# SURFACE AND GROUNDWATER MONITORING PLAN NAAZ QUARRY, PIETERMARITZBURG, KWAZULU-NATAL

**APRIL 2021**

For:


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**SYNOPSIS**

Surface and groundwater monitoring plan for quarry site

**KEY WORDS:**

Surface water, groundwater, sampling, monitoring, laboratory analysis



**QUALITY VERIFICATION**

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882

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# SURFACE AND GROUNDWATER MONITORING PLAN NAAZ QUARRY, PIETERMARITZBURG, KWAZULU-NATAL

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# SURFACE AND GROUNDWATER MONITORING PLAN NAAZ QUARRY, PIETERMARITZBURG, KWAZULU-NATAL

## 1 INTRODUCTION

This document has been prepared as the surface water and groundwater monitoring plan for the Naaz Quarry, as per the requirements of water use licence applications. This document serves to provide the user with a methodology to conduct surface and groundwater monitoring to ensure reproducible and reliable results through consistent and appropriate sampling techniques. Monitoring information needs to be gathered in a confident manner to interpret surface and groundwater chemistry over time, and to determine impacts associated with the quarry activities, such that meaningful management measures can be implemented for the site. This plan focuses on chemistry monitoring and does not consider biomonitoring.

Application for environmental authorisation to mine dolerite has been made for the permit area. The proposed mining method will make use of blasting in order to loosen the hard rock. The material will be loaded and hauled to the crushing plant where it will be screened to various sized stockpiles. The aggregate will be stockpiled until it is transported from site using tipper trucks. The mining related activities will be contained within the approved mining permit boundaries.

The site is located on a portion of Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691, and is approximately 10km north north east of Pietermaritzburg. The permit area has an area of 4.9 ha. The site can be accessed via a dirt road off the R33 between Pietermaritzburg and New Hanover.

The following project activities are proposed:

- site establishment and infrastructure development
- stripping and stockpiling of topsoil from the proposed mining footprint area
- blasting and excavation of the mining area
- crushing and screening of the loosened material at the processing plant
- stockpiling of product until sold and transported off site.

The proposed quarry will appoint 11 employees including management. Due to the small scale of the operation, no permanent infrastructure will be built at the mining area. The Applicant plans to establish the following mobile/temporary infrastructure within the mining footprint:

- Chemical ablution facilities to be serviced by a registered contractor
- Crushing and screening plant
- Containers that will be used as site offices, workshops and storage rooms
- Temporary wash bay.

## 2 REFERENCES

The following references have been used in preparation of this sampling plan:

- Report referenced KZN 30/5/1/3/2/10724 MP of Greenmined Environmental titled “Proposed Mining on a Portion of Portion 0 (Remaining Extent) of the Farm Thandisizwe No 16691, Umshwathi Municipal Area, Kwazulu-Natal Province - Final Basic Assessment Report”, dated January 2021
- Report reference 005532R01 of JG Afrika (Pty) Ltd titled “Geohydrological Assessment for Proposed Naaz Quarry Site, Pietermaritzburg, Kwazulu-Natal”, dated April 2021

- The Department of Water and Environmental Affairs, 6 September 2013. Government Notice No. 665. Revision of the General Authorisations in Terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998)
- The Department of Water Affairs and Forestry, Third Edition, 2005. Waste Management Series. Minimum Requirements for Water Monitoring at Waste Management Facilities.
- JMC Weaver et al, 2007. Groundwater sampling, A Comprehensive Guide for Sampling Methods. Water Research Commission (TT303/07)
- The Department of Water Affairs and Forestry, 2006. Best Practise Guideline G3: Water Monitoring Systems.

# 3 MONITORING PLAN

## 3.1 Background

This section detailing the procedures forms the essence of the sampling plan. The recommended procedures are based on Weaver's Ground Water Sampling (2007) and JG Afrika's standard operating procedures for environmental monitoring and field work. A WULA typically requires a sampling plan to be established within six months of issuance of the licence. A monitoring borehole network for the site for unobstructed sampling will be required.

Groundwater monitoring is required during construction, operation and closure phases of the activity. During any of these phases, surface water chemistry should be monitored monthly and groundwater chemistry bi annually. Construction monitoring is required to establish baseline conditions and should include targeted investigation monitoring to assess a comprehensive list of parameters. During operation, the monitoring may be reduced to targeted detection monitoring, and investigation monitoring carried out periodically as indicated by the detection monitoring results. Closure phase monitoring should be conducted for a specified period (2 to 5 years) subject to the results of the operational phase. Alternatives to be considered include SANS241 drinking water standards or South African Water Quality Guidelines for livestock watering subject to end user use of the groundwater systems.

On the basis of the General Limits of the General Authorisations[1], investigation and detection monitoring parameters should include the determinants presented in Table 1.

Table 1: List of Determinants

| **Detection (Routine)** | **Investigation (Detailed)** | |
|---|---|---|
| Faecal coliforms | Faecal coliforms | Dissolved Arsenic |
| Chemical Oxygen Demand (COD) | Chemical Oxygen Demand (COD) | Dissolved Cadmium |
| pH | pH | Dissolved Chromium (VI) |
| Ammonia | Ammonia | Dissolved Copper |
| Nitrate/Nitrite | Nitrate/Nitrite | Dissolved Cyanide |
| Chlorine | Chlorine | Dissolved Iron |
| Suspended solids | Suspended solids | Dissolved Lead |
| Electrical conductivity | Electrical conductivity | Dissolved Manganese |
| Ortho-phosphate | Ortho-phosphate | Mercury |
| Fluoride | Fluoride | Dissolved Selenium |
| Soap, oil or grease | Soap, oil or grease | Dissolved Zinc |
| Sodium Absorption Ratio (SAR) | Sodium Absorption Ratio (SAR) | Boron |

[1] The Department of Water and Environmental Affairs, 6 September 2013. Government Notice No. 665. Revision of the General Authorisations in Terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998)

### 3.2 Sampling Locations

The proposed sample locations have been selected based on downstream receiving environments for surface and groundwater. The sample locations include two (2 No.) surface water locations and two (2 No.) groundwater locations. The locations of the proposed sample points are summarised in Table 2 and shown in Figure *1*.

Table 2: Summary Sample Locations

| Location ID | South | East | Resource Type | Description |
|---|---|---|---|---|
| KZN1803092 | -29.523505° | 30.436720° | Groundwater | Downstream of site |
| NQBH2 | -29.513440° | 30.433910° | Groundwater | Downstream of site |
| SW1 | -29.524461° | 30.436691° | Surface Water | Downstream of site (non-perennial) |
| SW2 | -29.516905° | 30.438783° | Surface Water | Downstream of site (perennial) |

Selected proposed locations may be removed following consistent conformance, subject to the discretion of the Department. Additional sample locations may be added subject to the results of the ongoing monitoring and non-conformance.

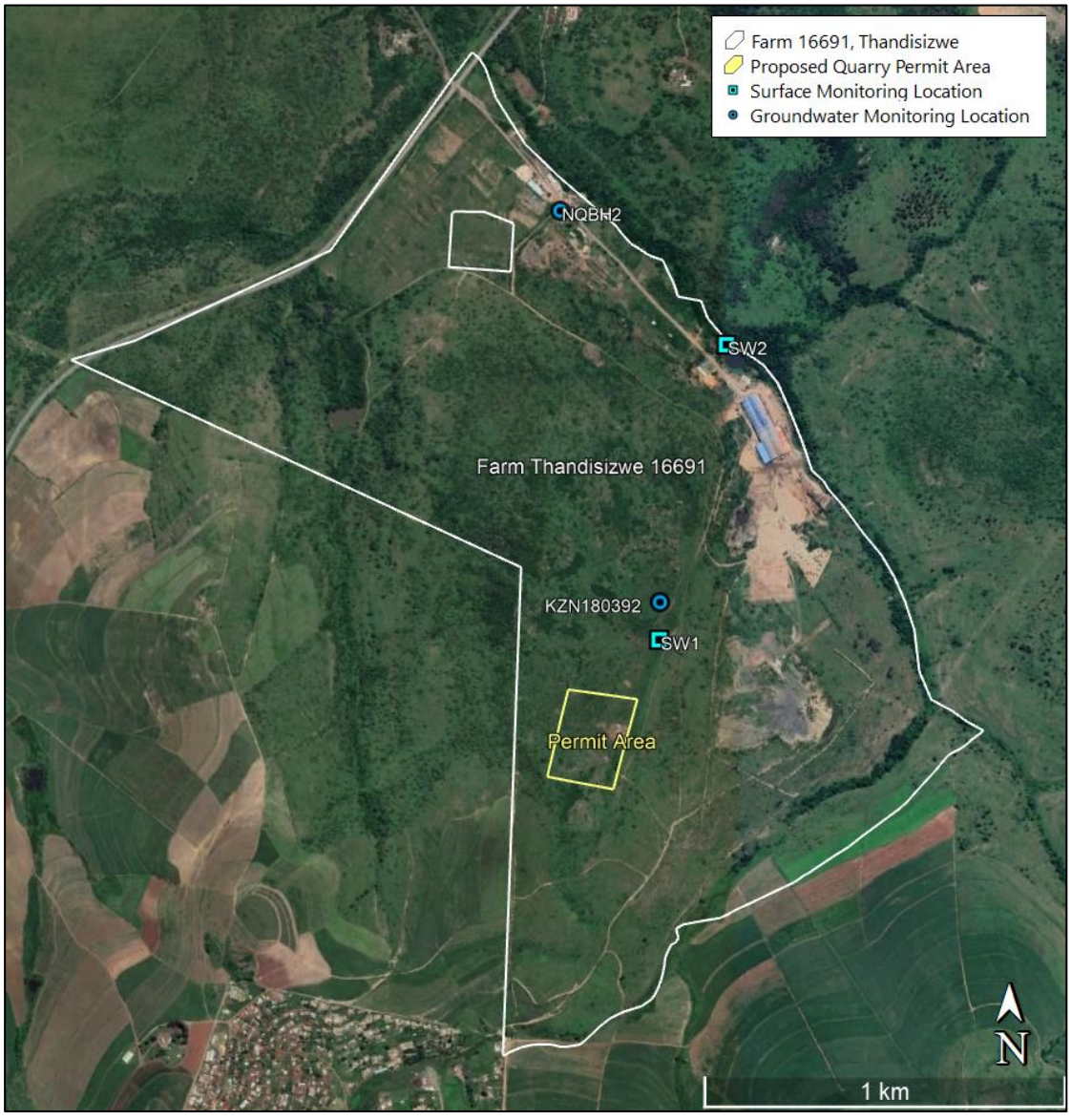


Figure 1: Site Plan Showing Sample Locations

### 3.3 Sample Frequency

The following sampling plan includes for construction, operation and closure phases. The construction phase is considered the "baseline" for the water quality monitoring and has a limited duration of three months (quarter cycle). Thereafter, all monitoring is considered operational phase monitoring. Monitoring should be carried out in accordance with the schedule presented in Table 3. The following monitoring should be compared with the water quality status quo results as presented in the geohydrological report[2].

Table 3: Monitoring Schedule

| Phase | Analysis Suite | Type | Monitoring Points | Frequency |
|---|---|---|---|---|
| Construction (Baseline) | Investigation + turbidity | Groundwater | KZN180392<br>NQBH2 | Quarterly<br>(at least 2 Events) |
| | | Surface water | SW1<br>SW2 | Monthly<br>(3 Events) |
| Operation (Lifespan) | Detection | Groundwater | KZN180392<br>NQBH2 | Bi annually |
| | | Surface water | SW1 | Monthly (flow permitting) |
| | | | SW2 | Quarterly |
| | Investigation | Groundwater | 2930CB00100<br>2930CB00112<br>21135086/1 | Biennially |
| | | Surface water | SW1<br>SW2 | |
| | | Groundwater | Any location should be subject to investigation monitoring if any screening limit is exceeded successively or a determinant shows significant variance | Ad hoc (bi annually) for at least 3 events provided water quality reverts to within screening limits |
| | | Surface water | | Ad hoc (monthly) for at least 3 events provided water quality reverts to within screening limits |
| Closure* (subject to monitoring during previous phases) | Detection | Groundwater | KZN180392<br>NQBH2 | Bi annually |
| | | Surface water | SW1 | Monthly (flow permitting) |
| | | | SW2 | Quarterly |

*Closure Monitoring should be continued such that three repetitive results of groundwater monitoring are obtained

[2] Report reference 005532R01 of JG Afrika (Pty) Ltd titled "Geohydrological Assessment for Proposed Naaz Quarry Site, Pietermaritzburg, Kwazulu-Natal", dated April 2021

# 4 METHODOLOGY

## 4.1 Equipment

Equipment that is to be utilised for the groundwater and surface water monitoring works will include the following:

- This guideline document
- Site map
- Safety equipment (overalls, safety shoes, gum boots, hard hats, safety glasses, gloves)
- Spanners/keys for opening borehole covers (additional or specific equipment required to open borehole to be supplied by Client e.g. manhole cover keys)
- Electronic dipmeter for monitoring of water levels, and tape measure
- 3" Submersible pump, with VSD (Variable Speed Drive)
- Disposable bailers and nylon cord
- Calibrated mulitmeter (pH, EC and temp)
- 25 litre drum for water collection and purge monitoring
- Sample containers – 1 x 1000ml bottles for macro and micro constituents, 1 x sterilised microbiological bottle
- Nitrile gloves
- Cooler box(es) and ice bricks for temporary storage of samples in the field
- Borehole and surface water sampling log sheets (Annexure B)
- Chain of custody forms (Annexure B)
- Sample labels, clear tape and marker pens
- Paper towelling
- Calculator, camera and GPS
- Field logbook
- Pens/pencils/rubber
- Toolbox
- First aid kit.

## 4.2 Contacts (Example Only)

| | | |
|---|---|---|
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| | Designation | Project Manager |
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| | Email | Murchellin.S@greenmined.co.za |
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| Land owner / Operator | Company | |
| | Name | TBA |

| | | |
|---|---|---|
| | Designation | |
| | Cell Phone | |
| | Email | |

### 4.3 Sequence

The "outside in" approach should be adopted when carrying out sampling to minimise possible cross contamination between sample points. In this instance, all locations are considered downstream. The preferred sample sequence is presented in Table 4 and should be revised after baseline analysis has been carried out.

Table 4: Summary Sample Sequence

| Sequence | Groundwater | Surface Water |
|---|---|---|
| 1 | NQBH2 | SW1 |
| 2 | KZN180392 | SW2 |

### 4.4 Groundwater Sampling

It is recommended that groundwater sampling be carried out in accordance with the Water Research Commission's Comprehensive Guide for Groundwater Sampling, as presented by Weaver and Cavé of Groundwater Sciences, CSIR (WRC Report No TT 303/07).

For boreholes that are already in operation, samples can be collected from the existing borehole pump outlets (preferably at a reservoir or tap outlet at the wellhead). No purging will be required due to ongoing operation of the borehole, however, sample taps need to be sanitized and flushed prior to sample collection.

Un equipped Boreholes will be purged using a submersible pump where appropriate. Purging of at least three well volumes is required. Groundwater samples will be collected from the discharge of the portable submersible pump and placed directly in sample bottles supplied by the laboratory. At the time of sampling, field measurements of pH, EC and temperature should be recorded on the sample log. Sample bottles will be labelled and cooled in an insulated cool box on site. All samples will be dispatched to the laboratory within the laboratory's required sample holding times for the designated analysis. All sampling and monitoring equipment will be rinsed and decontaminated between each sampling point.

A detailed description of the groundwater sampling process is presented in Appendix A. All information pertaining to the sampling of boreholes will be recorded on groundwater sampling field sheets as presented in Annexure B.

### 4.5 Surface Water Sampling

Surface water sampling is carried out at locations that will be representative of the surface water body. Locations where stagnant water and/or fast running water occur are not generally suitable. Surface water samples will be collected by the grab method. Samples will be collected directly in sample bottles provided by the laboratory unless a preserving agent is already in the bottle. In this case, samples will be collected in a disposable container and decanted into the sample bottles to prevent spillage and loss of preservative. Field measurements will be taken from the disposable container after collecting samples using a handheld multi meter. Parameters will be recorded on the field sampling sheets and will include temperature, pH, EC and TDS.

Samples will be collected from immediately below the surface of the water body. The sample container should be inverted before placing it through the water surface. Once below the surface a portion of air should be displaced from the container in an inverted position by pressing the

container sides. The container should then be re inverted to the upright position while under water to allowing water from below the surface to enter the bottle. Once full, the bottle should be slowly raised out of the water body preventing any unnecessary water movement in and around the sample container.

A detailed description of the surface water sampling process is presented in Annexure A. All information pertaining to the sampling of surface water will be recorded on sampling field sheets as presented in Annexure B.

### 4.6 Sample Handling

All samples will be collected in bottles provided by the laboratory and packaged and stored in a cooler box on site prior to being shipped to the laboratory. All details pertaining to the sampling processes will be recorded on field sample sheets. Samples will be dispatched to the laboratory under signed chain of custody documents signifying ownership. The laboratory will be issued with a laboratory analysis request. Sample handling documents are presented in Annexure B. No allowance has been made for QA/QC sampling.

### 4.7 Laboratory

Water samples will be analysed by an SANAS accredited laboratory. It is recommended that Talbot Laboratory be used for the analysis and this lab be used consistently through the monitoring programme to ensure repeatability. Samples will be analysed in terms of the analysis suite as presented in Table 1 (unless alternate screening guidelines are required).

### 4.8 Reporting

The results of water level monitoring, purging details, and sampling and analysis are to be presented in a factual report. The results of analysis are to be compared to appropriate screening guideline values (General Limits / SANS241) to give a comparative indication of chemistry trends and possible contamination. Any negative findings will be highlighted and recommendations made for future sampling and possible remedial measures.

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# *Annexure A: STANDARD OPERATING PROTOCOLS FOR ENVIRONMENTAL SITE ASSESSMENTS*

*Groundwater Level Monitoring*

*Groundwater Purge and Sampling Using a Submersible Pump*

*Surface Water Grab Sampling*

*Installation of Permanent Groundwater Monitoring and Sampling Boreholes*

## Groundwater Level Monitoring

Additional Information

Groundwater Sampling Sheet.

Equipment

Electronic Interface Meter
Groundwater Level Meter (Dip Meter)
Tape measure
Alan Keys and Spanners.

Purpose

Groundwater levels will be monitored on a routine basis, as well as prior to the collection of groundwater samples at each of the boreholes. This will provide information on the volumes of water contained within each borehole, fluctuations in depths to groundwater, and for contouring groundwater flow direction. Details of volumes will be used to determine the purging volume required prior to a sample being collected, as well as to measure the resultant drawdown from a pumping event.

Procedure

The depth to water level will be determined to the nearest 0.005m (5mm) using an electronic indicator (dip meter). This will be thoroughly cleaned and decontaminated before and after each monitoring event to prevent the occurrence of cross contamination. To ensure consistency between monitoring events, a reference point at the top of each well casing (cap removed) will be marked, and will be used as the starting point on each occasion. This will allow for a true representation of trends in depth to groundwater to be ascertained.

In those instances where Non-Aqueous Phase Liquid (NAPL) is present, an electronic oil/water interface meter will be used to determine the depths at which the free phase product and groundwater occur. The NAPL/groundwater interface is determined with an infrared sensor probe which responds to the different densities of aqueous and non-aqueous liquids. Boreholes that report the presence of NAPL will not be sampled.

## Groundwater Purge and Sampling Using a Submersible Pump

Additional Information

Groundwater Sampling Sheet
Chain of Custody Document

Equipment

Portable Submersible Pump and Power Supply
Groundwater Level Meter (Dip Meter)
Tape measure
Alan Keys and Spanners
Cooler Boxes
Frozen Ice Packs
Sample Bottles
Disposable Sampling Gloves
Marker Pen and Labels.

Purpose

Water samples will be taken at agreed depths in the piezometers for chemical analysis. Suitable analysis. Streams include physical, macro, micro and micro biological constituents. Sampling depths are limited to approximate 30 metres depth. The waters will be visually assessed during sample collection and where any contamination is noted, additional samples may be taken.

Purging Prior to Sampling

To ensure the collection of a groundwater sample that is representative of the conditions present in the aquifer, water is purged from the well prior to each sampling event. This facilitates the flow of 'fresh' groundwater towards the piezometer/borehole for subsequent sampling and analysis. Purging must be carried out in a controlled manner to ensure that the sample does not become influenced by the sampling process. Purging and sampling is carried by using a portable battery or generator powered submersible pump which is lowered into the borehole at the required sampling depth. The submersible pump is decontaminated between each sampling location. The objectives of purging a groundwater well prior to a sampling event are as follows:

- Purge a volume of groundwater that is greater than 3 times the volume of standing water in the monitoring well
- Purge at a flow rate that will not create excessive drawdown and turbulence of the formation water and hence lead to aeration of the sample being collected. Purging is carried out at a low abstraction rate of less than 500 litres per hour.

All details regarding the sampling process are recorded on the groundwater sampling field sheet. Deviations to the sampling protocol must be noted. To accurately calculate the volume of water to be purged from each well, the following information is required:

- The depth to groundwater (meters)
- The depth to the bottom of the piezometer (meters)
- The diameter of the piezometer (meters)
- The minimum volume that requires purging is equal to 3 times the volume of water present in the piezometer.

All measurements will be recorded on the field sampling sheet. All equipment will be cleaned and maintained on an ongoing basis to ensure reliable operation and results.

The flow rate must be recorded during purging. The drawdown of the water level can be monitored using the groundwater level probe. The purge water must be monitored until consistent readings of the well head parameters have been achieved. The pH, EC, redox potential and temperature of the groundwater is measured at the well head from grab samples during purging using the multimeter. Purging will continue until at least 3 times the monitoring well volume has been removed and 3 consecutive readings of the parameters are recorded at 5 minute intervals occur within the following limits.

- pH +0.1

- Electrical Conductivity +3%
- Redox Potential +10mV.

Sample Collection

Groundwater sampling is carried out using the same equipment used for purging and must be carried out when the required purge volume has been removed from the borehole. Well head parameters including pH, EC and redox potential should stabilise to ensure purging has been sufficiently carried out. The advantage of using a submersible pump for purging and sampling are as follows:

- Battery or generator powered
- Relative large volumes of water can be purged from larger diameter wells in quicker time.
- Flow rates are relatively low and will reduce agitation within the piezometer.

Samples will be collected at the discharge outlet of the submersible pump directly into sample containers provided by the laboratory. Disposable sample gloves will be worn at all times. The correct number of bottles must be obtained from the laboratory with any necessary preservatives for the required analysis. The following activities will be carried out in sequence for groundwater sampling from a monitoring well:

- A code will be allocated to the sample bottle, and if necessary, preserving agents will be added
- Groundwater sample requirements and handling will be carried out in accordance with laboratory requirements
- Samples that are to be filtered should not be preserved until after filtration
- The sample bottle will be rinsed with the groundwater being sampled, unless a preserving agent is already in the bottle
- Restriction of sample turbulence while sampling will be adhered to
- The bottles will be filled completely and closed ensuring that no air is trapped inside
- The required information of the groundwater sample will be clearly marked on the sample bottle. This will include project name, reference, date and sample reference
- Groundwater samples will immediately be placed into a cool box or portable refrigerator (preferably at a temperature between +2 to 5°C)
- On completion of the fieldwork, the groundwater samples will be transported maintaining the same temperature directly to the laboratory
- Holding times will be minimized during fieldwork and at the laboratory.

Prevention of Cross-Contamination

To prevent cross-contamination, sampling and monitoring equipment shall be thoroughly cleaned after each sample has been taken. All rinse water used in the cleaning process of sampling and monitoring equipment will be combined with purge water and disposed of appropriately. At no point should the inside of the sample cap or the opening of the sample bottle come into contact with anything other than sample water, especially the sampler's hands. This is particularly important for microbiological analysis.

Bottling and Preservation of Groundwater Samples

Groundwater samples will be bottled in such a way as to ensure that the bottling does not affect concentrations of specific substances in the groundwater samples. This shall be achieved by using the correct type of bottle (clear glass, coloured glass, PE), the use of Teflon coating in the caps, the pre-treatment of sample bottles and the correct methodology of the sampling itself. Certain sample bottles must be completely filled (no air/bubbles left in the bottle). Bottling will be carried out in accordance with instructions supplied by the laboratory undertaking the analysis.

Handling of Samples

Bottles or vials holding the samples will be marked in a clear/legible and durable manner to permit identification without ambiguity at the laboratory. It is necessary during sample collection, to note the sampler's name, date and time of sampling, and other relevant sampling details. This will be recorded on the field sampling sheet. Sample labels must be covered with clear tap to prevent wet labels being damaged in transit.

Transport of Samples

Bottles and/or vials holding samples will be protected and sealed in such a way that they do not deteriorate and do not lose any part of their contents during transport. Correct packaging will protect or minimise the bottles and/or vials from possible breakage thus avoiding recollection. Bottles and/or vials with samples shall be kept at a temperature lower than that prevailing at the time of filling. Storage in a cool box with ice bricks or a refrigerator will be required prior to shipment. The most rapid option of shipment will be selected to ensure the holding times are minimised.

Sample Reception at the Laboratory

On arrival at the laboratory, the temperature within the transport container will be noted and the samples shall, if their immediate analysis is impossible, be preserved under conditions such that the required analysis is not jeopardized. The use of refrigerated and/or dark cabinets is highly recommended. Samples are stored at temperatures between +2 to 5°C. The laboratory will notify JG Afrika of their reception by acknowledgement of the chain of custody documentation.

Records

Chain of Custody records will be completed and accompany any shipment of samples. All parties who handle the samples are required to complete and sign the documents signifying temporary or final ownership.

Quality Assurance and Quality Control

To ensure that the sample protocol is being executed correctly and that systematic errors are recognised before they seriously impact the analysis results, it is necessary to undertake various QA/QC procedures. These involve the use of various sample blanks, sample duplicates and inter laboratory duplicate samples. This will enable quantitative corrections for errors which may arise due to handling, storage, transportation, laboratory procedures, and identification of possible cross-contamination between samples and/or equipment.

## Surface Water Grab Sampling

Additional Information

Surface Water Sampling Sheet
Chain of Custody Document.

Equipment

Disposable Collection Container
Cooler Box
Frozen Ice Packs
Sample Bottles
Disposable Sampling Gloves
Marker Pen and Labels.

Purpose

Water samples will be taken at agreed locations and/or depths in the water body for chemical analysis. The waters will be visually assessed during sample collection and where any contamination is noted, additional samples may be taken.

Sample Collection

Surface water sampling is carried out locations that will be representative of the surface water body. Locations where stagnant water and/or fast running water occur are not generally suitable. Samples will be collected directly in sample bottles provided by the laboratory unless a preserving agent is already in the bottle. In this case, samples will be collected in a disposable container and decanted into the sample bottles to prevent spillage and loss of preservative. Samples will be collected from below the surface of the water body. Disposable sample gloves will be worn at all times. The correct number of bottles must be obtained from the laboratory with any necessary preservatives for the required analysis. The following activities will be carried out in sequence for surface water sampling:

- A code will be allocated to the sample bottle, and if necessary, preserving agents will be added
- Sample requirements and handling will be carried out in accordance with laboratory requirements
- Samples that are to be filtered should not be preserved until after filtration
- The sample bottle will be rinsed at least twice with the water to be sampled, unless a preserving agent is already in the bottle
- Restriction of sample turbulence while sampling will be adhered to
- The bottles will be filled completely and closed ensuring that no air is trapped inside
- The required information of the water sample will be clearly marked on the sample bottle. This will include project name, reference, date and sample reference
- Water samples will immediately be placed into a cool box or portable refrigerator (preferably at a temperature between +2 to 5°C)
- On completion of the fieldwork, the water samples must be transported maintaining the same temperature directly to the laboratory
- Holding times will be minimized during fieldwork and at the laboratory.

The same methodologies relating to cross contamination, bottling, handling, transport, sample reception, quality assurance and recording used in groundwater sampling, apply to surface water sampling.

# *Annexure B: SAMPLE HANDLING DOCUMENTS*

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004

## SURFACE WATER SAMPLING FORM

JG AFRIKA
EXPERIENCE QUALITY INTEGRITY

| | | | | | |
|---|---|---|---|---|---|
| 1 Project Name | | | | | |
| 2 Reference No. | | | | | |
| 3 Sample Point Description | | | | | |
| 4 Co-ordinates | Latitude (South) | | Longitude (East) | | |
| | S | | E | | |
| 5 Sampling Details | | | | | |
| 5.1 Date | | Sampled by :- | | | |
| 5.2 Time Started | | | | | |
| 5.3 Time Completed | | | | | |
| 5.4 Method | | | | | |
| 6 Samples Collected | | | | | |
| 6.1 TRT Sample Nos. | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| 6.2 Time | | | | | |
| 6.3 Laboratory | | | | | |
| 6.4 Consisting of (bottles) | | | | | |
| 7 General Comments | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

1812
003

## GROUNDWATER SAMPLING FORM

JG AFRIKA
EXPERIENCE QUALITY INTEGRITY

| | | | | | |
|---|---|---|---|---|---|
| 1 Project Name | | | | | |
| 2 Reference No. | | | | | |
| 3 Borehole No. | | | | | |
| 4 Borehole Info | | | | | |
| 4.1 Co-ordinates | S_____° | E_____° | | | |
| 4.2 Final Depth | | | | | |
| 4.3 Casing Internal Diameter | | | | | |
| 4.5 Stick up | | | | | |
| 5 Groundwater Monitoring Details | | | | | |
| 5.1 Date | | | | | |
| 5.2 Time | | | | | |
| 5.3 Measurements From | Ground Level | Top of Casing | | | |
| 5.4 Depth to Groundwater | | | | | |
| 6 Purging of Monitoring Well | | | | | |
| 6.1 Volume of water in borehole | | | | | |
| 6.2 Time Started | | | | | |
| 6.3 Time Completed | | | | | |
| 6.4 Pump Intake Depth | | | | | |
| 6.5 Volume Purged | | | | | |
| 6.6 Purge Rate | | | | | |
| 6.7 Purge Method | | | | | |
| 7 Sampling Details | | | | | |
| 7.1 Date | | | | | |
| 7.2 Time Started | | | | | |
| 7.3 Time Completed | | | | | |
| 7.4 Well head measurements | | | | | |
| 7.4.1 Time of measurement | | | | | |
| 7.4.2 Temp | | | | | |
| 7.4.3 pH (-) | | | | | |
| 7.4.4 EC (uS / mS) | | | | | |
| 8 Samples Collected | | | | | |
| 8.1 TRT Sample Nos. | | | | | |
| 8.2 Time | | | | | |
| 8.3 Laboratory | | | | | |
| 8.4 Consisting of (bottles) | | | | | |
| 9 General Comments | | | | | |

Sampled by:-

Calculation of Volume in Well:-

Calculation of Purged Groundwater (V = π r2 x h) :-

## SAMPLE CUSTODY FORM

| | | | |
|---|---|---|---|
| **Deliver to** | Laboratory Name<br>Laboratory address | **From** | JG AFRIKA (PTY) LTD<br>1 The Boulevard<br>Westway Office Park<br>3629 |
| **For the Attention of** | Lab Manager | Contact | YOUR NAME |

| Our Project Title | Lab Reference | Project/Order Number | Airwaybill Number |
|---|---|---|---|
| | -- | | na |

| Sample Tracking (Ownership) | | Signature of Receipt | Date | Time |
|---|---|---|---|---|
| JG Afrika | name | | | |
| Courier | name | | | |
| Laboratory | name | | | |

**LIST OF SAMPLES DELIVERED**

| Sample Number | Sample Date | Comprising | Analysis Request |
|---|---|---|---|
| | | | Investigation Monitoring Suite |
| | | | |
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**LABORATORY MANAGER**

| | | | |
|---|---|---|---|
| Contact Person | | | |
| Signature | | | |
| Date Received | | Time Received | |
| Anticipated Report Date | | | |
| Comments | | | |

**Please Complete and Return Fax to JG Afrika at +27-31-2658255**