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LEADERS IN ENVIRONMENTAL MONITORING

Wesizwe Platinum

Bakubung Mine

Quarterly Water Monitoring Report

December 2020

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Wesizwe Platinum Limited

Bakubung Mine

Quarterly Water Quality Assessment Report

December 2020

Attention:

Keneilwe Mntambo

Thendo Matovheke

Report:

Wesizwe Platinum Bakubung Mine

Quarterly Surface water and Groundwater Quality Report

December 2020

Report Number:

WPBM/WQR/Q2/2020/IF

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Keneilwe Mntambo

December 2020

WESIZWE BAKUBUNG PLATINUM MINE SURFACE WATER AND GROUNDWATER MONITORING QUARTERLY REPORT

DECEMBER 2020 MONITORING PERIOD

1. Introduction

Aquatico was commissioned by Wesizwe Platinum for the monitoring of ten (10) groundwater localities and four (4) surface water localities on the Frischgewaagd and Mimosa farms at their Bakubung Mine (Referred to in the rest of the report as “Wesizwe Bakubung”).

Monitoring of surface and groundwater will take place on a monthly basis; on a quarterly basis monitoring will include a broader suite of chemical and bacteriological analysis.

2. Fieldwork:

All fieldwork is conducted based on the protocols and specifications, and code of practice contained in the SABS ISO 5667:1-15. These international standards address all aspects from the program design, sampling methods as well as sample preservation and many other aspects. Applicable standards include:

- ISO 5667-1: 2008 Part 1: Guidance on the design of sampling programs and sampling techniques
- ISO 5667-3: 2018 Part 3: Guidance on preservation and handling of samples
- ISO 5667-11: 2015 Part 11: Guidance on sampling of groundwater
- DWAF Best Practice Guidelines Series G3: General Guidelines for Water Monitoring Systems

Observations during sampling are of critical importance during the evaluation of the water quality results. Aquatico therefore employs highly qualified personnel to conduct the fieldwork as well as the evaluation component of the program.

Aquatico developed a custom-made data input system in accordance with SABS ISO guidelines 5667-1 to 5667-3, to assist the field technician in recording the physical and environmental information of the sampling locality. This information is needed to interpret water quality especially if the water quality results obtained by the laboratory indicate sudden changes at a specific locality.

The field data typically include the following information:

- Location, name and details of the sample site
- Method of collection
- Name of collector
- Nature of pre-treatment, if any
- Preservative or stabilizer added, if any
- Flow status or dam level
- GPS Coordinates
- Photographic evidence
- Water level of boreholes
- Other data gathered at this point

All of the above information is recorded on a handheld PDA device deployed to the field complete with GPS, bar-code scanner, camera and database-linked MONLIMS software. The water quality database is electronically updated with this information when the field technician returns from the field trip.

3. **Laboratory analysis**:
   - This analytical laboratory takes part in the:
     - **SABS commercial** (PTS0003) - SANAS accredited proficiency testing by inter-laboratory comparisons – Water Chemical Analyses
     - **National Laboratory Association (NLA)** of South Africa (PTS0009) – SANAS accredited Proficiency testing by inter-laboratory comparisons – Microbiology.
     - The Laboratory has also been registered in terms of the **Blue Drop** requirements of the National Certification Program by the Department of Water Affairs.

Table 1: Laboratory analytical packages for Bakubung Platinum Mine

Bakubung Mine - Monthly laboratory analysis package		
Method	**SANAS**	**Variable/Description**
ALM 20	**A**	pH
ALM 20	**A**	Electrical conductivity (EC)
ALM 20	**A**	Temperature
ALM 21	**A**	Turbidity (NTU)
ALM 24	**A**	Total Dissolved Solids (TDS) - gravimetric
Bakubung Mine - Quarterly laboratory analysis package		
Method	**SANAS**	**Variable/Description**
ALM 20	**A**	pH
ALM 20	**A**	Electrical conductivity (EC)
ALM 20	**A**	Temperature
ALM 21	**A**	Turbidity (NTU)
ALM 24	**A**	Total Dissolved Solids (TDS) - gravimetric
ALM 01	**A**	Total Alkalinity
ALM 26	**A**	Bicarbonate alkalinity * *Requires pH & Alkalinity*
ALM 26	**A**	Carbonate alkalinity * *Requires pH & Alkalinity*
ALM 02	**A**	Chloride (Cl)
ALM 03	**A**	Sulphate (SO_4)
ALM 06	**A**	Nitrate (NO_3) as N
ALM 08	**A**	Fluoride (F)
ALM 30	**A**	Ca Mg Na K
ALM 31	**A**	Al Fe Mn Cr Cu Ni Pb Zn Cd Co
ALM 32	**NA**	Ag, Bi, Li
ALM 33	**A**	B, Ba, Mo, Si, Sr, V
ALM 34	**A**	As & Se
ALM 36	**NA**	(3) Sb, Sn, Ti
ALM 12	**NA**	Total Phosphorus (TP)
ALM 40	**A**	Total Coliforms & *E. coli (<1 to > 100 000 CFU/100ml)*

4. Data interpretation

Water quality is discussed focussing on various properties of the water such as physical, chemical and bacteriological quality.

Physical water quality refers to the water quality properties such as temperature, electrical conductivity, pH and oxygen content that may be determined by physical methods. When referring to the physical quality of water, we refer to the three parameters namely pH, EC or TDS. The physical quality affects the aesthetic as well as chemical quality of the water.

Physical quality	
Parameter	**Relevance to domestic user**
pH	Affects the corrosive effect and taste of water
EC/TDS	Serves as a general indicator of change in water quality and affects the "freshness" taste of the water. Indicates the salinity and quantity of dissolved substances

The chemical quality of the water refers to the nature and concentrations of dissolved substances such as organic or inorganic compounds, including metals, in the water body. Many chemicals in water are essential for the biotic community and may form an integral part of the nutritional requirements. However, elevated levels may be limiting (affecting palatability and potentially result in illnesses) for some of the downstream water users.

Chemical quality	
Parameter	**Relevance to domestic user**
Alkalinity	Indicative of intrinsic buffering capacity against acidification
Major anions	Influence the salinity levels and may pose health effects in high concentrations
Hardness	Affects the scaling and foaming quality of the water
Major cations	Elevated levels could affect the taste of water and may pose health effects in high concentrations
Heavy metals	Toxic at low concentrations

Bacteriological water quality refers to the presence of a specific group of microscopic organisms that may be found naturally in many water bodies and play an integral part in the ecosystem. Depending on the species and amount of these organisms found in the water they may have limiting effects and cause unfavourable conditions in surface waters.

Bacteriological quality	
Parameter	**Relevance to domestic user**
E. coli	Indicator of possible faecal contamination
Total coliforms	Serves as a general indicator of the presence of microorganisms in water as well as the effectiveness of disinfection

The WRC (1998) Quality of Domestic Water Supplies guidelines (QDWSG) are used for classification of the water qualities observed. The WRC has developed a useful colour coding system for evaluating the prevailing water quality of water used for domestic purposes (see Table 2).

The system is based on the principle of assigning a colour to a specific concentration range of variables commonly found in water and that has a major effect on the suitability of water for domestic use.
Due to the frequent use of water for domestic purposes and the importance of effective water quality evaluation for that specific use, efficient data for a wide variety of variables are available. When comparing data with the guidelines for domestic use, the worst substance class will determine the overall class of the water supply. Data can be interpreted as follows:

- Water testing within the **Blue** or **Green** colour class 0 or class 1 may be used without reservation and is considered safe for all users.
- Water testing within the **Yellow** colour class 2 is generally regarded as safe; however sensitive users should be identified and warned to take personal consumption precautions.
- Water testing within the **Red** colour class 3 can be used as a short-term emergency supply, approximately seven days only, when other sources are unavailable.
- When water tests within the **Purple** colour class 4 the public must be warned not to use the water, or to use emergency home treatment where possible. If this is not possible, alternative water supplies must be considered and made available.

Please note that although the above information indicates that water when classified as Class 3 quality for domestic use can be used as a short-term emergency it is highly recommended that water in this class together with water classified as Class 4 not be consumed as it may potentially pose clinical infections in users.

Table 2: Structure of the classification system describing the effects of the different classes of water on the various domestic uses of water (Quality of Domestic Water Supplies, Vol. 1: Assessment Guide)

CLASS / COLOUR	DESCRIPTION	EFFECTS
Class 0 (Blue)	**Ideal water quality**	**Drinking health**: No effects, suitable for many generations
		Drinking aesthetic: Water is pleasing
		Food preparation: No effects
		Bathing: No effects
		Laundry: No effects
Class 1 (Green)	**Good water quality**	**Drinking health**: Suitable for lifetime use. Rare instances of sub-clinical effects
		Drinking aesthetic: Some aesthetic effects may be present
		Food preparation: Suitable for lifetime use
		Bathing: Minor effects on bathing or on bath fixtures
		Laundry: Minor effects on laundry or on fixtures
Class 2 (Yellow)	**Marginal water quality**	**Drinking health**: May be used without health effects by majority of individuals of all ages, but may cause effects in some individuals in sensitive groups. Some effects possible after lifetime use.
		Drinking aesthetic: Poor taste and appearance are noticeable
		Food preparation: May be used without health or aesthetic effects by the majority of individuals.
		Bathing: Slight effects on bathing or on bath fixtures
		Laundry: Slight effects on laundry or on fixtures
Class 3 (Red)	**Poor water quality**	**Drinking health**: Poses a risk of chronic health effects, especially in babies, children and the elderly
		Drinking aesthetic: Bad taste and appearance may lead to rejection of water
		Food preparation: Poses a risk of chronic health effects, especially in babies, children and the elderly
		Bathing: Significant effects on bathing or on bath fixtures
		Laundry: Significant effects on laundry or on fixtures
Class 4 (Purple)	**Unacceptable water quality**	**Drinking health**: Severe acute health effects, even with short-term use
		Drinking aesthetic: Taste and appearance will lead to rejection of water
		Food preparation: Severe acute health effects, even with short-term use
		Bathing: Serious effects on bathing or on bath fixtures
		Laundry: Serious effects on laundry or on fixtures

The Wesizwe Platinum Bakubung Mine is currently in possession of a water use licence (WUL) No. 26064730. The WUL indicates water quality limits for waste water to be disposed of onto a pollution control dam and is stipulated in table 3.

Limits as stipulated in the RQO for Mokolo-Crocodile West Catchments are also used in assessing the surface water quality as the Wesizwe Platinum mine is located in Unit 5_7 of this catchment.

No limits are provided for groundwater quality or receiving environment quality, as such the SANS241-1:2015 drinking water standards will be applied to the analysed water quality recorded in this report. The General Limit [Section 21 (f) and (h)] of the General Authorisation (General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act 36 of 1998) in Government notice 665, as published in the Government Gazette no 36820 dated 6 December 2013) will be applied to the analysed water quality in this report as a secondary guideline. These limits may be viewed in Table 3 below.

It should be noted that the water is also classified according to the WRC (1998) Quality of Domestic Water Supplies Assessment Guide and that the classification **only serves as reference** for the recorded water quality (based on the analysed variables).
Further testing would however be required before this water can be considered safe or should be used for domestic purposes.

The General Limit indicates various water qualities to which the discharging of waste or water containing waste **into a non-listed water resource** through a pipe, canal, sewer or other conduit; and disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process must comply. Please note that various exclusion of water users to this act exists (please see Section 21(1)(e) and 22(2)(e)) and as such should only serve as a general indication of water quality and not for compliance purposes.

Table 3: Compliance criteria used for assessing water quality at Wesizwe Bakubung Mine

VARIABLE	UNITS	SANS 241-1:2015 Drinking Water Limits	General Authorisation Limit, Section 21f and h, 2013	WUL Water Quality Limits	RQO Mokolo-Crocodile West Catchments
Electrical conductivity (EC) @ 25°C	mS/m	170	150	70 – 150	≤85
pH @ 25°C	pH	5.0/9.7	5.5/9.5	5 - 6 and 9 - 9.5	6 – 9
Total Dissolved solids @ 180°C	mg/l	1200	-	-	-
Chloride (Cl)	mg/l	300	-	100 – 200	≤120
Sulphate (SO_4)	mg/l	500	-	200 – 400	≤120
Fluoride (F)	mg/l	1.5	1	0.7 – 1.0	-
Nitrate (NO_3) as N	mg/l	11	15	6 – 10	4.5
Aluminium (Al)	mg/l	0.3	-	-	≤0.1
Arsenic (As)	mg/l	0.01	0.02	-	-
Boron (B)	mg/l	2.4	1	-	-
Barium (Ba)	mg/l	0.7	-	-	-
Cadmium (Cd)	mg/l	0.003	0.005	-	-
Chromium (Cr)	mg/l	0.05	-	-	-
Copper (Cu)	mg/l	2	0.01	-	-
Iron (Fe)	mg/l	0.3	0.3	-	≤0.3
Manganese (Mn)	mg/l	0.1	0.1	-	≤0.15
Calcium (Ca)	mg/l	-	-	80 – 150	-
Sodium (Na)	mg/l	200	-	100 – 200	≤100
Nickel (Ni)	mg/l	0.07	-	-	-
Orthophosphate (PO_4) as P	mg/l	-	10	-	-
Lead (Pb)	mg/l	0.01	0.01	-	≤0.0095
Antimony (Sb)	mg/l	0.02	-	-	-
Selenium (Se)	mg/l	0.04	0.02	-	-
Zinc (Zn)	mg/l	5	0.1	-	≤0.002
E. coli	CFU/100ml	0	1000	-	130
Total coliform	CFU/100ml	10	-	-	-
Turbidity	Mg/l	≤1	-	-	10% variation

5. Site background information and water monitoring plan

Wesizwe Bakubung Platinum Mine is an underground operation in the Boshoek area situated approximately 32 km north-west of Rustenburg in the A22F quaternary catchment. The site is situated north of the non-perennial Elands River. The Elands River in turn flows into the Limpopo River. **Table 4** represents the current surface water and groundwater monitoring programme conducted by Aquatico.

Groundwater in the areas surrounding the mines is mainly used for domestic supply, watering of gardens and livestock. Groundwater is the sole source of water for many of the surrounding households on farms. It is for this reason that an accurate monitoring program is essential so that a potential groundwater quality impact can be identified and managed or mitigated in time.

Table 4: Active monitoring localities at Wesizwe Bakubung Mine

Wesizwe - Bakubung Mine Water Monitoring Plan			
Locality	Description	Coordinates	
		Latitude	Longitude
Groundwater localities			
FBH01D	Borehole on Frischgewaagd, downgradient	S25.38673	E27.07585
FBH02D	Borehole on Frischgwaagd, downgradient	S25.38498	E27.07824
FBH04D	Borehole on Frischgewaagd, downgradient	S25.38625	E27.08576
FBH05S	Borehole on Frischgewaagd, downgradient	S25.38098	E27.07233
FDB1	Borehole on Mimosa farm, upgradient	S25.39648	E27.07429
MBH01D	Borehole on Mimosa farm, downgradient	S25.40059	E27.03159
MBH03D	Borehole on Mimosa farm, downgradient	S25.39686	E27.04689
MBH04	Borehole on Mimosa farm, downgradient	S25.39277	E27.03087
MBH05	Borehole on Mimosa farm, downgradient	S25.39201	E27.04928
MBH06	Borehole on Mimosa farm, downgradient	S25.40556	E27.05078
Surface water localities			
SW1	Elands River upstream of mine	S25.41648	E27.03318
SW2	Elands River midstream along mine	S25.39313	E27.07504
SW3	Elands River downstream from mine	S25.39337	E27.09493
SW4	Mine water pond (PCD)	S25.38927	E27.08720

An aerial view of the monitoring programme is presented in Figure 1 below. This report will discuss the ten (10) groundwater and four (4) surface localities monitored on a monthly basis. On a quarterly basis (March, June, September and December) a broader range of variables are analysed for.

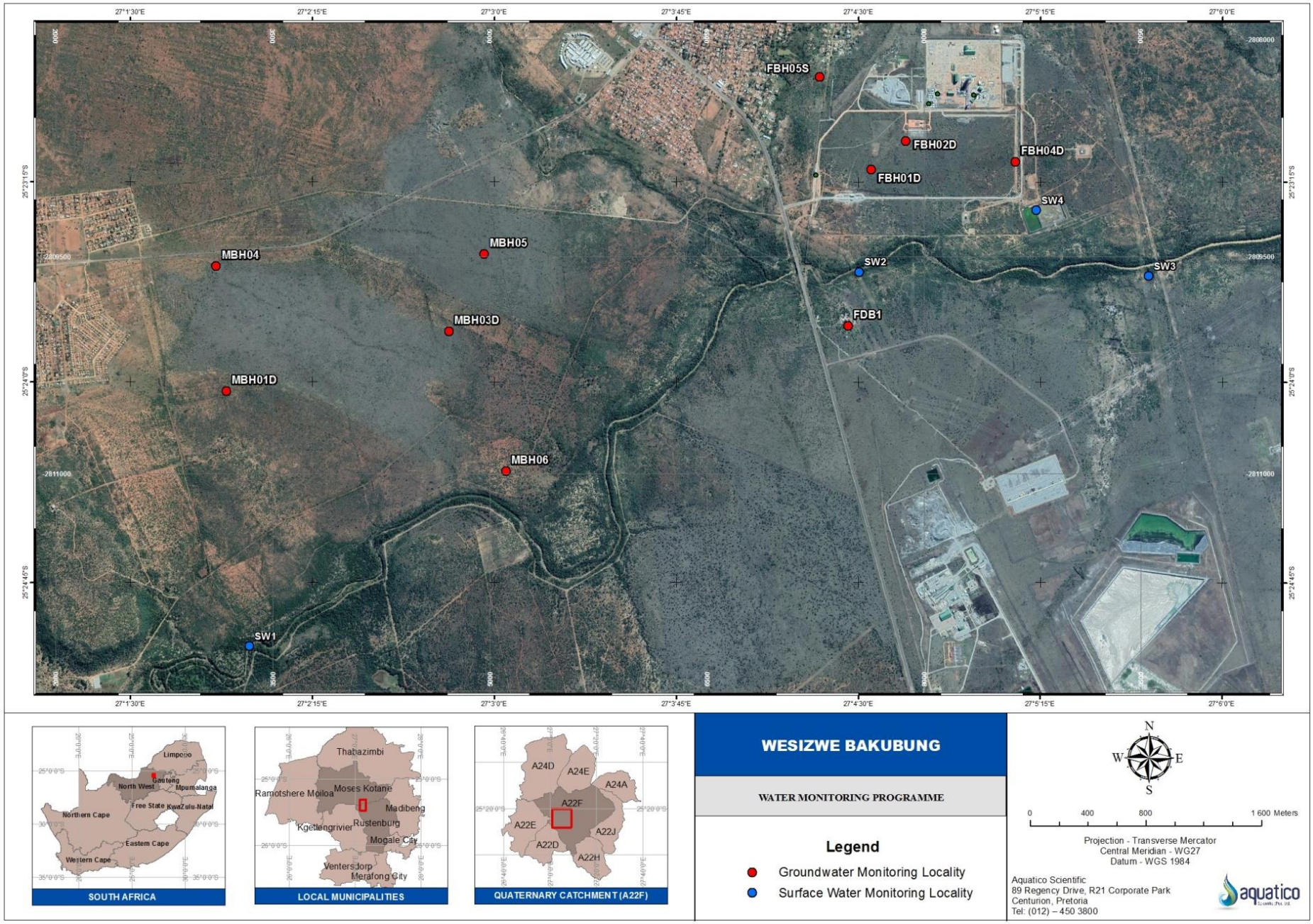


Figure 1: Wesizwe Bakubung Water Monitoring Map

6. Sampling register

Table 5: Sampling register as per the December 2020.

SAMPLING REGISTER : MONTHLY								
PROJECT NAME:	Wesizwe Bakubung Environmental							
MONTH:	December 2020							
SAMPLER NAME:	Lubabalo Gobile							
Wesizwe Bakubung Environmental								
Locality	Description	Coordinates		Sample Time	Status	Flow/Level	Remarks	Lab no
		Latitude	Longitude					
Borehole								
FBH01D	Borehole on Frischgewaagd, downgradient	S25.38670	E27.07586	2020-12-11 12:04	Yes	22.79 m	CLEAR	71967
FBH02D	Borehole on Frischgwaagd, downgradient	S25.38499	E27.07824	2020-12-11 12:11	Yes	39. m	CLEAR	71968
FBH04D	Borehole on Frischgewaagd, downgradient	S25.38620	E27.08572	2020-12-11 12:57	Yes	21.41 m	CLEAR	71969
FBH05S	Borehole on Frischgewaagd, downgradient	S25.38102	E27.07231	2020-12-11 10:00	Yes	8.34 m	SLIGHTLY TURBID	71970
FDB1	Borehole on Mimosa farm, upgradient	S25.39647	E27.07429	2020-12-11 09:36	Demolished	-	DEMOLISHED	-
MBH01D	Borehole on Mimosa farm, downgradient	S25.38670	E27.07585	2020-12-11 12:04	Dry	-	DRY	-
MBH03D	Borehole on Mimosa farm, downgradient	S25.39685	E27.04691	2020-12-11 10:57	Yes	20.66 m	CLEAR	71971
MBH04	Borehole on Mimosa farm, downgradient	S25.39279	E27.03084	2020-12-11 10:28	Blocked	-	BLOCKED	-
MBH05	Borehole on Mimosa farm, downgradient	S25.39202	E27.04930	2020-12-11 10:46	Yes	21.48 m	CLEAR	71972
MBH06	Borehole on Mimosa farm, downgradient	S25.40557	E27.05074	2020-12-11 11:17	Yes	20.94 m	CLEAR SUSPENDED SOLIDS	71973
River or stream								
SW1	Elands River upstream of mine	S25.38426	E27.05313	2020-12-11 10:20	Dry	Dry	DRY	-
SW2	Elands River midstream along mine	S25.39335	E27.07416	2020-12-11 09:42	Dry	Dry	DRY	-
SW3	Elands River downstream from mine	S25.39154	E27.03769	2020-12-11 10:24	Dry	Dry	DRY	-
Pollution Control Dam								
SW4	Mine water pond (PCD)	S25.38902	E27.08698	2020-12-11 12:51	Yes	High	CLEAR	71974

7. Water quality results

7.1. Groundwater monitoring

7.1.1. Field measurements

Table 6: Groundwater measurements as taken *in situ* during December 2020 sampling

Locality	Field EC measurement	Field pH measurement	Field temperature measurement
	mS/m	pH	°C
FBH01D	91.2	7.31	28.6
FBH02D	89.9	6.93	29.2
FBH04D	96.5	7.9	27.6
FBH05S	187.8	7.8	27.9
FDB1			
MBH01D			
MBH03D	143.7	7.01	27.4
MBH04			
MBH05	79.2	7.21	26.8
MBH06	95.1	7.09	28.1

7.1.2. Frischgewaagd groundwater quality results and discussions

FBH01D

Physical water quality may be described as neutral, very hard and saline with bicarbonate alkalinity the dominant contributing anion and Mg the dominant cation (Figure 3). Most of the analysed variables complied with the SANS 241-1:2015 drinking water standards except total coliform counts which were high (Table 7). Water quality, as analysed, may be classified as **Unacceptable water quality (Class 04)** according to the WRC QDWS (1998) guidelines due to total coliform counts detected. The water quality at this locality deteriorated in terms of total coliforms but improved in terms of turbidity and *E. coli* when compared to last quarterly results.

FBH02D

Physical water quality may be described as neutral, slightly hard and saline with bicarbonate alkalinity as the dominant contributing anion and sodium + potassium the dominant contributing cation (Figure 3). Most of the analysed chemical variables, except total coliform counts, complied with the SANS 241-1:2015 drinking water standards; no *E. coli* detected. Water quality, as analysed, may be classified as **Marginal water quality (Class 02)** according to the WRC QDWS (1998) guidelines due to total coliform counts detected. The water quality at this locality deteriorated in terms of total coliforms but improved in terms of turbidity when compared to last quarterly results.

FBH04D

Physical water quality may be described as neutral, very hard and saline with bicarbonate alkalinity and magnesium the dominant contributing anion and cation respectively (Figure 3). All the analysed variables complied with the SANS 241-1:2015 drinking water standards. Water quality, as analysed, may be classified as **Marginal water quality (Class 02)** according to the WRC QDWS (1998) due to the concentration of hardness measured. The water quality at this locality improved in terms of turbidity and *E. coli* when compared to last quarterly results.

FBH05S

Physical water quality may be described as neutral, very hard and saline with bicarbonate alkalinity and magnesium the dominant contributing anion and cation respectively (Figure 3). The SANS 241-1:2015 drinking water standards was exceeded by turbidity; no *E. coli* detected or total coliforms counts were detected (Table 7). Water quality as analysed, may be classified as **Marginal water quality (Class 02)** according to the WRC QDWS (1998) due turbidity recorded. The water quality at this locality improved in terms of Fe and total coliform when compared to last quarterly results.

7.1.3. Mimosa groundwater quality results and discussions

MBH03D

Physical water quality may be described as neutral, very hard and saline with bicarbonate alkalinity the dominant contributing anion and magnesium the dominant cation (Figure 3). The concentrations of Fe and Mn as well as turbidity exceeded the SANS 241-1:2015 drinking water standards; no *E. coli* or total coliforms detected (Table 7). Water quality, as analysed, may be classified as **Unacceptable water quality (Class 04)** according to the WRC QDWS (1998) guidelines due to turbidity measured. The water quality at this locality deteriorated in terms of Fe when compared to last quarterly results.

MBH05

Physical water quality may be described as neutral, hard and non-saline with bicarbonate alkalinity the dominant contributing anion and magnesium the dominant cation (Figure 3). The Mn concentration and turbidity exceeded the SANS 241-1:2015 drinking water standards; no *E. coli* detected or total coliforms counts were detected (Table 7). Water quality, as analysed, may be classified as **Marginal water quality (Class 02)** according to the WRC QDWS (1998) guidelines due to turbidity and Mn concentration measured. The water quality at this locality improved in terms of total coliforms when compared to last quarterly results.

MBH06

Physical water quality may be described as neutral, very hard and saline with bicarbonate alkalinity the dominant contributing anion and magnesium the dominant cation (Figure 3). The Mn concentration and turbidity exceeded the SANS 241-1:2015 drinking water standards; no *E. coli* and total coliform detected (Table 7). Water quality, as analysed, may be classified as **Marginal water quality (Class 02)** according to the WRC QDWS (1998) guidelines due to turbidity and total hardness concentration measured. The water quality at this locality deteriorated in terms of Mn when compared to last quarterly results.

7.1.4. STIFF diagram

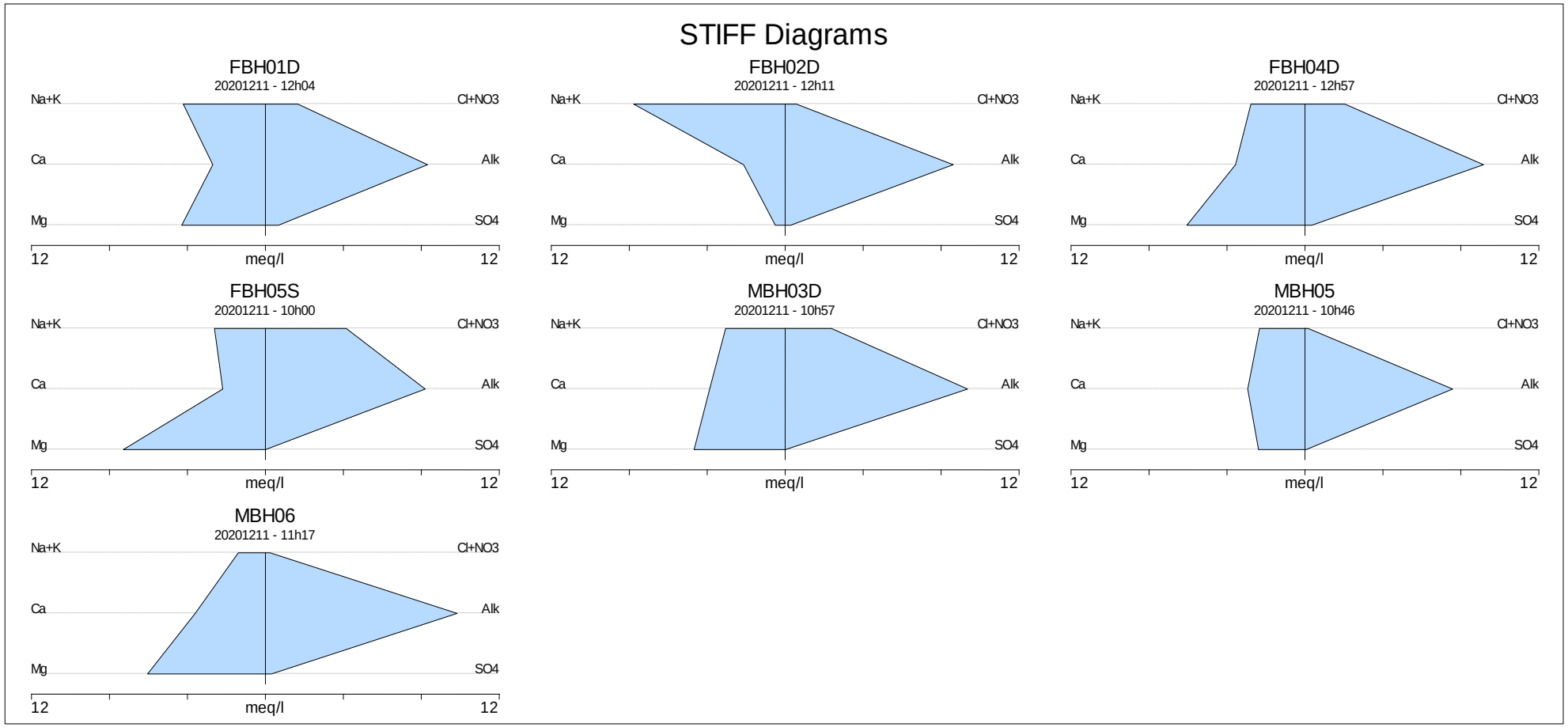


Figure 2: STIFF diagrams for sampled groundwater localities as per the December 2020 quarterly monitoring period

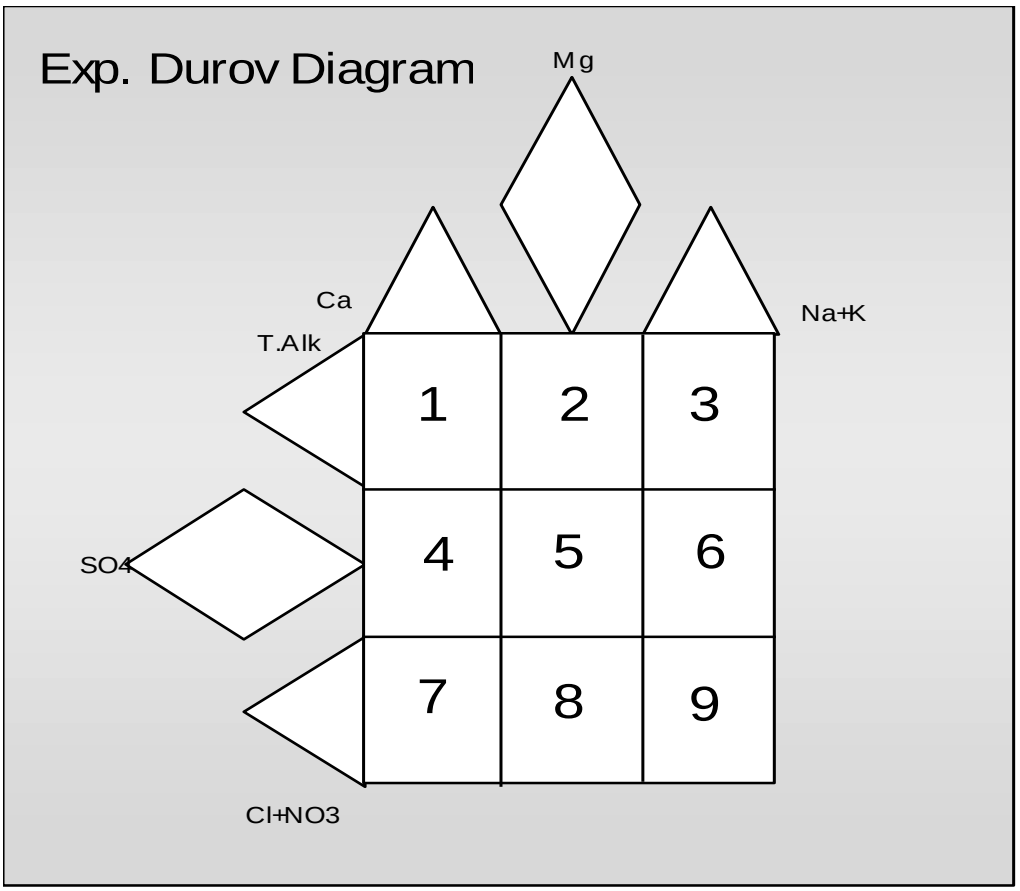
Table 7: Recorded groundwater quality data for December 2020.

DATA TABLE:													
PROJECT NAME	Wesizwe Bakubung Environmental									DATE COMPILED	24 December 2020		
ASSESSMENT SET 1	SANS 241-1:2015 Drinking Water Standard (SABS, 2015)									SELECTED DATE	07 December 2020		
ASSESSMENT SET 2	SAWQG Volume 5, Agricultural Use, Livestock Watering, Cattle									COMPILED BY	Immaculata Famah		
											Value exceeds the assessment set 1		
VARIABLE	UNITS	ASSESSMENT 1	ASSESSMENT 2	MONITORING LOCALITIES									
				FBH01D	FBH02D	FBH04D	FBH05S	FDB1	MBH01D	MBH03D	MBH04	MBH05	MBH06
pH @ 25°C	pH	5.0/9.7	-	7.53	7.2	7.4	8	Demolished	Dry	7.12	Blocked	7.33	7.4
Electrical conductivity (EC) @ 25°C	mS/m	170	-	95.2	92.5	105	111			133		67.4	91.5
Total Dissolved solids @ 180°C	mg/l	1200	1000	526	616	664	614			674		554	612
Total hardness	mg CaCO3/l	-	-	350	132	482	475			428		267	483
Calcium (Ca)	mg/l	-	1000	54.1	42.8	71.4	43.9			77.7		58.9	72.2
Magnesium (Mg)	mg/l	-	500	52.2	6.17	73.7	88.6			56.8		29	73.5
Sodium (Na)	mg/l	200	2000	95.9	177	62.4	55.1			66		52.4	31.1
Potassium (K)	mg/l	-	-	1.69	2.84	2.44	8.45			7.34		2.13	1.45
Total alkalinity	mg CaCO3/l	-	-	416	431	458	410			468		379	492
Bicarbonate alkalinity	mg CaCO3/l	-	-	415	430	456	406			467		378	491
Carbonate alkalinity	mg CaCO3/l	-	-	1.33	0.636	1.08	3.84			0.573		0.756	1.17
Chloride (Cl)	mg/l	300	1500	56.2	19.5	56.3	146			83.2		4.79	7.34
Sulphate (SO_4)	mg/l	500	1000	32.4	13.4	17.1	<0.141			1.14		3.03	15.2
Fluoride (F)	mg/l	1.5	2	0.55	0.632	0.991	0.458			<0.263		<0.263	<0.263
Nitrate (NO_3) as N	mg/l	11	22.6	1.22	<0.194	6.53	<0.194			<0.194		<0.194	<0.194
Orthophosphate (PO_4) as P	mg/l	-	-	<0.005	<0.005	<0.005	<0.005			<0.005		<0.005	<0.005
Total phosphorus	mg/l	-	-	<0.010	<0.010	<0.010	<0.010			<0.010		<0.010	<0.010
Aluminium (Al)	mg/l	0.3	5	<0.002	<0.002	<0.002	<0.002			<0.002		<0.002	<0.002
Iron (Fe)	mg/l	0.3	10	<0.004	<0.004	<0.004	<0.004			1.51		<0.004	<0.004
Manganese (Mn)	mg/l	0.1	10	<0.001	0.003	<0.001	0.047			0.494		0.695	0.211
Chromium (Cr)	mg/l	0.05	-	<0.003	<0.003	<0.003	<0.003			<0.003		<0.003	<0.003
Copper (Cu)	mg/l	2	0.5	<0.002	<0.002	<0.002	<0.002			<0.002		<0.002	<0.002
Cobalt (Co)	mg/l	-	1	<0.003	<0.003	<0.003	<0.003			<0.003		<0.003	<0.003
Cadmium (Cd)	mg/l	0.003	0.01	<0.002	<0.002	<0.002	<0.002			<0.002		<0.002	<0.002

Nickel (Ni)	mg/l	0.07	1	<0.002	<0.002	<0.002	<0.002			<0.002		<0.002	<0.002
Lead (Pb)	mg/l	0.01	0.1	<0.004	<0.004	<0.004	<0.004			<0.004		<0.004	<0.004
Zinc (Zn)	mg/l	5	20	<0.002	<0.002	<0.002	<0.002			<0.002		<0.002	<0.002
Silver (Ag)	mg/l	-	-	<0.001	<0.001	<0.001	<0.001			<0.001		<0.001	<0.001
Arsenic (As)	mg/l	0.01	1	<0.006	<0.006	<0.006	<0.006			<0.006		<0.006	<0.006
Boron (B)	mg/l	2.4	5	<0.013	<0.013	<0.013	<0.013			<0.013		<0.013	<0.013
Barium (Ba)	mg/l	0.7	-	0.006	0.002	0.081	0.062			0.028		0.038	0.033
Bismuth (Bi)	mg/l	-	-	<0.004	<0.004	<0.004	<0.004			<0.004		<0.004	<0.004
Lithium (Li)	mg/l	-	-	<0.001	<0.001	<0.001	<0.001			0.001		<0.001	0.003
Molybdenum (Mo)	mg/l	-	0.01	0.033	0.027	0.038	0.034			0.039		0.03	0.039
Antimony (Sb)	mg/l	0.02	-	<0.001	<0.001	<0.001	<0.001			<0.001		<0.001	<0.001
Selenium (Se)	mg/l	0.04	0.05	<0.002	<0.002	<0.002	<0.002			<0.002		<0.002	<0.002
Silicon (Si)	mg/l	-	-	26.7	21.6	27.2	3.26			28.3		21.7	36.1
Tin (Sn)	mg/l	-	-	<0.001	<0.001	<0.001	<0.001			<0.001		<0.001	<0.001
Strontium (Sr)	mg/l	-	-	0.537	0.25	1.4	0.802			0.222		0.248	0.3
Titanium (Ti)	mg/l	-	-	<0.001	<0.001	<0.001	<0.001			<0.001		<0.001	<0.001
Vanadium (V)	mg/l	-	1	0.019	<0.001	0.016	<0.001			<0.001		<0.001	0.002
Turbidity	NTU	1	-	0.29	0.748	0.39	13.6			127		3.74	2.58
E.coli	CFU/100ml	0	1000	0	0	0	0			0		0	0
Total coliform	CFU/100ml	10	-	1120	14	0	0			0		0	0
Temperature	°C	-	-	22.3	22.2	22.2	22.1			22.2		22.2	22.2

7.1.5. Expanded Durov diagram

One of the most appropriate ways to characterize groundwater is to assess the plot position of the water quality on an Expanded Durov diagram. As with STIFF diagrams, the plot positions are determined on the basis of milli-equivalent per litre (meq/L). The characteristics of the different fields will be discussed briefly:



Field 1: Fresh, very clean recently recharged groundwater with HCO_{3}^{-} and CO_3 dominated ions.

Field 2: Field 2 represents fresh, clean, relatively young groundwater that has started to undergo Mg ion exchange, often found in dolomitic terrain.

Field 3: This field indicates fresh, clean, relatively young groundwater that has undergone Na ion exchange (sometimes in Na-rich granites or other felsic rocks), or because of contamination effects from a source rich in Na.

Field 4: Fresh, recently recharged groundwater with HCO_{3}^{-} and CO_3 dominated ions that has been in contact with a source of SO_4 contamination, or that has moved through SO_4 enriched bedrock.

Field 5: Groundwater that is usually a mix of different types – either clean water from Fields 1 and 2 that has undergone SO_4 and NaCl mixing / contamination, or old stagnant NaCl dominated water that has mixed with clean water.

Field 6: Groundwater from Field 5 that has been in contact with a source rich in Na, or old stagnant NaCl dominated water that resides in Na-rich host rock / material.

Field 7: Water rarely plots in this field that indicates NO_3 or Cl enrichment, or dissolution.

Field 8: Groundwater that is usually a mix of different types - either clean water from Fields 1 and 2 that has undergone SO_4, but especially Cl mixing / contamination, or old stagnant NaCl dominated water that has mixed with water richer in Mg.

Field 9: Very old, stagnant water that has reached the end of the geohydrological cycle (deserts, salty pans, etc.) or water that has moved a long time and / or distance through the aquifer and has undergone significant ion exchange.

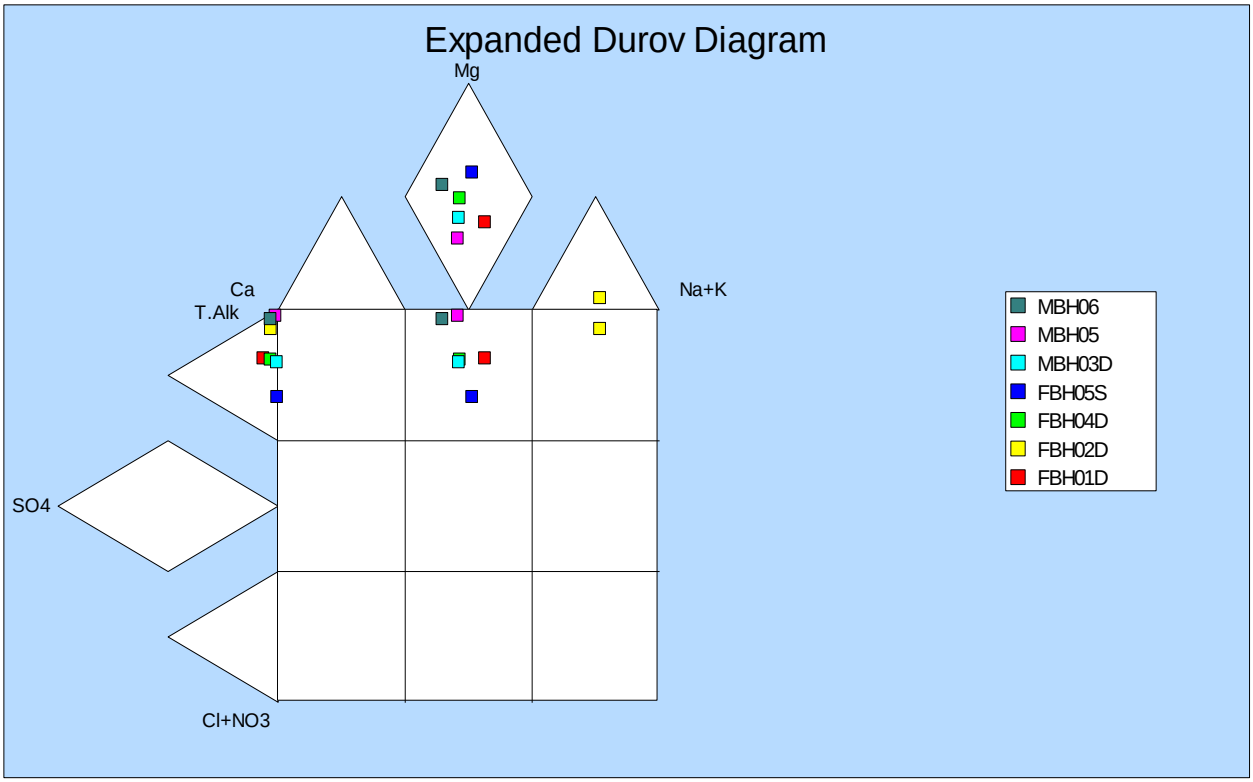


Figure 3: Expanded Durov diagram of the groundwater monitoring localities at Wesizwe Bakubung

All the analysed groundwater monitoring localities at Wesizwe Bakubung, with the exception of locality **FBH02D**, plotted in Field 2 of the expanded Durov diagram (Figure 3). Field 2 represents fresh, clean, relatively young groundwater that has started to undergo Mg ion exchange, often found in dolomitic terrain. Locality **FBH02D** plotted in Field 3 which represents fresh, clean, relatively young groundwater that has undergone Na ion exchange (sometimes in Na-rich granites or other felsic rocks), or because of contamination effects from a source rich in Na.

7.2. Surface water monitoring

7.2.1. Field measurements

Table 8: Surface water measurements as taken *in situ* during sampling

Locality	Field EC measurement	Field pH measurement	Field temperature measurement
	mS/m	pH	°C
SW1			
SW2			
SW3			
SW4	109.6	8.06	28.9

7.2.2. Surface water quality results and discussions

SW1, SW2 and **SW3** are monitoring localities situated upstream, midstream and downstream, respectively, of the Bakubung Mine on the Elands River. When flow occurs a spatial assessment, table is added to the report to calculate any changes that may be seen between the upstream locality and the downstream locality. **SW1, SW2** and **SW3** were dry as observed on the day of sampling.

SW4

Physical water quality may be described as alkaline, moderately soft and non-saline. Most analysed variables complied with the Wesizwe Bakubung WUL (2010) guidelines for wastewater to be discharged as well as the General Authorisation limits with the exception of pH. The RQO limits were also exceeded in terms of pH and Na. Water quality, as analysed, may be classified as **Marginal water quality (Class 02)** according to the WRC QDWS (1998) classification system due to turbidity and total coliform counts detected in the sample.

The classification of the PCD (**SW4**) by the WRC (1998) only serves as a reference for the recorded water quality and it is not recommended that the water from this locality be used for domestic purposes without further testing.

Table 9: Surface water quality data for December 2020.

DATA TABLE:								
PROJECT NAME	Wesizwe Bakubung Environmental				DATE COMPILED	24 December 2020		
ASSESSMENT SET 1	Wesizwe Platinum, WUL 2010				SELECTED DATE	07 December 2020		
ASSESSMENT SET 2	General Authorisation Limit, Section 21f and h, 2013				COMPILED BY	Immaculata Famah		
ASSESSMENT SET 3	RQO guidelines Unit 5_7							
					Value exceeds the assessment set 1			
VARIABLE	UNITS	ASSESSMENT 1	ASSESSMENT 2	ASSESSMENT 3	MONITORING LOCALITIES			
					SW1	SW2	SW3	SW4
pH @ 25°C	pH	5.0/9.5	5.5/9.5	6/9	DRY			9.9
Electrical conductivity (EC) @ 25°C	mS/m	150	150	85				72.9
Total Dissolved solids @ 180°C	mg/l	-	-					394
Total hardness	mg CaCO3/l	-	-					93
Total alkalinity	mg CaCO3/l	-	-					75
Bicarbonate alkalinity	mg CaCO3/l	-	-					40.8
Carbonate alkalinity	mg CaCO3/l	-	-					30.3
Calcium (Ca)	mg/l	150	-					15.5

Magnesium (Mg)	mg/l	-	-			13.1
Sodium (Na)	mg/l	200	-	100		106
Potassium (K)	mg/l	-	-			7.1
Chloride (Cl)	mg/l	200	-	120		108
Sulphate (SO_4)	mg/l	400	-	120		70.6
Fluoride (F)	mg/l	1	1			0.455
Nitrate (NO_3) as N	mg/l	10	15	4.5		2.47
Orthophosphate (PO_4) as P	mg/l	-	10			0.049
Total phosphorus	mg/l	-	-			0.053
Aluminium (Al)	mg/l	-	-	0.1		<0.002
Iron (Fe)	mg/l	-	0.3	0.3		<0.004
Manganese (Mn)	mg/l	-	0.1	0.15		0.004
Cadmium (Cd)	mg/l	-	0.005			<0.002
Cobalt (Co)	mg/l	-	-			<0.003
Chromium (Cr)	mg/l	-	-			<0.003
Copper (Cu)	mg/l	-	0.01			<0.002
Nickel (Ni)	mg/l	-	-			<0.002
Lead (Pb)	mg/l	-	0.01	0.0095		<0.004
Zinc (Zn)	mg/l	-	0.1	0.002		<0.002
Silver (Ag)	mg/l	-	-			<0.001
Arsenic (As)	mg/l	-	0.02			<0.006
Boron (B)	mg/l	-	1			<0.013
Barium (Ba)	mg/l	-	-			0.045
Bismuth (Bi)	mg/l	-	-			<0.004
Lithium (Li)	mg/l	-	-			<0.001
Molybdenum (Mo)	mg/l	-	-			0.014
Antimony (Sb)	mg/l	-	-			<0.001
Selenium (Se)	mg/l	-	0.02			<0.002
Silicon (Si)	mg/l	-	-			1.81
Tin (Sn)	mg/l	-	-			<0.001
Strontium (Sr)	mg/l	-	-			0.319
Titanium (Ti)	mg/l	-	-			<0.001
Vanadium (V)	mg/l	-	-			0.002
Turbidity	NTU	-	-			2.19
E. coli	CFU/100ml	-	1000	130		1
Total coliform	CFU/100ml	-	-			28

*The RQO stipulates that the limit for Turbidity must be derived and a 10% variation from background concentration is allowed.

Table 10: Turbidity Variation

	SW1	SW2	SW3	SW4
Baseline - Average turbidity concentrations from October 2016 to December 2017	619.2	416.4	311.8	18.3
Dec-20	-	-	-	38
Variation	-	-	-	-88%

Spatial Assessment

No monthly spatial assessment on the Eland River could be calculated because all the Eland River localities were observed as dry.

8. Summary

8.1. Groundwater

- The Physical water quality for most of the groundwater localities could be described as neutral, saline and very hard.
- All the groundwater localities exceeded the SANS 241-1:2015 drinking water standards in terms of at least one variable; the most being turbidity.
- Analysed nutrients were low and were within acceptable limits.
- All sampled localities were dominated by the bicarbonate anion while most were dominated by the magnesium cation.
- Total coliforms counts were detected at **FBH01D** and **FBH02D**.

8.2. Surface water

- The Elands River localities (**SW1, SW2** and **SW3**) were recorded as dry on the day of sampling.
- For the pollution control dam (**SW4**), the Wesizwe Bakubung WUL (2010) guidelines as well as the General Authorization Limits were complied with in terms of the majority of variables measured with the exception of pH.
- Water quality of the PCD could be classified as marginal for domestic use according to the WRC (1998) QDWS classification system.
- Nutrients were low and were within acceptable limits.
- The RQO limits were exceeded in terms of pH and Na at **SW4**.
- Turbidity change at **SW4** was below 10%, hence, complying with the RQO stipulations.

9. Recommendations

- Correct sampling localities should be stipulated (e.g., incorrect surface water monitoring coordinates as per the WUL).
- If boreholes are to be used for specific purposes other than monitoring, these uses should be explained as to conduct the correct compliance monitoring.

10. Groundwater hydrograph

A groundwater hydrograph is included in **Appendix A** to relay groundwater levels per monitoring locality versus the monitoring time period. Readings are displayed in metres below ground level (mbgl). Groundwater levels have remained relatively stable over long and short period of time.

11. Time series graphs

The main purpose with a time-series plot is not to show exact concentrations for each monitoring point and each parameter, but rather to present an overall impression of the trends over the evaluation period. Short terms trends are available in **Appendix B**.

For all groundwater localities the pH values fluctuated somewhat, although remaining mostly within the neutral range. All localities are also seen to variate in unison. As compared to last quarter, pH values increased at most of the groundwater localities except at **FBH04D** that

remained increased and **MBH03D** that remained relatively constant. TDS concentrations in the groundwater for most localities show a long-term trend with a gradual increase. As compared to last quarter, there was an increase in TDS concentration at **FBH02D, FBH04D** and **MBH05** while TDS decreased at **FBH05S** and **MBH03D**.

Increasing trends for TDS concentrations for the past quarterly periods at surface water localities can be observed. pH values at **SW1** decrease reveals a decreasing trend for the past quarterly periods but increased in September 2020 while **SW3** and **SW4** show increasing trends with **SW3** dropping in September 2020.

12. Photographic Sampling Register

A photographic sampling register of the monitoring event is presented in **Appendix C** of this report. The photographic sampling register will provide a locality photo for each monitored locality along with the coordinates, date and time of each sample taken and the name of the field technician that conducted the sampling.

13. Test Report

A test report of the chemical and bacteriological analysis done by Aquatico Laboratories is attached to this report under **Appendix D**. The test report from the outsource laboratory is also attached under this appendix.

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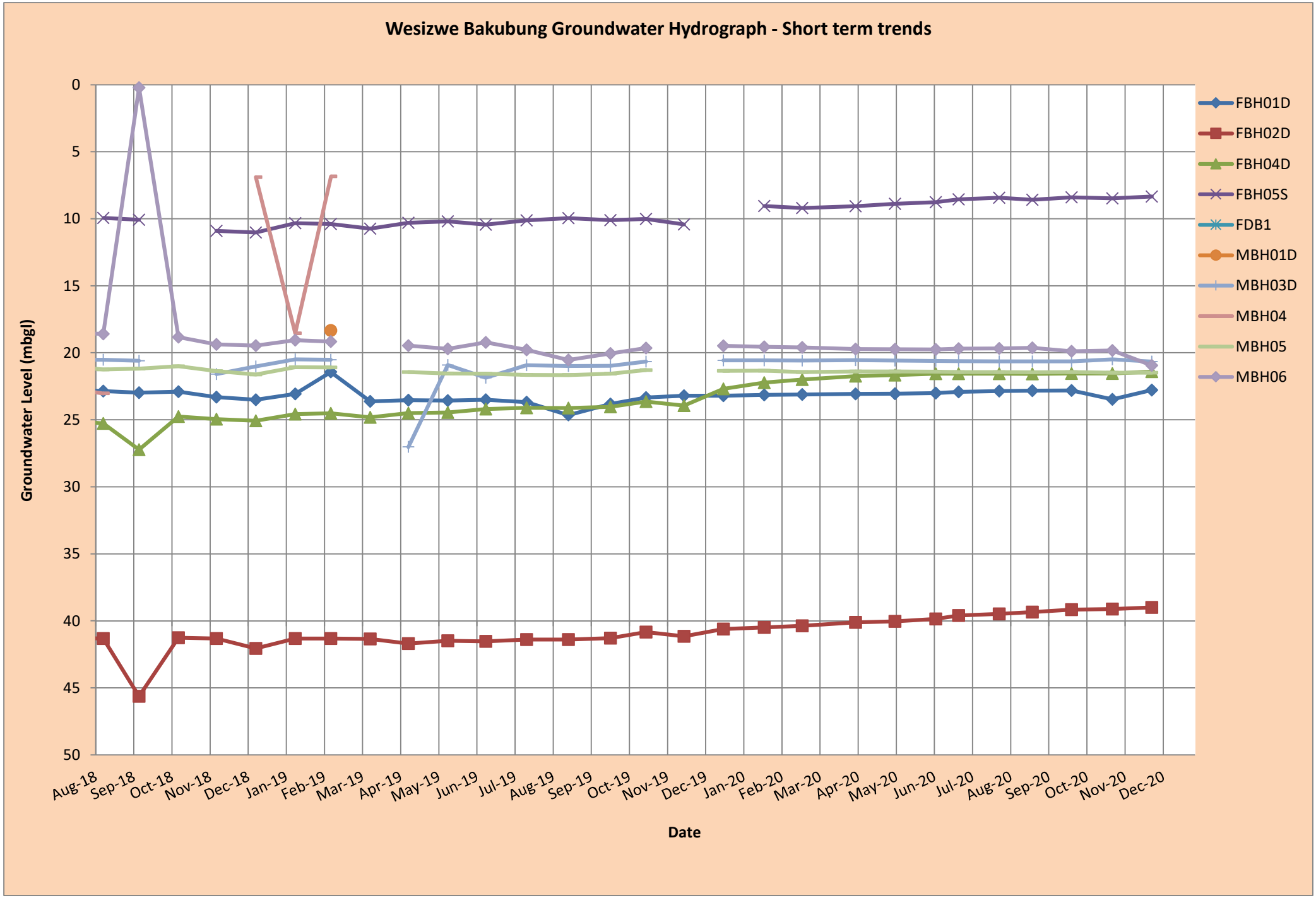
Aquatico Scientific
imma@aquatico.co.za

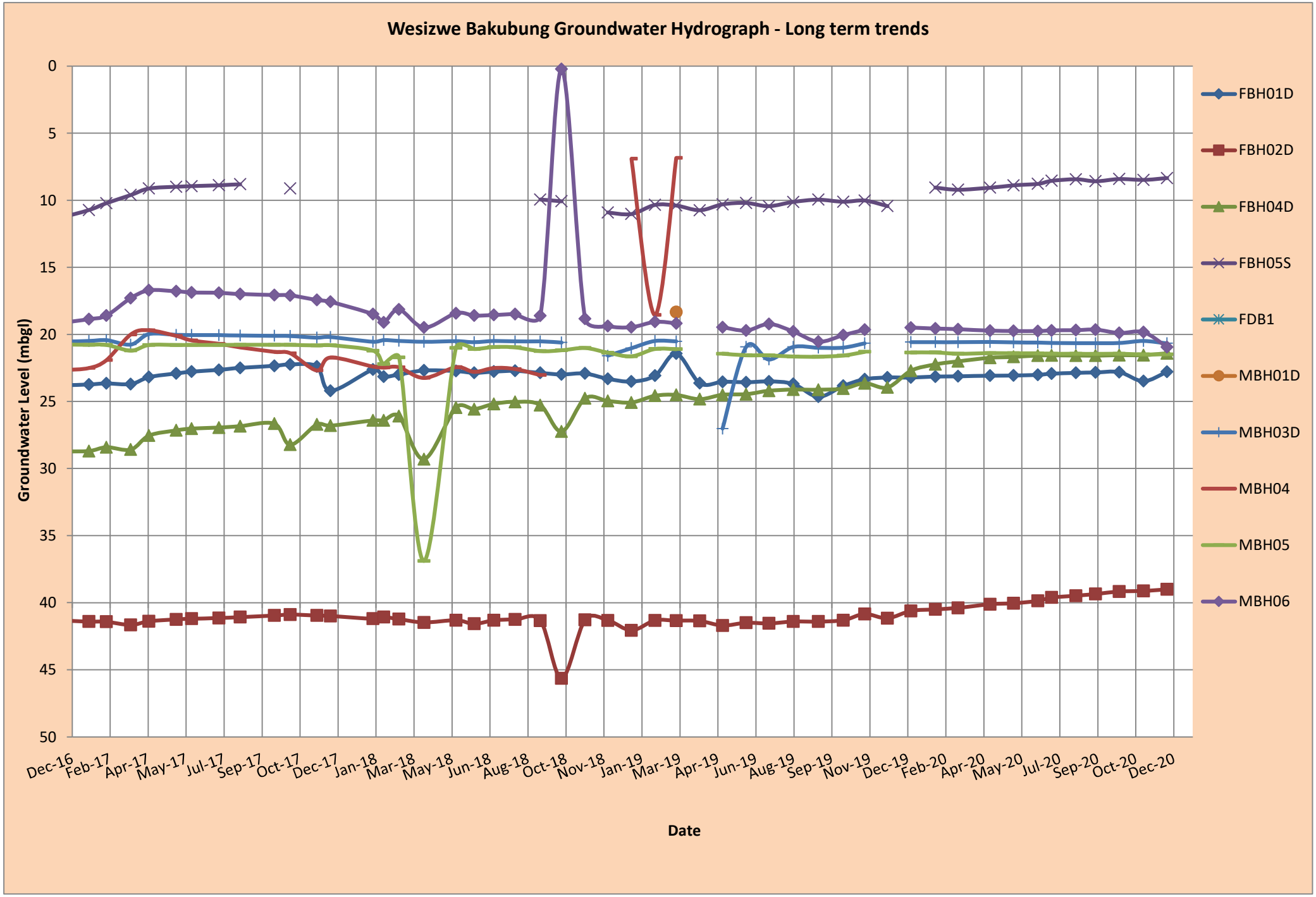
14. References

- Department of Water Affairs and Forestry (DWAF). Act N. 36 of 1998: National Water Act, 1998
- South Africa, General Authorisations in terms of Section 39 of the National Water Act, 1998 (Act NO. 36 of 1998). *Government Gazette*, 36820, 6 December 2013.
- The South African Bureau of Standards (SABS), ISO 5667-1 to 5667-15, First Edition, 1999

Appendix A

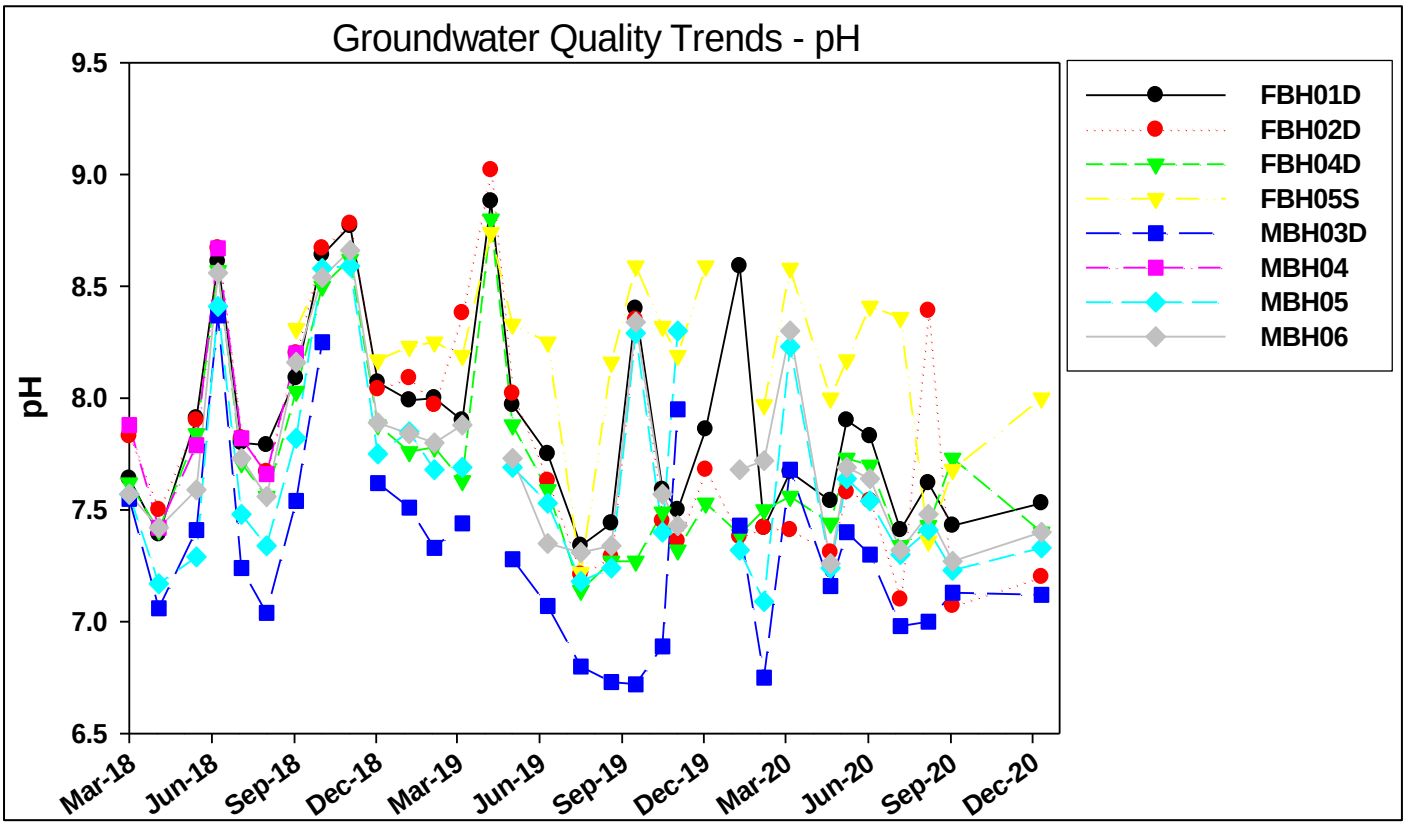
Groundwater hydrograph

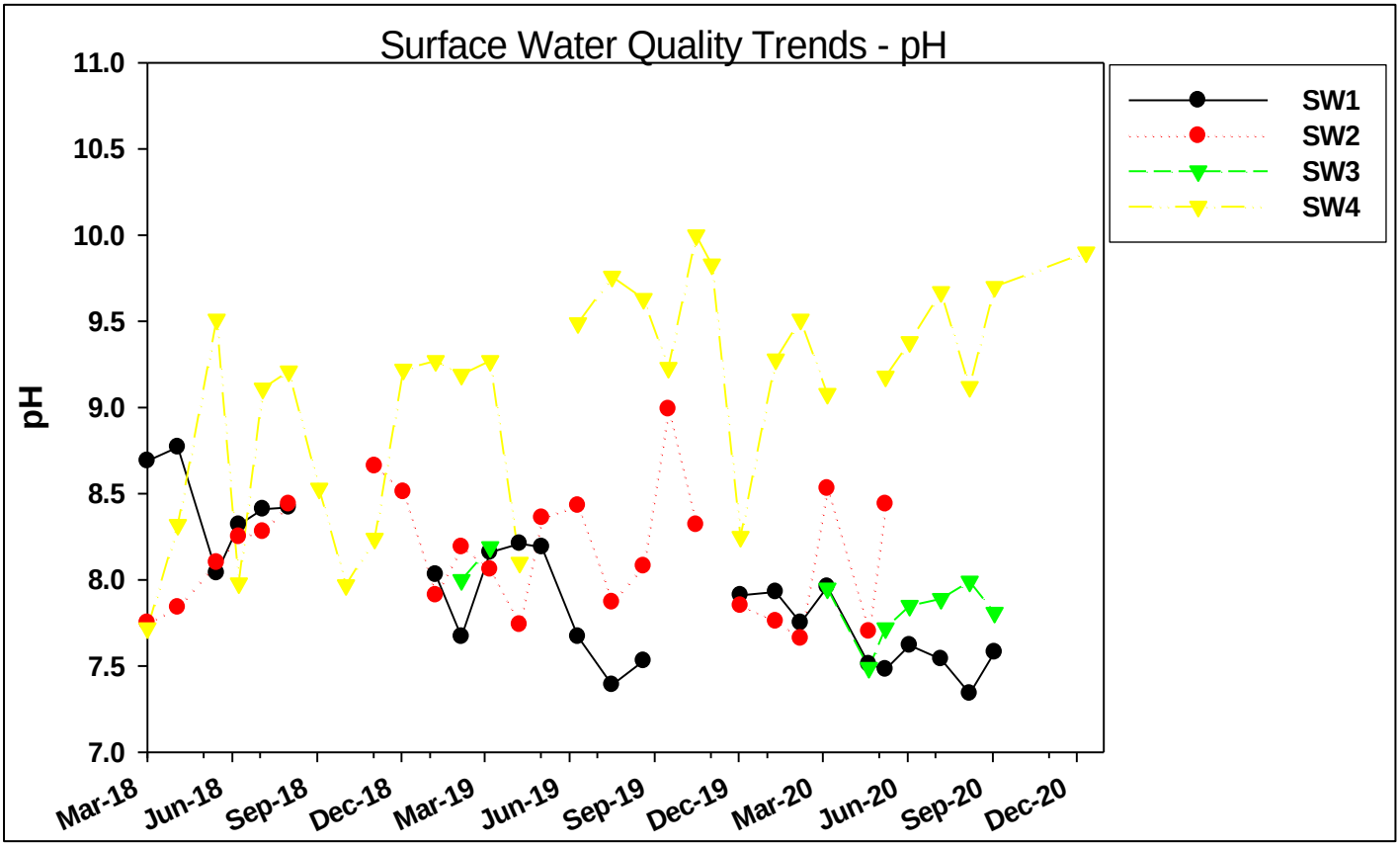

Wesizwe Bakubung Groundwater Hydrograph - Short term trends
Groundwater Level (mbgl)
0
5
10
15
20
25
30
35
40
45
50
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Nov-20
Dec-20
Date
FBH01D
FBH02D
FBH04D
FBH05S
FDB1
MBH01D
MBH03D
MBH04
MBH05
MBH06

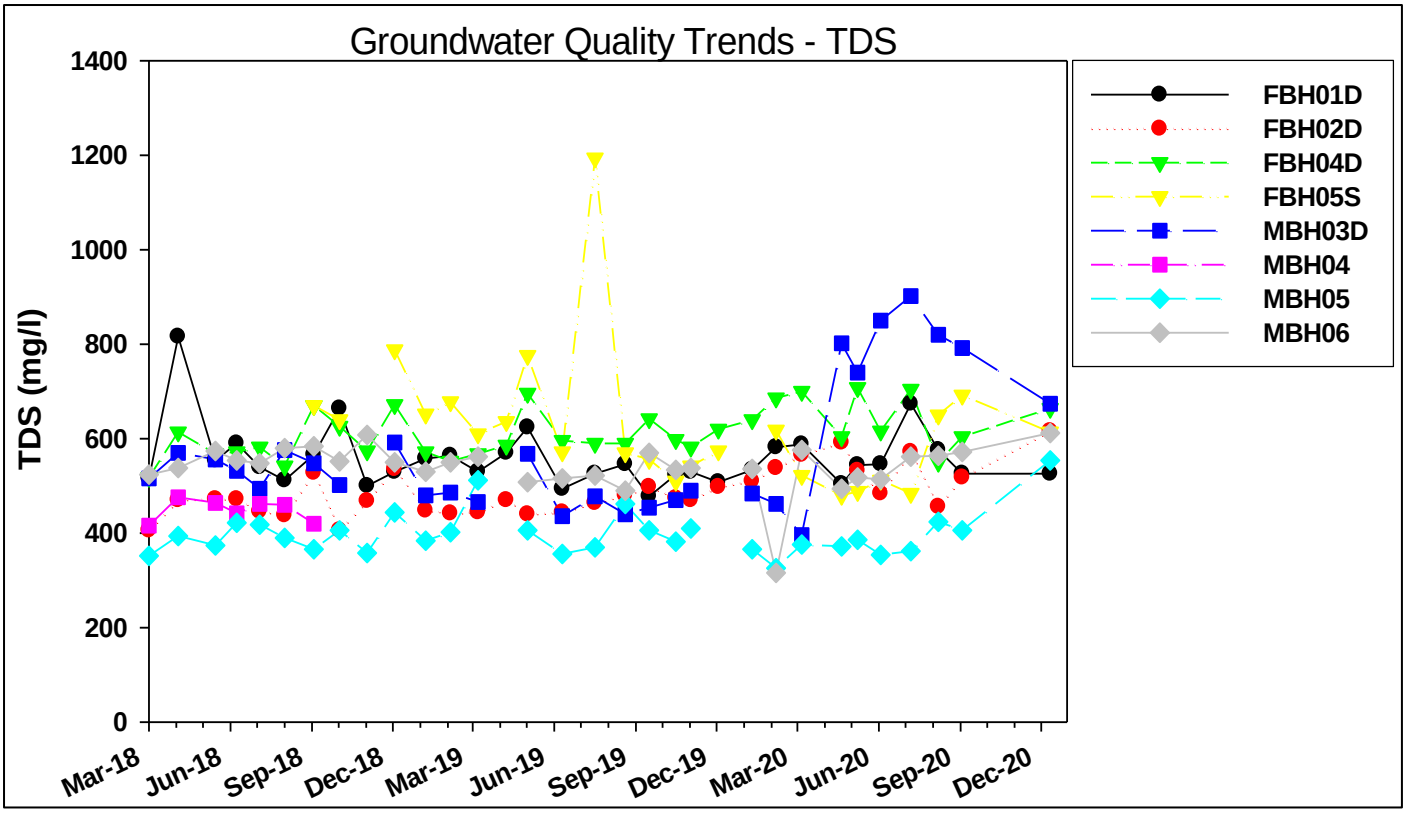

Wesizwe Bakubung Groundwater Hydrograph - Long term trends
Groundwater Level (mbgl)
0
5
10
15
20
25
30
35
40
45
50
Dec-16
Feb-17
Apr-17
May-17
Jul-17
Sep-17
Oct-17
Dec-17
Jan-18
Mar-18
May-18
Jun-18
Aug-18
Oct-18
Nov-18
Jan-19
Mar-19
Apr-19
Jun-19
Aug-19
Sep-19
Nov-19
Dec-19
Feb-20
Apr-20
May-20
Jul-20
Sep-20
Oct-20
Dec-20
Date
FBH01D
FBH02D
FBH04D
FBH05S
FDB1
MBH01D
MBH03D
MBH04
MBH05
MBH06

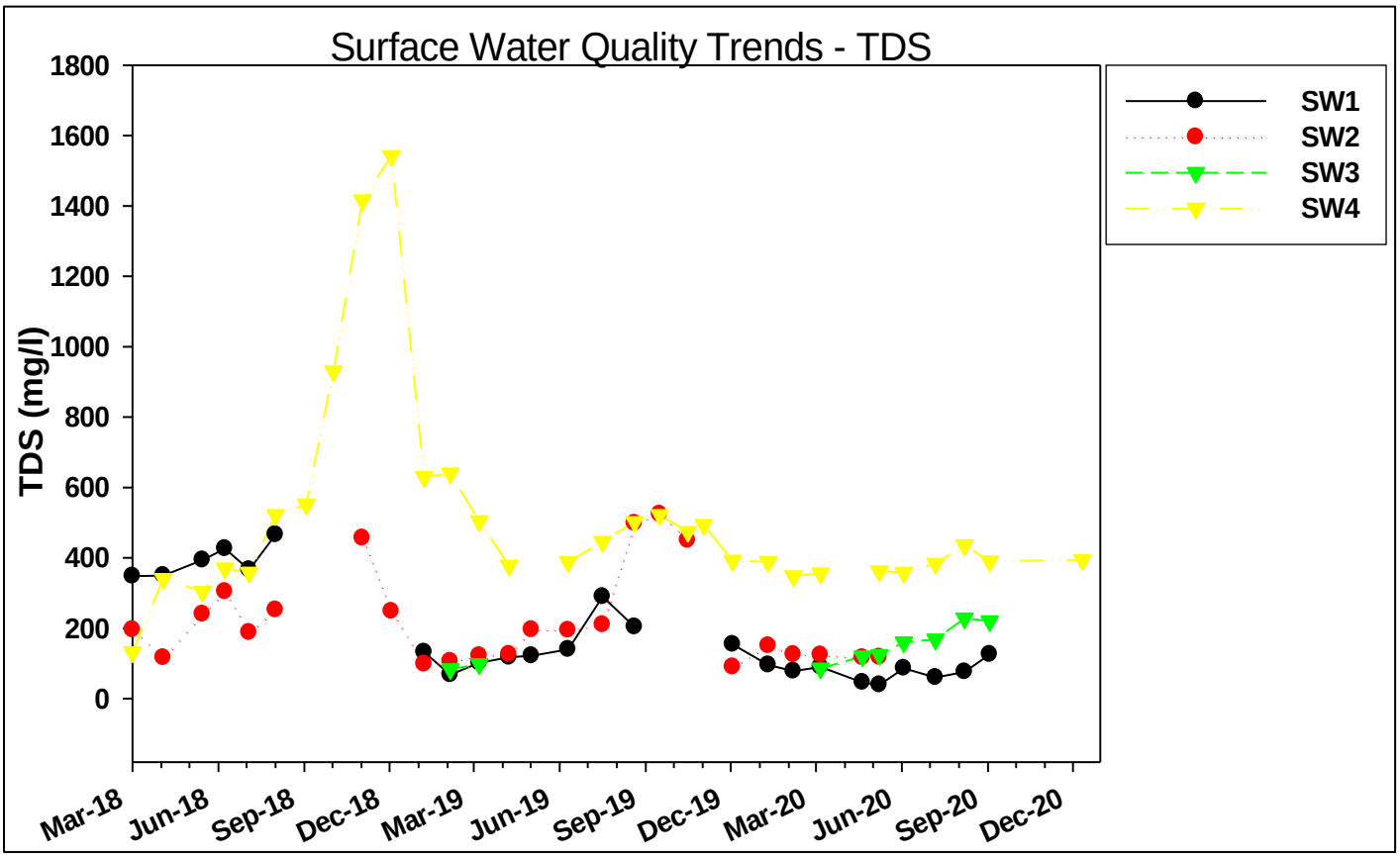
Appendix B

Time series graphs


Groundwater Quality Trends - pH
pH
9.5
9.0
8.5
8.0
7.5
7.0
6.5
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
FBH01D
FBH02D
FBH04D
FBH05S
MBH03D
MBH04
MBH05
MBH06


Surface Water Quality Trends - pH
pH
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
SW1
SW2
SW3
SW4


Groundwater Quality Trends - TDS
TDS (mg/l)
1400
1200
1000
800
600
400
200
0
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
FBH01D
FBH02D
FBH04D
FBH05S
MBH03D
MBH04
MBH05
MBH06


Surface Water Quality Trends - TDS
TDS (mg/l)
1800
1600
1400
1200
1000
800
600
400
200
0
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
SW1
SW2
SW3
SW4

Appendix C

Photographic Sampling Register

LEADERS IN ENVIRONMENTAL MONITORING

WESIZWE BAKUBUNG ENVIRONMENTAL - PHOTOGRAPHIC MONITORING CATALOGUE

Locality	FBH01D
Locality Coordinates	S25.38670 E27.07586
Sample Date	2020-12-11 12:04
Sample By	Lubabalo Gobile

Borehole on Frischgewaagd, downgradient

Locality	FBH02D
Locality Coordinates	S25.38499 E27.07824
Sample Date	2020-12-11 12:11
Sample By	Lubabalo Gobile

Borehole on Frischgwaagd, downgradient

Locality	FBH04D
Locality Coordinates	S25.38620 E27.08572
Sample Date	2020-12-11 12:57
Sample By	Lubabalo Gobile

Borehole on Frischgewaagd, downgradient

Locality	FBH05S
Locality Coordinates	S25.38102 E27.07231
Sample Date	2020-12-11 10:00
Sample By	Lubabalo Gobile

Borehole on Frischgewaagd, downgradient

Locality	MBH01D
Locality Coordinates	S25.38670 E27.07585
Sample Date	2020-12-11 12:04
Sample By	Lubabalo Gobile

Borehole on Mimosa farm, downgradient

Locality	MBH03D
Locality Coordinates	S25.39685 E27.04691
Sample Date	2020-12-11 10:57
Sample By	Lubabalo Gobile

Borehole on Mimosa farm, downgradient

LEADERS IN ENVIRONMENTAL MONITORING

WESIZWE BAKUBUNG ENVIRONMENTAL - PHOTOGRAPHIC MONITORING CATALOGUE

Locality	MBH05
Locality Coordinates	S25.39202 E27.04930
Sample Date	2020-12-11 10:46
Sample By	Lubabalo Gobile

Borehole on Mimosa farm, downgradient

Locality	MBH06
Locality Coordinates	S25.40557 E27.05074
Sample Date	2020-12-11 11:17
Sample By	Lubabalo Gobile

Borehole on Mimosa farm, downgradient

Locality	SW1
Locality Coordinates	S25.38426 E27.05313
Sample Date	2020-12-11 10:20
Sample By	Lubabalo Gobile

Elands River upstream of mine

Locality	SW2
Locality Coordinates	S25.39335 E27.07416
Sample Date	2020-12-11 09:42
Sample By	Lubabalo Gobile

Elands River midstream along mine

Locality	SW3
Locality Coordinates	S25.39154 E27.03769
Sample Date	2020-12-11 10:24
Sample By	Lubabalo Gobile

Elands River downstream from mine

Locality	SW4
Locality Coordinates	S25.38902 E27.08698
Sample Date	2020-12-11 12:51
Sample By	Lubabalo Gobile

Mine water pond (PCD)

Appendix D

Test report

aquatico Laboratories (Pty). Ltd.

ilac-MRA sanas Testing Laboratory T0685

Test Report

Client: Wesizwe Platinum
Address: 5 Ronbex Road, Activia Park, Elandsfontein, 1406
Report no: 97241
Project: Wesizwe Bakubung Environmental

Date of report: 21 December 2020
Date accepted: 11 December 2020
Date completed: 21 December 2020
Date received: 11 December 2020

Lab no:				71967	71968	71969	71970	71971	71972	71973
Date sampled:				11-Dec-20	11-Dec-20	11-Dec-20	11-Dec-20	11-Dec-20	11-Dec-20	11-Dec-20
Aquatico sampled:				Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample type:				Water	Water	Water	Water	Water	Water	Water
Locality description:				FBH01D	FBH02D	FBH04D	FBH05S	MBH03D	MBH05	MBH06
Analyses		**Unit**	**Method**							
A	pH @ 25°C	pH	ALM 20	7.53	7.20	7.40	8.00	7.12	7.33	7.40
A	Electrical conductivity (EC) @ 25°C	mS/m	ALM 20	95.2	92.5	105	111	133	67.4	91.5
A	Total Dissolved solids @ 180°C	mg/l	ALM 24	526	616	664	614	674	554	612
A	Total alkalinity	mg CaCO3/l	ALM 01	416	431	458	410	468	379	492
A	Chloride (Cl)	mg/l	ALM 02	56.2	19.5	56.3	146	83.2	4.79	7.34
A	Sulphate (SO_4)	mg/l	ALM 03	32.4	13.4	17.1	<0.141	1.14	3.03	15.2
A	Nitrate (NO_3) as N	mg/l	ALM 06	1.22	<0.194	6.53	<0.194	<0.194	<0.194	<0.194
N	Total phosphorus	mg/l	ALM 12	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
A	Orthophosphate (PO_4) as P	mg/l	ALM 04	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
A	Fluoride (F)	mg/l	ALM 08	0.550	0.632	0.991	0.458	<0.263	<0.263	<0.263
A	Calcium (Ca)	mg/l	ALM 30	54.1	42.8	71.4	43.9	77.7	58.9	72.2
A	Magnesium (Mg)	mg/l	ALM 30	52.2	6.17	73.7	88.6	56.8	29.0	73.5
A	Sodium (Na)	mg/l	ALM 30	95.9	177	62.4	55.1	66.0	52.4	31.1
A	Potassium (K)	mg/l	ALM 30	1.69	2.84	2.44	8.45	7.34	2.13	1.45
A	Aluminium (Al)	mg/l	ALM 31	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
A	Iron (Fe)	mg/l	ALM 31	<0.004	<0.004	<0.004	<0.004	1.51	<0.004	<0.004
A	Manganese (Mn)	mg/l	ALM 31	<0.001	0.003	<0.001	0.047	0.494	0.695	0.211
A	Chromium (Cr)	mg/l	ALM 31	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
A	Copper (Cu)	mg/l	ALM 31	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
A	Nickel (Ni)	mg/l	ALM 31	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
A	Zinc (Zn)	mg/l	ALM 31	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
A	Cobalt (Co)	mg/l	ALM 31	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
A	Cadmium (Cd)	mg/l	ALM 31	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
A	Lead (Pb)	mg/l	ALM 31	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
A	E.coli	CFU/100ml	ALM 40	<1	<1	<1	<1	<1	<1	<1
A	Total coliform	CFU/100ml	ALM 40	1120	14	<1	<1	<1	<1	<1
A	Turbidity	NTU	ALM 21	0.290	0.748	0.390	13.6	127	3.74	2.58
A	Arsenic (As)	mg/l	ALM 34	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006

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Client: Wesizwe Platinum
Address: 5 Ronbex Road, Activia Park, Elandsfontein, 1406
Report no: 97241
Project: Wesizwe Bakubung Environmental

Date of report: 21 December 2020
Date accepted: 11 December 2020
Date completed: 21 December 2020
Date received: 11 December 2020

Lab no:				71967	71968	71969	71970	71971	71972	71973
Date sampled:				11-Dec-20	11-Dec-20	11-Dec-20	11-Dec-20	11-Dec-20	11-Dec-20	11-Dec-20
Aquatico sampled:				Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample type:				Water	Water	Water	Water	Water	Water	Water
Locality description:				FBH01D	FBH02D	FBH04D	FBH05S	MBH03D	MBH05	MBH06
Analyses		**Unit**	**Method**							
A	Selenium (Se)	mg/l	ALM 34	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
A	Silicon (Si)	mg/l	ALM 33	26.7	21.6	27.2	3.26	28.3	21.7	36.1
N	Silver (Ag)	mg/l	ALM 32	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
A	Boron (B)	mg/l	ALM 33	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013
A	Barium (Ba)	mg/l	ALM 33	0.006	0.002	0.081	0.062	0.028	0.038	0.033
N	Bismuth (Bi)	mg/l	ALM 32	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
N	Lithium (Li)	mg/l	ALM 32	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.003
A	Molybdenum (Mo)	mg/l	ALM 33	0.033	0.027	0.038	0.034	0.039	0.030	0.039
A	Strontium (Sr)	mg/l	ALM 33	0.537	0.250	1.40	0.802	0.222	0.248	0.300
A	Vanadium (V)	mg/l	ALM 33	0.019	<0.001	0.016	<0.001	<0.001	<0.001	0.002
A	Bicarbonate alkalinity	mg CaCO3/l	ALM 26	415	430	456	406	467	378	491
A	Carbonate alkalinity	mg CaCO3/l	ALM 26	1.33	0.636	1.08	3.84	0.573	0.756	1.17
N	Antimony (Sb)	mg/l	ALM 36	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N	Tin (Sn)	mg/l	ALM 36	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N	Titanium (Ti)	mg/l	ALM 36	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N	Temperature	°C	ALM 20	22.3	22.2	22.2	22.1	22.2	22.2	22.2

Client: Wesizwe Platinum
Address: 5 Ronbex Road, Activia Park, Elandsfontein, 1406
Report no: 97241
Project: Wesizwe Bakubung Environmental

Date of report: 21 December 2020
Date accepted: 11 December 2020
Date completed: 21 December 2020
Date received: 11 December 2020

Lab no:				71974
Date sampled:				11-Dec-20
Aquatico sampled:				Yes
Sample type:				Water
Locality description:				SW4
Analyses				
		Unit	**Method**	
A	pH @ 25°C	pH	ALM 20	9.90
A	Electrical conductivity (EC) @ 25°C	mS/m	ALM 20	72.9
A	Total Dissolved solids @ 180°C	mg/l	ALM 24	394
A	Total alkalinity	mg CaCO3/l	ALM 01	75.0
A	Chloride (Cl)	mg/l	ALM 02	108
A	Sulphate (SO_4)	mg/l	ALM 03	70.6
A	Nitrate (NO_3) as N	mg/l	ALM 06	2.47
N	Total phosphorus	mg/l	ALM 12	0.053
A	Orthophosphate (PO_4) as P	mg/l	ALM 04	0.049
A	Fluoride (F)	mg/l	ALM 08	0.455
A	Calcium (Ca)	mg/l	ALM 30	15.5
A	Magnesium (Mg)	mg/l	ALM 30	13.1
A	Sodium (Na)	mg/l	ALM 30	106
A	Potassium (K)	mg/l	ALM 30	7.10
A	Aluminium (Al)	mg/l	ALM 31	<0.002
A	Iron (Fe)	mg/l	ALM 31	<0.004
A	Manganese (Mn)	mg/l	ALM 31	0.004
A	Chromium (Cr)	mg/l	ALM 31	<0.003
A	Copper (Cu)	mg/l	ALM 31	<0.002
A	Nickel (Ni)	mg/l	ALM 31	<0.002
A	Zinc (Zn)	mg/l	ALM 31	<0.002
A	Cobalt (Co)	mg/l	ALM 31	<0.003
A	Cadmium (Cd)	mg/l	ALM 31	<0.002
A	Lead (Pb)	mg/l	ALM 31	<0.004
A	E.coli	CFU/100ml	ALM 40	1
A	Total coliform	CFU/100ml	ALM 40	28
A	Turbidity	NTU	ALM 21	2.19
A	Arsenic (As)	mg/l	ALM 34	<0.006

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Client: Wesizwe Platinum
Address: 5 Ronbex Road, Activia Park, Elandsfontein, 1406
Report no: 97241
Project: Wesizwe Bakubung Environmental

Date of report: 21 December 2020
Date accepted: 11 December 2020
Date completed: 21 December 2020
Date received: 11 December 2020

Lab no:				71974
Date sampled:				11-Dec-20
Aquatico sampled:				Yes
Sample type:				Water
Locality description:				SW4
Analyses		**Unit**	**Method**	
A	Selenium (Se)	mg/l	ALM 34	<0.002
A	Silicon (Si)	mg/l	ALM 33	1.81
N	Silver (Ag)	mg/l	ALM 32	<0.001
A	Boron (B)	mg/l	ALM 33	<0.013
A	Barium (Ba)	mg/l	ALM 33	0.045
N	Bismuth (Bi)	mg/l	ALM 32	<0.004
N	Lithium (Li)	mg/l	ALM 32	<0.001
A	Molybdenum (Mo)	mg/l	ALM 33	0.014
A	Strontium (Sr)	mg/l	ALM 33	0.319
A	Vanadium (V)	mg/l	ALM 33	0.002
A	Bicarbonate alkalinity	mg CaCO3/l	ALM 26	40.8
A	Carbonate alkalinity	mg CaCO3/l	ALM 26	30.3
N	Antimony (Sb)	mg/l	ALM 36	<0.001
N	Tin (Sn)	mg/l	ALM 36	<0.001
N	Titanium (Ti)	mg/l	ALM 36	<0.001
N	Temperature	°C	ALM 20	22.3

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