with the health and safety requirements prescribed by law as they may apply to the services.

3.3 Monitoring points, parameters analysed and frequency

3.4 Groundwater Monitoring Points

Number	Identity	X Co-ordinates	Y Co-ordinates	Parameters to be Analysed	Frequency
10490-08	Borehole	28.91759	-25.90990	pH, Dissolved oxygen	Quarterly
10490 -09	Borehole	28.916 64	-25.92740		

10490-10	Borehole	28.89600	-25.92740	Total dissolved solids, Temperature, Alkalinity, Total Suspended Solids, Total hardness as calcium carbonate, Electrical conductivity, Nitrate/nitrite, Ammonia (NH3), Phosphate, Fluoride, Sulphate Chloride, Aluminium (total), Sodium Magnesium, Nitrate, Manganese (total), Calcium, Potassium, Iron(total), Turbidity E. Coli, Total Coliform, Faecal Coliform and Chemical Oxygen Demand, water levels.	
10490-17	Borehole	28.90533	-25.93989		
10490-21	Borehole	28.92259	-25.94277		
10490-25	Borehole	2888393	-25.92330		
10490-27	Borehole	28.93232	-25.91280		
BH 02	Borehole	28.90675	-25.90260		
BH 03	Borehole	28.90014	-25.91234		
BH 11	Borehole	28.93147	-25.95020		
BH 24	Borehole	28.899 45	-25.90000		
BH 25	Borehole	28.89334	-25.90450		
BH 27(LGW-B4)	Borehole	28.95413	-25.91610		
BH 30(LGW-B11)	Borehole	28.954 13	-25.91610		
DWBH-06	Borehole	28.92613	-25.92171		
DWBH-07	Borehole	28.93006	-25.92496		
DWBH-36	Borehole	28.91236	-25.91445		
GDF-6D	Borehole	28.92886	-25.90808		
KP05	Borehole	28.93214	-25.91958		
10490-14	Borehole	28.93476	-25.91506		
10490-18	Borehole	28.989815	-25.93727		
MP14-001	Borehole	28.89699	-25.9298		
MP14-002	Borehole	28.89642	-25.91896		
MP14-003	Borehole	28.92724	-25.92724		
Spring 1	Borehole	28.93680	-25.90230		
Spring 2	Borehole	28.93372	-25.88930		

Spring 3	Borehole	28.90632	-25.90632		
Spring 4	Borehole	28.88893	-25.94449		
Spring 6	Borehole	28.92797	-25.94760		
Spring 10	Borehole	28.95462	-25.95428		
Spring 11	Borehole	28.93460	-25.93110		
Spring 12	Borehole	28.91466	-25.94236		
Kam 8	Borehole	25.972530	-25.972530		
Kam 71	Borehole	28.925990°	-25.949930		
Kam 91	Borehole	28.878150°	-25.962750°		
Kam 9	Borehole	28.878051°	-25.963058°		

3.5 Surface water monitoring points

Number	Identity	X Co-ordinates	Y Co-ordinates	Parameters to be Analysed	Frequency
SW 1	Surface	28.88306	-25. 92000		Monthly
SW 2	Surface	28.868 47	-25 .8533		
SW 3	Surface	28.889 15	-25. 888 10		
SW 4	Surface	28.89269	-25. 89090		
SW5	Surface	28.90239	-25. 94310		
SW 6	Surface	28.88723	-25.88723		
SW 7	Surface	28.89394	-25.92578		
SW 8	Surface	28.90094	-25.89460		
SW 9	Surface	28.91739	-25.90245		
SW 10	Surface	28.86982	-25.87853		
SW11	Surface	28.86170	-25.88439		
SW 16	Surface	28.85141	-25.90218		

SW 17	Surface	28.86313	-25.87476	Flow, Temperature, pH, EC, Suspended Solids, Dissolved Oxygen, Chemical Oxygen Demand, Turbidity, Sechi disk depth, Alkalinity (mg CACO3/l), Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Sulphate (SO4), Fluoride (F) (Si), Ammonia (NH3), PO4, Nitrite, Nitrate, Hydrocarbon (including naphthalane) and Faecal coliforms	
SW 18	Surface	28.91201	-25.94699		
NCSW01	Surface	28.92214	-25.90743		
NCSW03	Surface	28.90512	-25.92340		
NCSW08	Surface	28.92297	-25.92858		
NCSW09	Surface	28.91531	-25.92697		
CSW08	Surface	28.865289	-25.871985		
Zustertroom	Surface	No coordinates available as yet			
Ezemvelo confluence of the Wilge and Elands River	Surface	No coordinates available as yet			
Before and after the confluence of the Wilge and Bronkhorstspruit	Surface	No coordinates available as yet			
The Wilge Dam (old Premier mine dam)	Surface	No coordinates available as yet			
Spruit upstream of as facility	Surface	28.92798	25.94775		
Spruit upstream of ash facility tributary (south)	Surface	2890786	2595677		
Spruit North of ash facility	Surface	2889425	2592636		
Spruit downstream of ash facility (South)	Surface	2888535	2592799		
Pan	Surface	2891044	2593620		

Offset wetland downstream	Surface	28.88941	25.88819		
Wilge river B	Surface	28.86381	25.87875		
Before wilge river confluence	Surface	28.86176	25.88438		
Wilge river A	Surface	28.86615	25.87340		
Offset wetland upstream	Surface	28.92111	25.87686		
ADDD east and west compartment,	Dam	28,89667	25,93134		
SDD east and west compartment	Dam	28.896714	25.920889		
HRD east and west compartment,	Dam	28.913664°	25.922873°		
OLC settling tanks (east and west compartment)	Dam	Not available	Not available		

3.6 Aquatic monitoring points

Number	Identity	X Co-ordinates	Y Co-ordinates	Parameters to be Analysed	Frequency
KUS 4	Aquatic	-25.94818	28.93557	Target Water Quality Ranges for aquatic ecosystems (TWQRs - DWAF, 1996), instream water quality objectives as stipulated in the WUL1 and the Resource Water Quality Objectives (RWQO) set for the Wilge catchment (DWAF, 2009)	Bi-annual
KUS 7	Aquatic	-25.93887	28.89471		
KUS 8	Aquatic	-25.92588	28.89419		
KUS 9	Aquatic	-25.91424	28.88064		
Kus 10	Aquatic	-25.90738	28.92702		
KUS 11	Aquatic	-25.88997	28.89236		
KUS 16	Aquatic	-25.90219	28.85142		

KUS 17	Aquatic	-25.87476	28.86313	Habitat – Index of Habitat Integrity (IHI) and Invertebrate Habitat Assessment System (IHAS) Aquatic Macroinvertebrates – South African Scoring System 5 (SASS5), Fish – Fish community analyses and Fish Response Assessment Index (FRAI);	
KUS 18	Aquatic	-25.86431	28.86893		

3.7 Location Maps

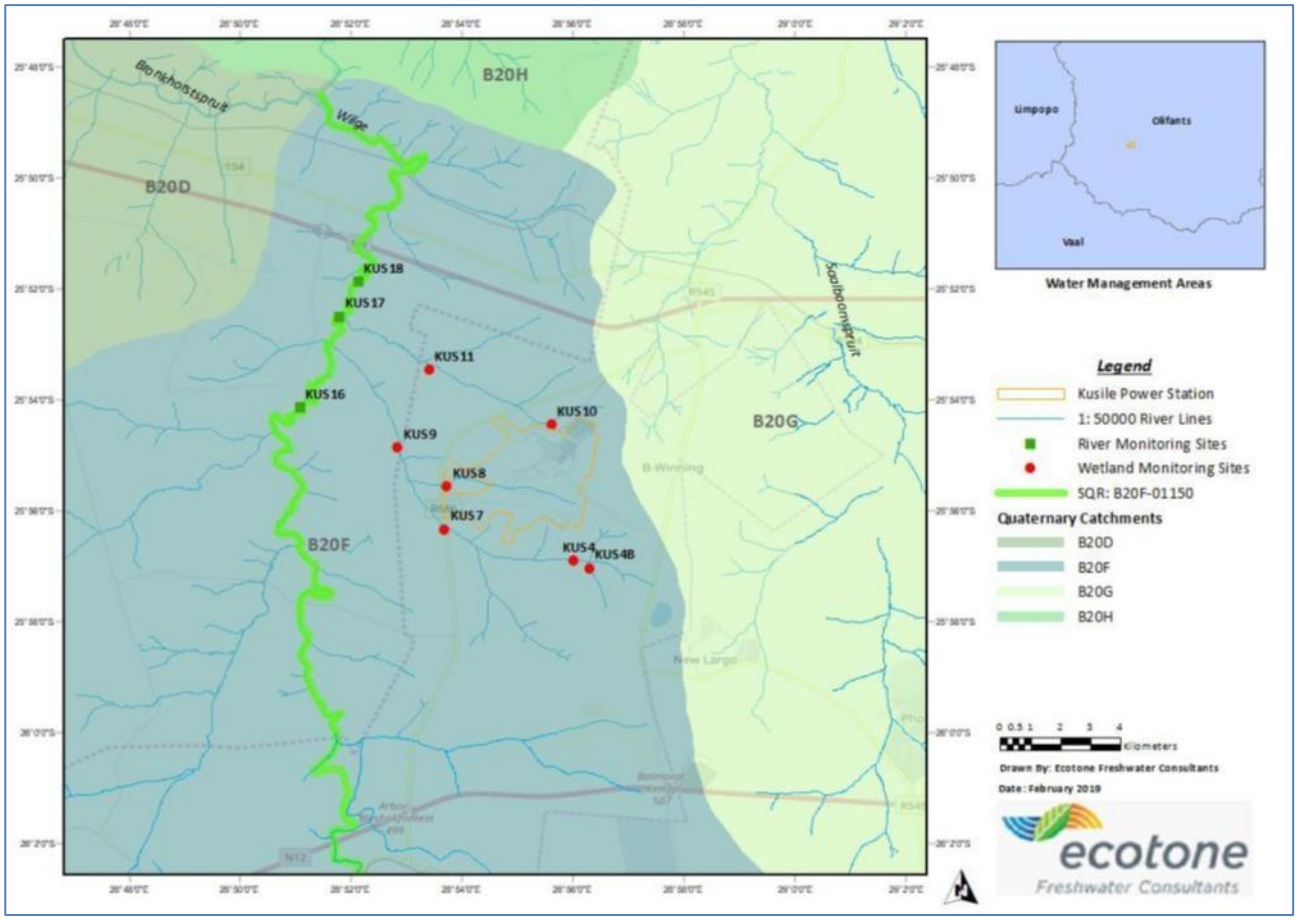

Figure 1: Aquatic Monitoring points

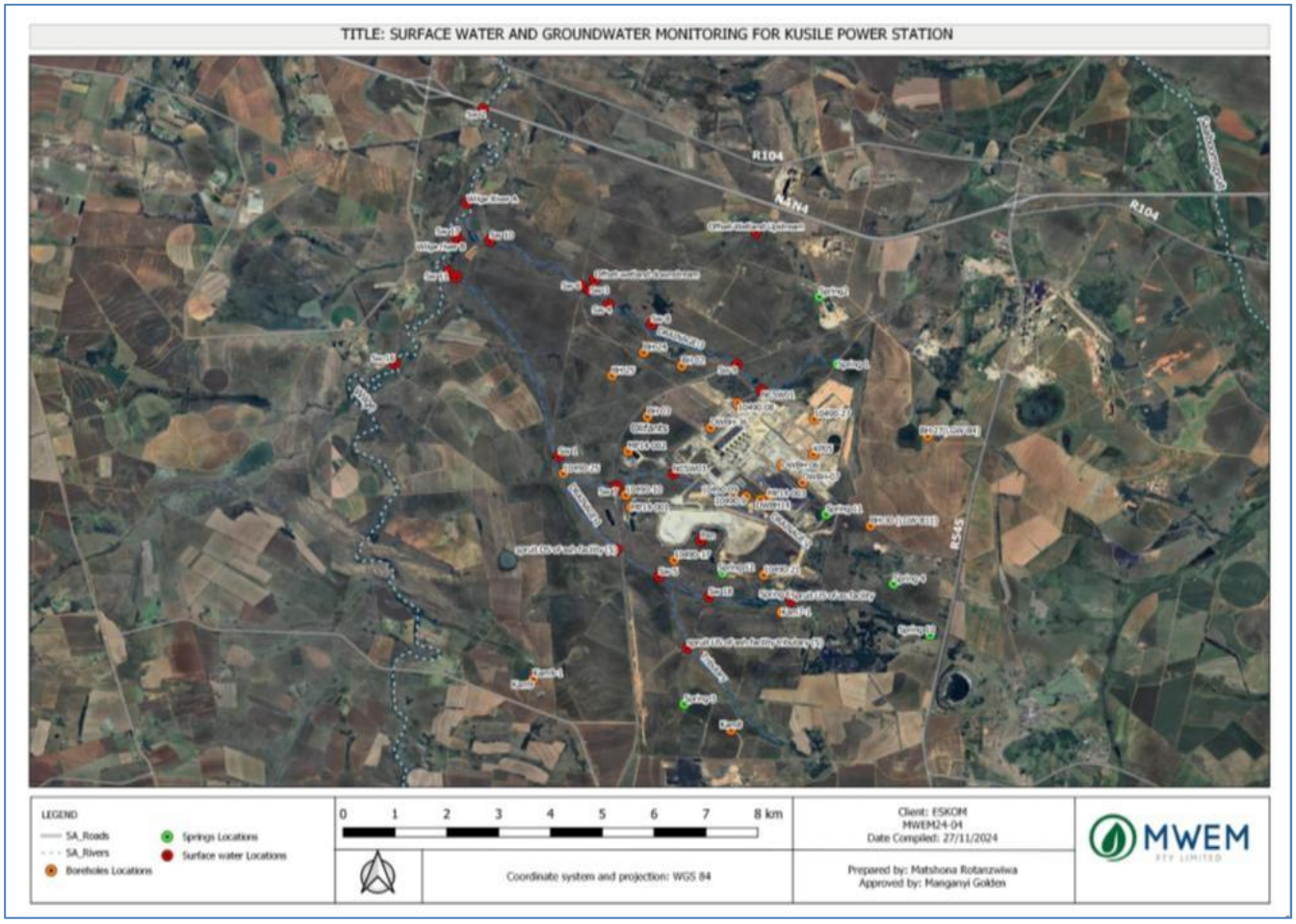

Figure 2: Surface and groundwater monitoring points

4. Acceptance

This document has been seen and accepted by:

Full Name and Surname	Designation
	Environmental Management Manager
	Senior Advisor Environmental
	Environmental Management Officer
	Environmental Management Officer

Full Name and Surname	Designation
	Environmental Management Officer
	Geologist

5. Revisions

Date	Rev.	Compiler	Remarks
July 2025	4		The scope of work aligned to the integrated and amended WUL
January 2023	3		Document was due for review. Section 6 and 7 were removed
December 2019	2		New template
June 2017	1		First issue.

6. Development Team

7. Acknowledgements

N/A

Appendix A

	Activity	Frequency
Activity Schedule		
1	Surface Water Monitoring	Weekly (selected monitoring monist)
		Monthly (all surface monitoring points including pollution control dams
2	Groundwater monitoring	Quarterly
3	Biomonitoring/Aquatic monitoring	Quarterly
4	Wetland delineation study	Once-off
5	Update of Water Conservation and Water Demand Management Plan	Yearly
6	Review Water Conservation and Water Demand Management Plan	Once in five years
7	Update the Integrated Waste and Water Management Plan	Yearly
8	Assess the habitat to monitor the sustainability of the diversions	Yearly
9	Inspect the functioning of stormwater infrastructure and turbidity level	Yearly
10	Soil sampling required upstream and downstream of Kusile Power Station footprint	When required
11	Prepare presentation on surface, ground and aquatic water quality and present it to the EMC.	Quarterly
12	Geohydrological model based on latest disposal and stockpiling.	Yearly
13	Purging of boreholes using potable pumps	Yearly
14	Site walkdown by an Ecologist during growing season (October to March) to identify bulbous plant species.	Annually

15	Maintenance of monitoring network which includes replacing of destroyed and lost monitoring points. Including drilling new boreholes	4 boreholes per year (20 per 5 years)
16	Conduct a source apportionment study - to determine load (from simultaneously measured flow and concentration) in each reach of the spruit and in relevant reaches of the river and consult other sources where necessary and department of water and sanitation.	Once off
18	Update the Master Layout Plan as per the WUL requirements	Once off
Adhoc activties		
19	Review of existing monitoring methodology, network and amendment if necessary.	Once in five years
20	Adhoc Environmental Monitoring Committee meeting when required.	When required
21	Conduct risk analysis and pollution source investigations should the need arises, this is related to upstream mining activities, agricultural impacts on water resources around and within the Kusile Complex.	Once off
22	Training to be done on an “as and when required” basis to Kusile Power Station personnel for a better understanding of the total monitoring system ensuring capacity to proactively minimise any environmental issues that could arise from any of the Kusile Power Station activities.	Once off
23	Conduct other water management related studies when required (e.g. any interventions or studies required by DWS)	2 studied in 5 years