Calvinia, Hantam municipality Additional groundwater supply, Northern Cape (2018).

REPORT:	***PREPARED BY:***
GEOSS Report No: 2018/10-18 ***PREPARED FOR:*** Gert Meiring BVI - Upington Office Director - Civil Department 55 Bult Street Upington 8800 South Africa	Charles Peek GEOSS - Geohydrological and Spatial Solutions International (Pty) Ltd Unit 12, Technostell Building, 9 Quantum Street, TechnoPark Stellenbosch 7600 Tel: (021) 880-1079 Email: info@geoss.co.za (www.geoss.co.za)

GEOHYDROLOGICAL AND SPATIAL SOLUTIONS INTERNATIONAL (PTY) LTD
GEOSS

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EXECUTIVE SUMMARY

BVi Consulting Engineers have been appointed by the Hantam Municipality to conduct a feasibility study and find a long-term solution for the bulk water supply to Calvinia in the Northern Cape. It has recently faced water shortages due to drought conditions in the area. The current water usage for the town equates to approximately 14.5 L/s. GEOSS was subcontracted, as groundwater consultants, in order to site additional boreholes to be drilled and tested for sustainable supply to the town, with a target of 45 L/s.

Current supply boreholes were reassessed and six new areas were investigating for possible groundwater development:

- Rhenosterhoek Farm
- Nature reserve
- Ceres Karroo area (Kruitberg)
- Keiskie
- Downes
- North-west region

The study included an initial remote geological and topographical investigation of the area and lineament mapping; this preceded the site visit. The site visit included a hydrocensus, an evaluation of the site geology and geophysics.

Thirty-one boreholes were drilled, of which twelve were viable for testing. The total estimate sustainable yield from these boreholes is 68 L/s which meets the target yield of the project, although it will require careful management, informed by groundwater level monitoring, to ensure it is correctly utilised.

Overall the groundwater quality is classified as "good to moderate". The fluoride concentration of all the tested sites is a concern (of varying degrees) and should be addressed before production begins. Exploration borehole Cal_Phase3_4A had an anomalous high iron concentration of 22 mg/L, typical iron concentrations range between 0.024 – 0.3 mg/L in the Calvinia area.

It is recommended that monitoring equipment be installed in the boreholes, in order to ensure data informed management. The boreholes will also need to be authorised via a Water Use License Application.

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ABBREVIATIONS

CGS	The Council of Geoscience
CDT	Constant discharge test
DWA	Department of water affairs
DWAF	Department of Water and Forestry
L/s	litres per second
m	metres
mamsl	meters above mean sea level
mbch	metres below collar height
mbgl	metres below ground level
mm/a	millimetres per annum
mS/m	milliSiemens per meter
NGA	National Groundwater Archive

GLOSSARY OF TERMS

Aquifer: a geological formation, which has structures or textures that hold water or permit appreciable water movement through them [from National Water Act (Act No. 36 of 1998)].

Borehole: includes a well, excavation, or any other artificially constructed or improved groundwater cavity which can be used for the purpose of intercepting, collecting or storing water from an aquifer; observing or collecting data and information on water in an aquifer; or recharging an aquifer [from National Water Act (Act No. 36 of 1998)].

Fractured aquifer: Fissured and fractured bedrock resulting from decompression and/or tectonic action. Groundwater occurs predominantly within fissures and fractures.

Groundwater: water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.

Intergranular Aquifer: Generally unconsolidated but occasionally semi-consolidated aquifers. Groundwater occurs within intergranular interstices in porous medium. Typically occur as alluvial deposits along river terraces.

Intergranular and fractured aquifers: Largely medium to coarse grained granite, weathered to varying thicknesses, with groundwater contained in intergranular interstices in the saturated zone , and in jointed and occasionally fractured bedrock.

Transmissivity: the rate at which a volume of water is transmitted through a unit width of aquifer under a unit hydraulic head (m^2/d); product of the thickness and average hydraulic conductivity of an aquifer.

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Cover photo:

Borehole drilling within the Calvinia nature reserve.

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Reviewed by:

Julian Conrad (23 October 2018)

1. INTRODUCTION

BVi Consulting Engineers have been appointed by the Hantam Municipality to conduct a feasibility study to find a long-term solution for the bulk water supply to Calvinia in the Northern Cape.

Calvinia is a small town in the Northern Cape province of South Africa, located 380 km north-east of Cape Town in the Namakwa District (**Map 1, Appendix A**). It is currently facing water shortages due to low levels in the Karee dam and the bulk supply is limited due to problems with the supply boreholes water levels declining. The current water usage for the town is 1250 cubes/pd, this equates to 14.5 L/s. Groundwater in the region does show potential and a revised assessment is required of the groundwater options for groundwater supply. This includes investigating the following areas and re-assessing current supply boreholes:

- Rhenosterhoek Farm
- Nature reserve
- Ceres Karroo area (Kruitberg)
- Keiskie
- Downes
- North-west region

The study included an initial remote geological and topographical investigation of the area and lineament mapping; this preceded the site visit. The site visit included a hydrocensus, an evaluation of the site geology and geophysics.

2. TERMS OF REFERENCE

The project Terms of Reference were to assess the existing utilised groundwater resources and develop additional groundwater resources by:

- Obtain all relevant data to the project (i.e. obtain data from the National Groundwater Archive (NGA), etc), including geological maps and geohydrological maps. Any relevant groundwater reports will also be sourced.
- Evaluating the potential of locating additional boreholes within the current well fields
- Map potential groundwater bearing structures and formations on the satellite imagery and aerial photographs using the ArcGIS desktop software. The lineaments will be mapped using false-colour composites and grey-scale pansharpened aerial images. The satellite lineament data will then be overlain on the 1:50 000 scale digital geological maps. The geological data of the area will be digitised and attributed from the published geological and other relevant maps. The boreholes and other relevant groundwater information will be superimposed on GIS generated maps for analysis.

- Surface geological and geophysical (electromagnetic and magnetic) mapping will be conducted in detail in areas where boreholes with groundwater potential may occur
- Analyse the data, using geohydrological methods and address the questions set out in the project objectives.
- Mange drilling and yield testing of additional boreholes
- Undertake safe yield and water quality assessment of current supply boreholes. The test pumping data will be analysed using various methods (Theis, Cooper-Jacob and FC).
- A 24, 48 or 72-hour sustainable pumping schedule for each borehole will be determined as well as alternative pumping schedule to maximise the boreholes. Optimum allowable water level drawdown and pump depth will be advised.

3. REGIONAL SETTING

3.1 *General*

Calvinia falls under the jurisdiction of the Hantam Local Municipality in Namakwa District which is located in the southern part of the Northern Cape Province. The town is just south of the Hantam mountains on the banks of the Oorlogskloof River. The town is 380 km north of Cape Town and 400 km south west of Upington. The town's elevation is approximately 1050 m above mean sea level, and positioned on a water divide, with streams radiating outwards in all directions. The town is located in quaternary catchment E40B, but positioned close to the boundary with E40A (East) and D58B (North). The Hantam Local Municipality is the Water Services Authority and the Water Services Provider for all the settlements under its jurisdiction (DWA, 2009).

The Town is dependent on the Karee Dam located 4.5 km north of the town, during dry periods when the dam is empty the town use its alternative groundwater source as a backup. The town currently uses six production boreholes located east of the town.

3.2 *Climate*

Hantam Municipal Area lies in an area that falls on the boundary between regions with summer and winter rainfall, and rainfall therefore occurs throughout the year. The long-term average climatic data for Calvinia (1981 – 2010) indicate an approximate rainfall of 198 mm/a for the period (**Figure 1**). The data indicates that >70% of the rainfall occurs during the summer months (November to April). December and January are the wettest months whilst June and July are the driest.

Climate data for Calvinia (1981-2010)													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C	32	32.3	30.1	26	21.5	18.2	17.9	19.4	22.5	25.9	28.2	30.3	25.3
Daily mean °C	22.7	22.9	21.1	17.4	13.8	10.8	10.5	11.2	13.7	16.8	19.1	21.1	16.8
Average low °C	13.4	13.8	12.3	9.5	6.4	3.8	3.6	3.4	5	7.9	10	12	8.3
Average rainfall mm	29.49	26.94	27.31	18.56	9.33	0.64	1.09	5.07	11.41	18.87	22.48	27.73	198.92
Average rainy days (≥ 1.0 mm)	1	1	3	4	3	4	4	4	4	3	2	2	35

Figure 1: Long term annual climatic data for Calvinia (online, meteo-climat-bzh access 2017)

3.3 *Regional Geology*

The Geological Survey of South Africa (now the Council for Geoscience) has mapped the area at 1:250 000 scale (3118 Calvinia). The geological setting is shown in **Map 3** (**Appendix A**). The geology underlying Calvinia can be broken down into different lithologies.

3.3.1 Unconsolidated units

Alluvial and colluvium deposits are limited in thickness and extent in the Calvinia area. They comprise mostly of weathering products of argillaceous rocks which have been deposited by sheet wash process. Majority of the alluvial is located within the Oorlogskloof River and Vlakfontein River channel. The thickness of the alluvium material varies between 5 – 30 meters below ground level.

3.3.2 Sedimentary units

The sediments in the Calvinia area belong to the Ecca Group of the Karoo Sequence. The formation present in the area is:

- Tierberg Shale Formation (Ecca Group)

These formations are all argillaceous in nature. The formation consists of quartzitic sandstone and subordinate shale bands. The Tierberg Formation comprises upward – coarsening sequence of thin laminated, dark-brown to light grey shale. Thin yellow weathering layers of volcanic ash may be present.

3.3.3 Dolerite Intrusions

An attempt was made to correlate the dolerite sheets with those of the Calvinia area some 80 km away (DWAF, 1981). A regular horizontal dolerite sheet with a thickness of 120 m was identified in Calvinia with an upper contact of 880 mamsl. This may correlate with the Rheeboksfontein Sheet which displays the same thickness but is at a lower elevation (~ 100 m lower).

The outcrop of dolerite in Calvinia with a lower contact at 1 010 – 1 040 mamsl may correspond with the Loeriesfontein Sheet. These correlations are tentative, but are potentially important considering the significant bearing that dolerite sheets have on groundwater occurrence in this geological setting.

3.3.4 Breccia Pipes

Additionally, there are a number of breccia pipes in the study area. These have been drilled by the Council for Geoscience and Department of water Affairs for investigation and water supply. They are evident in the field as dome shaped hills, as the pipes and surrounding metamorphosed rock is more resistant to weathering than the host rock. From aerial photography the pipes are evident as a dark spherical structure surrounded by a while alteration halo in the surrounding sedimentary formation.

The pipes consist of baked and dislocated shale and mudstone of the Prince Albert and Whitehill Formations, but molten, recrystallized and contorted sediments containing clasts from underlying strata are also found. These pipes resulted from localised hydrothermal activity generated by the emplacement of the lowermost dolerite sills.

3.4 *Regional Hydrogeology*

3.4.1 Aquifer type and yield

According to the 1:500 000 scale groundwater map of Calvinia (3118) the area does host a fractured aquifer. These semi-confined aquifers are formed by jointing and fracturing within the solid bedrock. (**Map 4, Appendix A**). The average borehole yield in the region has been classified as 0.5 to 2 L/s according to Department of Water Affairs and Forestry (DWAF 1998).

Primary or intergranular aquifers do occur within the area along the river banks/channels of the Oorlogskloof River. Groundwater flows within the unconsolidated sediment and weathered bedrock formations. The average thickness of the unconsolidated and weathered zone is 25 – 35 meters. In general, these aquifers are poorly developed and vulnerable to drought conditions.

3.4.2 Groundwater quality

Based on the DWAF (1998) classification the regional groundwater quality underlying the town and its surrounds is good to marginal with an associated electrical conductivity (EC) of 70 – 300 mS/m. (**Map 5, Appendix A**).

4. SITE VISIT - HYDROCENSUS

4.1 *Site visit*

Prior to the field work being carried out all relevant borehole data was obtained for the area and current production boreholes. In addition, the field work was used as an opportunity to collect as much anecdotal information as possible. The individual boreholes were visited to determine their state.

4.1.1 Production boreholes

Calvinia currently has seven production boreholes of which six are used for Town supply (**Table 1**). Calvinia-Ceres Rd BH was identified as a potential site during the site visit to conduct a pumping test. The Breccia BH was initially a study site for a potential artificial recharge scheme conducted by Dr. Murray. The borehole is used to store water during times of excess surface water for the purpose of supplying water during periods of drought. Currently (2018) the borehole is not been used to supply water.

Table 1: Calvinia Production boreholes information

Bhole ID	Latitude	Longitude	Elevation (mamsl)	Pump Depth (m)
Calvinia-Ceres Rd_BH	-31.635482	19.749442	1067	-
Golf_course_BH	-31.482959	19.763893	979	200
Witwal_BH	-31.452398	19.811102	1004	-
Sandgat_3_BH	-31.498032	19.874576	1007	17.00
Sandgat_4_BH	-31.502987	19.875842	1006	?38
Sandgat_5_BH	-31.509516	19.850230	1005	200
Breccia_BH	-31.485347	19.900996	1066	>100
Deon_Vlok_BH	-31.481290	19.968414	1083	250

Temporal data was provided by DWS for the period of October 2017 – April 2018. The data indicates water level, yield and volume abstracted. **Table 2**

Table 2: Temporal data water level data was provided by DWS

Bh ID	Water level Oct 2017 (mbgl)	Sustainable Yield (m^3/h)	Sustainable Yield (L/s)	Sust. Yield (m^3 /day)	Water level 10 Feb 2018 (mbgl)	Delivery on 10 Feb 2018 (m^3/h)	Sustainable Yield (L/s)	on 10 Feb 2017 (m^3 /d)	Water level 23 Feb 2018 (mbgl)	Delivery on 23 Feb 2018 (m^3/h)	Sustainable Yield (L/s)	on 23 Feb 2017 (m^3 /d)
Sandgat 3		5	1.5	129.60	12	5.14	1.43	123.36	12	4.4	1.2	105.6
Sandgat 4		3	0.8	69.12	30	2.9	0.81	69.6	30	4	1.1	96
Sandgat 5		11	3	259.20	40	3.15	0.88	75.6	40	3.4	0.9	81.6
Deon Vlok		58	16	1382.40	61.6	24	6.67	576	57.9	30	8.3	720
Witwal		36	10	864.00	54.9	6.8	1.89	163.2	57.5	5.7	1.6	136.8
Golfcourse BH		7	2	172.80	60	10.9	3.03	261.6	70.5	10.5	2.9	252

Water level 2 Mar 2018 (mbgl)	Delivery on 2 Mar 2018 (m^3/h)	Sustainable Yield (L/s)	on 2 Mar 2017 (m^3 /d)	Water level 6 Apr 2018 (mbgl)	Delivery on 6 Apr 2018 (m^3/h)	Sustainable Yield (L/s)	on 6 Apr 2017 (m^3 /day)	Water level 10 Apr 2018 (mbgl)	Delivery on 10 Apr 2018 (m^3/h)	Sustainable Yield (L/s)	on 10 Apr 2017 (m^3 /d)
12	4	1.1	96	12	3.8	1.1	91.2		3.75	1.0	90
30	3.6	1.0	86.4	30	2.75	0.8	66		2.83	0.8	67.92
40	3.4	0.9	81.6	40	2.47	0.7	59.28		2.43	0.7	58.32
63	26	7.2	624	80.3	17	4.7	408		17.6	4.9	422.4
58.4	6.3	1.8	151.2	65.3	6.8	1.9	163.2		6.8	1.9	163.2
69	10	2.8	240	?	1.9	0.5	45.6		0	0.0	0

5. DESKTOP STUDY AND GROUNDWATER EXPLORATION

5.1 *Desktop study*

The desktop study was conducted using the following information in order to identify higher potential areas for groundwater exploration;

- National Ground water archive (NGA)
- 1: 50 000 and 1: 250 000 Geological Maps
- South African airborne magnetic data
- Lineament maps provided by the CGS
- Climatic data for the region.
- Previous reports (Private and government sector)

The desktop study was stipulated to target areas either owned by municipality or government initially and then private owned land. Previous reports/literature indicated that groundwater is generally located within alluvial channels, dolerite dykes or dolerite sills. The above-mentioned data was collated into a Geographical information system (GIS) software package. Five areas of interest were identified which met the criteria of geological structures, and sufficient recharge/rainfall. The Nature reserve located 1 km north of Calvinia was re assessed for groundwater potential and the re-drilling of existing abandoned/dilapidated boreholes.

A study area identified by SRK Consulting (Report No: 345429/4) 18 km to the north-east of Calvinia on a farm known as Rhenosterhoek was assessed for groundwater potential. The report identified the area as a potential area for groundwater exploration, however, GEOSS reassessed the area and data. Based on GEOSS assessment the area was classified as a low priority due to changes in climatic data and limited information pertaining to aquifer yield potential.

- Rhenosterhoek Farm (SRK study area)
- Ceres Karoo area / Kruitberg (Study area 1)
- Keiskie/ Keiskie road (Study area 2)
- Downes (study area 3)
- North-west region along the R355 (Study area 4)
- Nature reserve (Re-drilling of existing boreholes)
- De Vlok farm (Study area 5)

The 1:250 000 and 1:50 000 geological maps were also used where possible, to increase the level of geological detail used in understanding target areas. The geological maps used in conjunction with aerial imagery were used to conduct lineament and fault mapping was at site specific scales, to more closely define target areas. These target areas were then compared to the available groundwater information surrounding them, to obtain estimate outcomes and expectations of groundwater exploration in these sites.

5.2 *Exploration study*

Once the desktop study targets had been identified, field work was completed to finalise the exploration drill sites. The field work took the form of onsite structural verification (field geology), where the target structures were visible at surface. In areas where the target structures were covered by alluvium, geophysical techniques were used to further define the exploration drill sites.

The electromagnetic geophysical techniques were used, the method is a no intrusive and rapid for covering large areas. the geophysical survey was undertaken using a CMD-DUO Electromagnetic conductivity meter which measures the ground conductivity of the subsurface. It is a rapid data acquisition instrument that can be successfully applied to groundwater exploration. The CMD-DUO induces a changing electromagnetic (EM) field with a known frequency into the subsurface using a sender coil. This changing EM field induces current flow in conductive subsurface areas (for example fractured sandstone saturated with groundwater), which is measured by the receiver coil. This is then automatically converted to ground conductivity. In general, the ground conductivity measured has a direct correlation with formation porosity and groundwater salinity; i.e. if porosity of the formation or groundwater salinity increases, this will be reflected as a higher ground conductivity measurement (Telford et al, 1990).

The geophysical profiles are attached in **Appendix B** and spatial overlain on **Map 2 (1- 4)**.

Access to two of the study areas were limited by the private land owners. Rhenosterhoek Farm owner refused access to the land. The second target area Downes, GEOSS was allowed access to conduct geophysical and structure mapping work. However, the Land owner stipulated that he does not want drilling to take place on his land.

GEOSS took careful consideration when siting exploration boreholes on private land in order to not impact current groundwater use on the property or obstruct the works of the farm.

5.3 *Exploration Borehole sites*

Boreholes sites were selected based on the lineament mapping, geology mapping and geophysics. The exploration drill programme was broken into three phases, this was due to funding constraints during the initial phase of the project. The phases were broken down into the following criteria;

- **Phase 1:** Priority sites were selected with the highest groundwater potential.
- **Phase 2:** All sites delineated during the initial groundwater exploration phase.
- **Phase 3:** Additional sites added through exploration results **Phase 2**. Additional funding allowed for the expansion of the study site and additional explorations areas were identified.

Table 3 list the drill targets and their phase number.

Table 3: Exploration boreholes

Drill phase	Drill No.	Name	Latitude (WGS 84)	Longitude (WGS 84)
Phase 1	1	Cal_DV1	-31.455414	19.773937
Phase 1	2	Cal_DV2	-31.429912	19.785117
Phase 1	3	Cal_DV3	-31.430694	19.7883
Phase 1	4	Cal_DV4	-31.411629	19.775115
Phase 1	5	Cal-S2-1	-31.558677	19.821479
Phase 1	6	Cal-S2-3	-31.651334	19.801571
Phase 1	7	Cal-S2-3TV	-31.565842	19.828691
Phase 1	8	Cal-S1-1	-31.643388	19.883707
Phase 1	9	Cal-S1-2	-31.618573	19.893546
Phase 1	10	Cal-S1-3	-31.618808	19.893628
Phase 2	11	Cal-S2-4	-31.650359	19.801047
Phase 2	12	Cal-S2-2	-31.555085	19.818219
Phase 2	13	Cal-S2-3B	-31.650182	19.802443
Phase 2	14	Cal-S2-7	-31.650782	19.76698
Phase 2	15	Cal-S2-8	-31.649895	19.770142
Phase 2	16	Cal-S2-9	-31.65117	19.783061
Phase 2	17	Cal-S1-KB	-31.636869	19.758089
Phase 2	18	Cal-S1-KB-B	-31.643077	19.758324
Phase 2	19	Cal-S1-KB-B2	-31.642809	19.758577
Phase 2	20	Cal_S2_10	-31.617462	19.744726
Phase 2	21	Cal-S3-1	-31.598452	20.017608
Phase 2	22	Cal-S3-2	-31.384946	19.539153
Phase 2	23	Cal-S3-3	-31.593047	19.999782
Phase 2	24	Cal_Nat5	-31.435236	19.784485
Phase 2	25	Cal_Nat6	-31.451284	19.770548
Phase 3	26	Cal_Phase3_1	-31.417054	19.94251

Phase 3	27	Cal_Phase3_2	-31.393491	19.547516
Phase 3	28	Cal_Phase3_3	-31.398477	19.553632
Phase 3	29	Cal_Phase3_6	-31.357725	19.6915
Phase 3	30	Cal_Phase3_4	-31.401169	19.556679
Phase 3	31	Cal_Phase3_5	-31.396265	19.55079
Phase 3	32	Cal_Phase3_7	-31.375992	19.667129
Phase 3	33	Cal_Phase3_8	-31.630381	19.749189
Phase 3	34	Cal_Phase3_8_Alt	-31.63271	19.748168
Phase 3	35	Cal_Phase3_9	-31.632714	19.756781
Phase 3	36	Cal_Phase3_10	-31.625006	19.755166
Phase 3	37	Cal_Phase3_11	-31.619652	19.753778
Phase 3	38	Cal_phase3_12	-31.626433	19.776246
Phase 3	39	Cal_phase3_13	-31.641369	19.76428
Phase 3	40	Cal_Phase3_14	-31.59096	20.001357
Phase 3	41	Cal_Phase3_15	-31.565631	19.959059
Phase 3	42	Cal_vlok1	-31.382153	19.956044
Phase 3	43	Re-Drill 39602	-31.372864	19.970834
Phase 3	44	Cal_Vlok2	-31.401289	20.007778

6. DRILLING RESULTS

A total of 44 boreholes were sited for the exploration phase of the project (**Map 2 (1 – 4), Appendix A**). 31 boreholes were drilled by the company H&A drilling during the period of March to August 2018. Drill locations each represented its own challenges which ranged from access due to bad weather conditions and difficult drilling conditions. **Table 4** summarize the drill results. Boreholes for each location can be found in **Appendix D: Borehole logs**.

On average exploration boreholes were drilled to a depth of 150 m with the deepest borehole been drilled to a depth of 207 m. Dolerite dikes and deep-seated sills were the primary drill targets for exploration. Drilling was either stopped due to high water pressure decreasing drill bit penetration, unfavourable geology been intersected or target depth of 212 m was reached (the maximum of 212 m was due to limited drill strings been available).

A total of 13 successful borehole were drilled with a cumulative blow yield of 136 L/s. The newly boreholes were then yield tested to determine sustainability and the results are presented in **Section 8**.

Table 4: Drilling results summary

Drill Phase	Name	Latitude (DD)	Longitude (DD)	Borehole depth (m)	Fractures (mbgl)	Blow yield (L/s)	Borehole diameter 1 (casing) and Depth (m)	Borehole diameter 2 and Depth (m)
Phase 1	Cal_DV1	-31.455414	19.773937	160	144 and **155**	25	**#**8.5" (0 - 165)	
Phase 1	Cal_DV2	-31.429912	19.785117	200		0.1	6.5" (0 -200)	
Phase 1	Cal_DV3	-31.430694	19.7883	205	**189**	2.7	6.5" (0 -202)	
Phase 1	Cal_DV4	-31.411629	19.775115	207	49; **82** and 85	3.1	6.5"(0 - 207)	
Phase 1	Cal-S2-3	-31.651334	19.801571	120	**31**	2.8	6.5" (0 - 120)	
Phase 1	Cal-S1-1	-31.643388	19.883707	180		0.1	6.5" (0 - 180)	
Phase 1	Cal-S1-2	-31.618573	19.893546	152		0.1	6.5" (0 -152)	
Phase 1	Cal-S1-3	-31.618808	19.893628	128		0.1	6.5" (0 -128)	
Phase 2	Cal-S2-4	-31.650359	19.801047	180	144 and **155**	4.9	6.5" (0 -180)	
Phase 2	Cal-S2-3B	-31.650182	19.802443	120	**28**	0.2	6.5" (0 -120)	
Phase 2	Cal-S2-7	-31.650782	19.76698	153		0.1	6.5" (0 -153)	
Phase 2	Cal-S2-8	-31.649895	19.770142	200	-	1.3	6.5" (0 -200)	
Phase 2	Cal-S2-9	-31.65117	19.783061	180		0.3	6.5" (0 -180)	
Phase 2	Cal-S1-KB	-31.636869	19.758089	180	**30**	1.3	6.5" (0 -180)	
Phase 2	Cal-S1-KB-B	-31.643077	19.758324	120		0.3	6.5" (0 -120)	
Phase 2	Cal-S1-KB-B2	-31.642809	19.758577	83		0.1	6.5" (0 -83)	
Phase 2	Cal_S2_10	-31.617462	19.744726	152	**79**	8.2	**#**8" (0 - 111)	6.5" (111 - 151)
Phase 2	Cal_Nat5	-31.435236	19.784485	170	**168**	5	6.5" (0 - 170)	
Phase 2	Cal_Nat6	-31.451284	19.770548	200	**19** and 80	3	6.5" (0 - 200)	
Phase 3	Cal_Phase3_3	-31.398477	19.553632		37 and **143**	1.1	6.5" (0 - 150)	
Phase 3	Cal_Phase3_6	-31.357725	19.6915	112	**92**	>25	8" (0 - 112)	

Phase 3	Cal_Phase3_4A	-31.401169	19.556679	79	22, 43 and **71**	> 10	8" (0 - 79)	
Phase 3	Cal_Phase3_5	-31.396265	19.55079	127			6.5" (0 - 127)	
Phase 3	Cal_Phase3_7	-31.375992	19.667129	137	**70**	0.1	6.5" (0 - 137)	
Phase 3	Cal_Phase3_8_Alt	-31.63271	19.748168	182		0.1	6.5" (0 - 182)	
Phase 3	Cal_Phase3_9	-31.632714	19.756781	117	36,39,62,68,72 and **96**	>10	#8" (0 - 117)	
Phase 3	Cal_phase3_12	-31.626433	19.776246	180		0.1	6.5" (0 - 180)	
Phase 3	Cal_phase3_13	-31.641369	19.76428	192			6.5" (0 - 192)	
Phase 4	Cal_vlok_2	-31.401289	20.007778	152		0.1	6.5" (0 - 152)	
Phase 3	Cal_vlok_1	-31.382153	19.956044	200		0.1	6.5" (0 - 200)	
Phase 3	ReDrill 39602	-31.372864	19.970834	180	**52**	30	8" (0 - 60)	6.5" (60 - 180)

* Metres below ground level (approximate, from borehole logs)

borehole reamed to 8" to allow for large pumps to be installed

** figures in bold denotes main water strikes in terms of blow yield

7. PUMPING TESTS: EXISTING PRODUCTION BOREHOLE

Seven boreholes existing boreholes, six boreholes are currently been used for water supply and one borehole (Calvinia-Ceres Rd_BH) was identified during the hydrocensus phase of the project. Concerns were raised as to the groundwater levels which haven shown a decline during the drought. Revaluation of the current production boreholes were conducted in order to determine the sustainable yields of the boreholes during drought conditions for both present and future. (**Map 2**, **Appendix A**).

7.1 *Ceres Road*

The step test commenced on the September 2017. The rest water level (RWL) was measured at 14.01 mbgl in the borehole of 51.90 m depth. The pump was only installed to 49.10 m. The Step Test involved four steps of increasing abstraction rates and the water level was drawn down to 35 m below the RWL at the end of the 3rd step, conducted at a rate of 5.06 L/s.

Based on the borehole response to the Step Test, the CDT was conducted at an abstraction rate of the installed pump at 2 L/s. The test was conducted for 48 hours (2880 minutes). The water level was drawn down to a maximum of 17.94 m below the rest water level at the completion of the CDT.

The recovery of the water level was monitored for 40 minutes. The water level recovery was relatively fast and indicates that long pumping periods per day will be sustained. Based on the data analysis the sustainable yield of the borehole is recommended to be 2 L/s, pumping for 24 hours per day and allowing 4 hours for recovery with a pump installed at 50 m below ground level. **Figure 2** graphically indicates the CDT and recovery data**.**

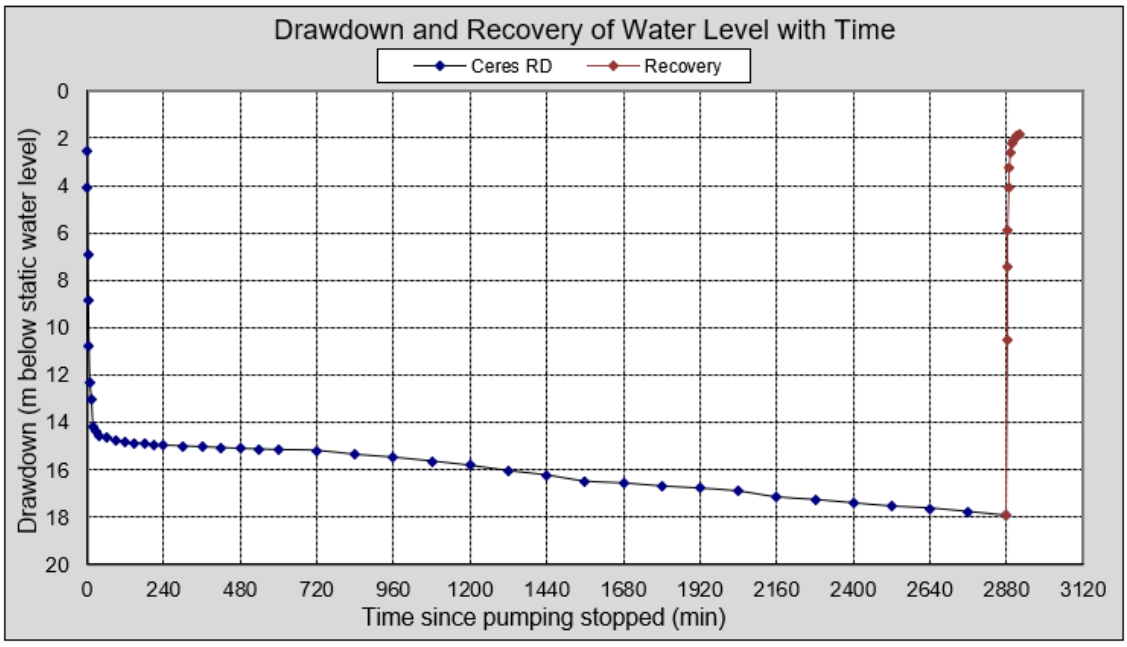


Figure 2: Constant Discharge Test and Recovery of Ceres Road BH

7.2 *Sandgat 3*

The step test commenced on the 16 September 2017, with the RWL measured at 8.41 mbgl in the borehole and the pump was installed to 13.20 m. The Step Test involved four steps of increasing abstraction rates and the water level was drawn down to 1.25 m below the RWL at the end of the fourth step, conducted at a rate of 2.5 L/s.

Based on the borehole response to the Step Test, the CDT was conducted at an abstraction rate of 2.2 L/s. The test was conducted for 48 hours (2880 minutes) and the water level was drawn down to a maximum 2.77 m below the rest water level at the completion of the CDT.

The recovery of the water level was monitored for 1.5 hours (90 minutes) and is presented**.** The borehole's recovery is relatively quick and can be related to it's unconfined nature. Based on the data analysis the sustainable yield of the borehole is recommended to be 1.2 L/s, pumping for 16 hours per day and allowing 8 hours for recovery with a pump installed at 160 m below ground level. The borehole can be pumped at 1.5 L/s for 24 hrs but monitoring of the borehole on a monthly basis will allow for refining of abstraction rate. **Figure 3** graphically indicates the CDT and recovery data.

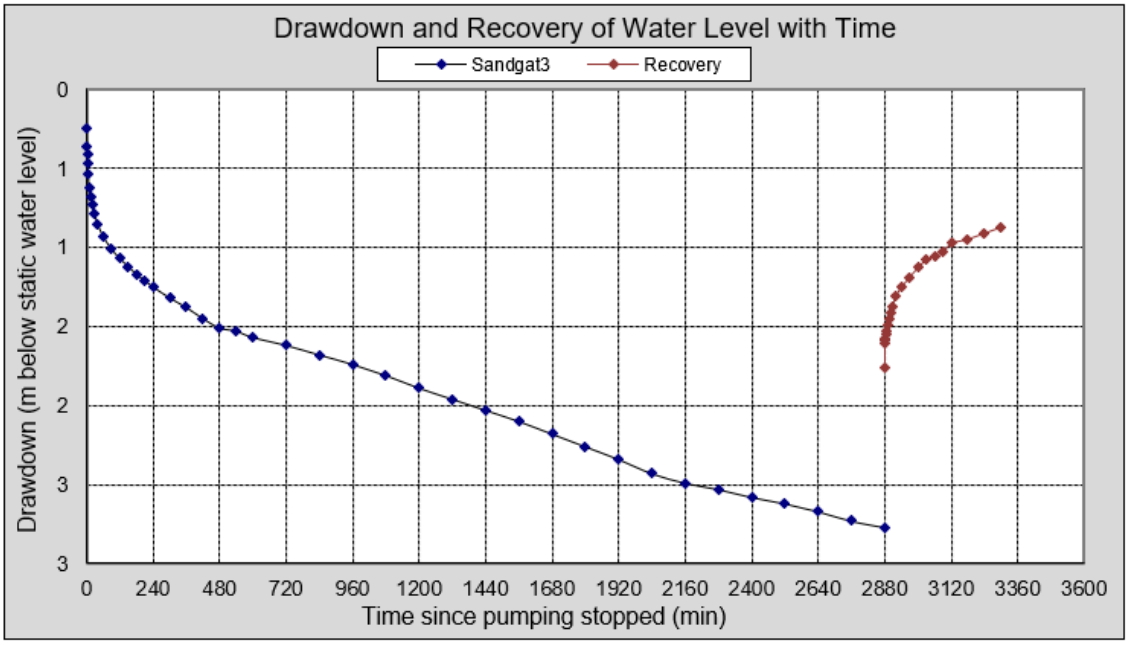


Figure 3: Constant Discharge Test and Recovery of Sandgat3

7.3 *Sandgat 4*

The step test commenced on the 29 September 2017, with the RWL measured at 8.59 mbgl in the borehole and the pump was installed to 55.10 m. The Step Test involved four steps of increasing abstraction rates. The water level was drawn down to pump inlet after step 3 run at a rate of 2 L/s.

Based on the borehole response to the Step Test, the CDT was conducted at an abstraction rate of 0.85 L/s. The test was conducted for 48 hours (2880 minutes) and the water level was drawn down to a maximum 19.78 m below the rest water level at the completion of the CDT.

The recovery of the water level was monitored for 20 minutes**.** The borehole's recovery is rapid, is may be linked to the unconfined nature of the borehole. The rapid recovery may indicate a highly transmissive zone around the borehole. Based on the data analysis the sustainable yield of the borehole is recommended to be 0.8 L/s, pumping for 24 hours per day and allowing 4 hours for recovery with a pump installed at 55 m below ground level. The sustainable yield of 0.8 L/s is classified as low. **Figure 4** graphically indicates the CDT and recovery data**.**

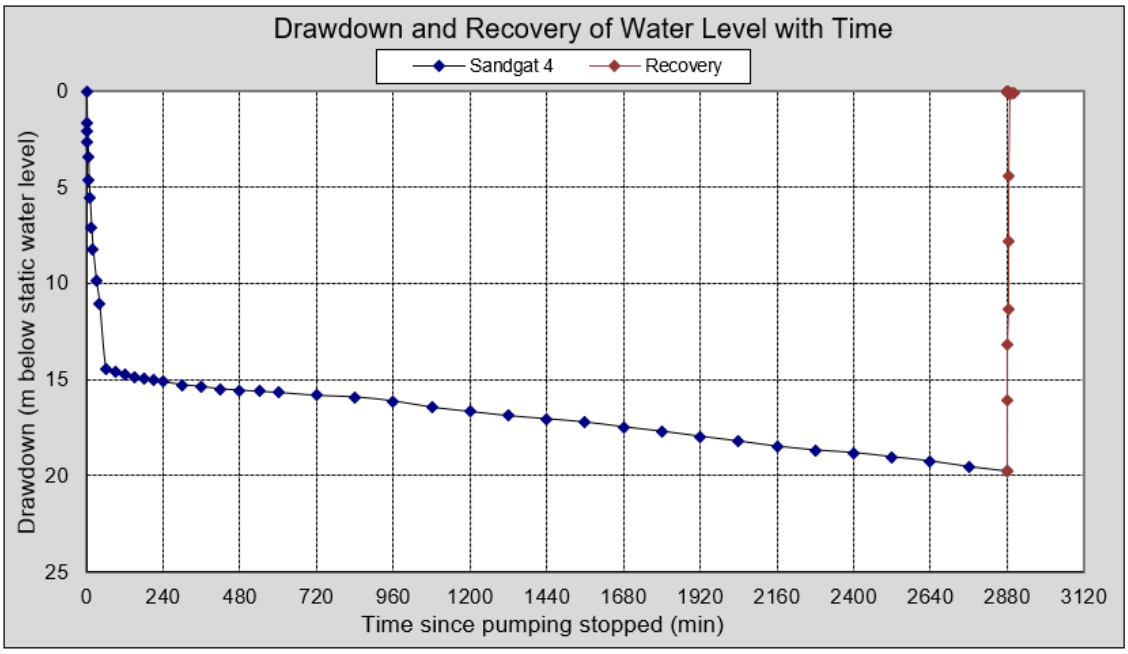


Figure 4: Constant Discharge Test and Recovery of Sandgat 4

7.4 *Sandgat 5*

The step test commenced on the 23 September 2017. The RWL was measured at 20.91 mbgl in the borehole of approximately 197 m depth. The Step Test involved four steps of increasing abstraction rates and the water level was drawn down to 25.74 m below the RWL at the end of the fourth step, conducted at a rate of 18 L/s, with the pump installed at 189.20 m.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 16 L/s. The test was conducted for 480 min and the water level was drawn down pump inlet. Due to the rapid drawdown a second CDT was conducted at 5 L/s for 48 hours, which resulted in 7.39 m of drawdown.

The recovery of the water level was monitored for 480 minutes**.** The borehole's recovery is slow. Based on the data analysis the available drawdown of the borehole is limited to 30 m. The sustainable yield of the borehole is recommended to be 3 L/s, pumping for 24 hours per day with 8 hours for recovery, with a pump installed at 60 m below ground level. The sustainable yield of 3 L/s is classified as moderate. **Figure 5** graphically indicates the CDT and recovery data.

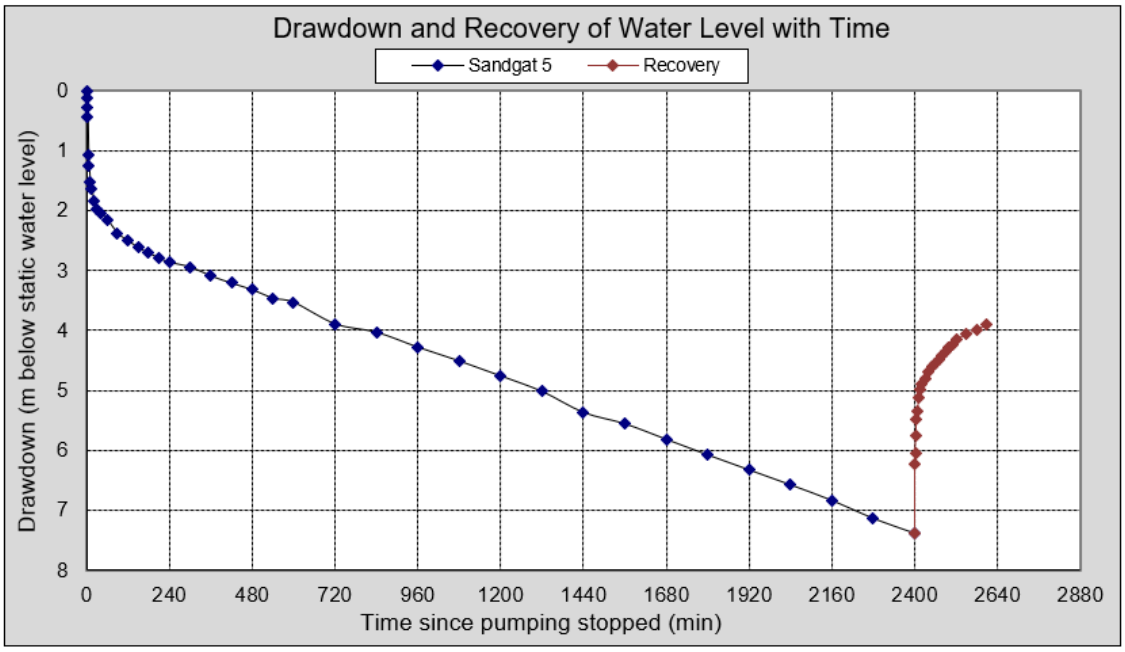


Figure 5: Constant Discharge Test and Recovery of Sandgat 5

7.5 *De Vlok Bh*

The step test commenced on the 26 September 2017. The RWL was measured at 22.6 mbgl in the borehole of approximately 250 m depth. The Step Test involved four steps of increasing abstraction rates and the water level was drawn down to 7.89 m below the RWL at the end of the fourth step, conducted at a rate of 18 L/s, with the pump installed at 150 m.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 16 L/s. The test was conducted for 72 hours (4320 minutes) and the water level was drawn down to 11.62 meters below rest water level.

The recovery of the water level was monitored for 480 minutes. Based on the data analysis the available drawdown is assumed to be 127 m. However, no detailed geological logs could be obtained for the hole to identify the main water strike and the pumping test did not indicate a critical drawdown. The sustainable yield of the borehole is recommended to be 16 L/s, pumping for 24 hours per day with 8 hours for recovery, with a pump installed at 150 m below ground level. Only monitoring will show if the recommended rate is correct. **Figure 6** graphically indicates the CDT and recovery data**.**

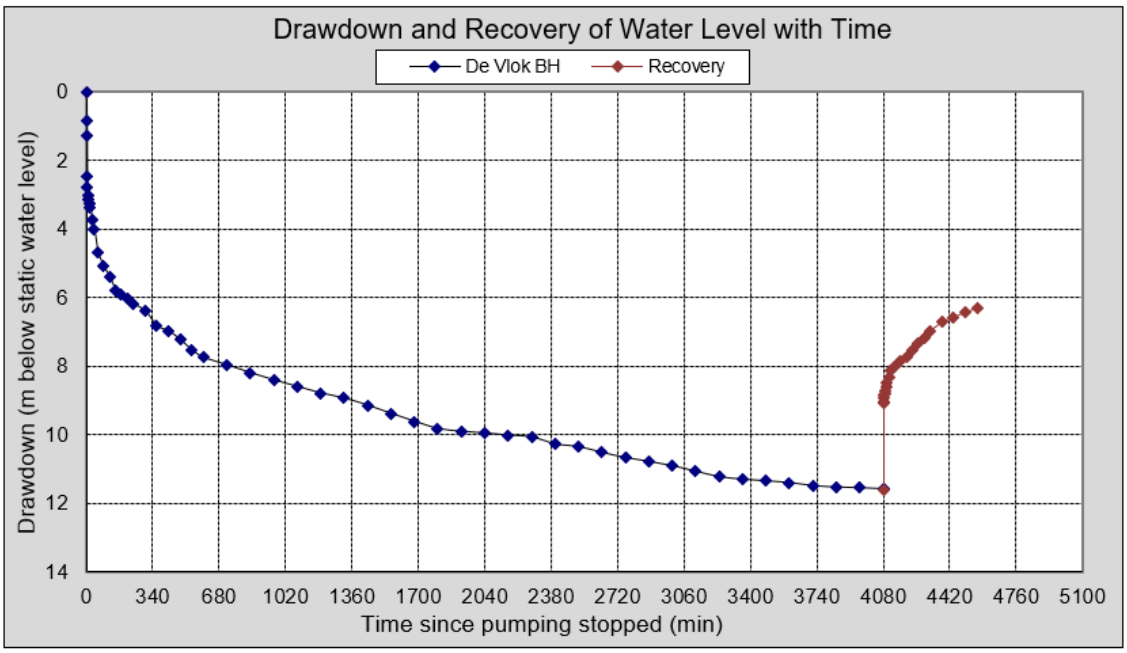


Figure 6: Constant Discharge Test and Recovery of De Vlok Bh

7.6 *Witvaal*

The step test commenced on the 29 September 2017. The RWL was measured at 22.90 mbgl in the borehole of approximately 193 m depth. The Step Test involved four steps of increasing abstraction rates and the water level was drawn down to 8.89 m below the RWL at the end of the fourth step, conducted at a rate of 12.25 L/s, with the pump installed at 91 m

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 10 L/s. The test was conducted for 48 hours (2880 minutes) and the water level was drawn down to 19.3 meters below rest water level.

The recovery of the water level was monitored for 480 minutes. Based on the data analysis the available drawdown is assumed to be 67.3 m. However, no detailed geological logs could be obtained for the hole to identify the main water strike and the pumping test did not indicate a critical drawdown. The sustainable yield of the borehole is recommended to be 6 L/s, pumping for 24 hours per day with 8 hours for recovery, with a pump installed at 150 m below ground level. Only monitoring will show if the recommended rate is correct. **Figure 7** graphically indicates the CDT and recovery data**.**

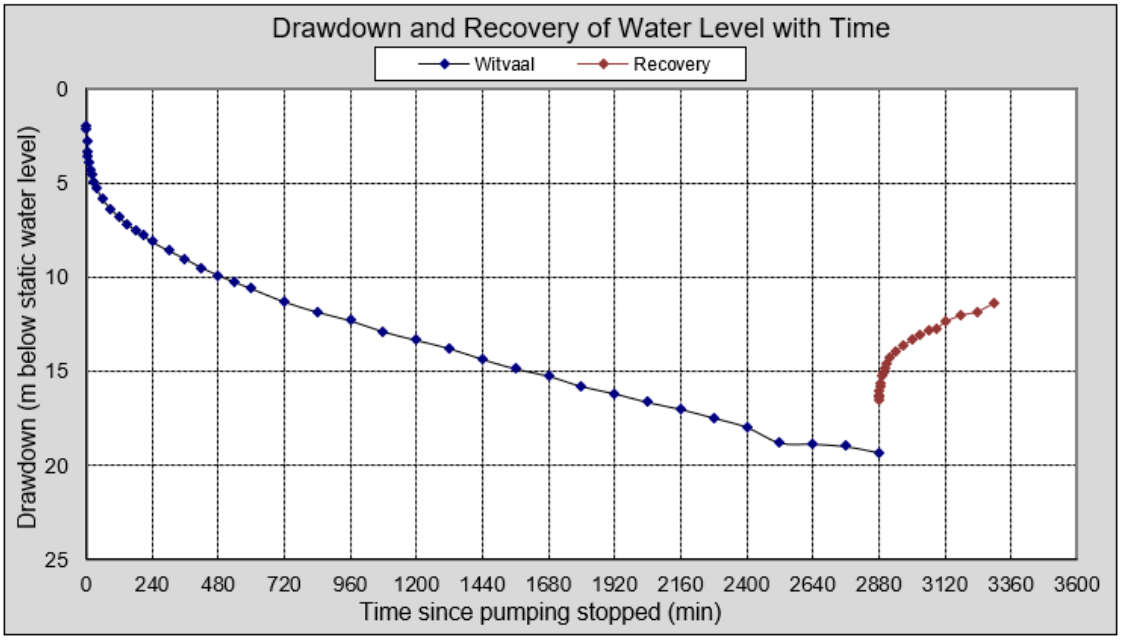


Figure 7: Constant Discharge Test and Recovery of Witvaal.

7.7 *Golf course Bh*

The step test commenced on the 26 September 2017. The RWL was measured at 36 mbgl in the borehole of approximately 225 m depth. The Step Test involved three steps of increasing abstraction rates and the water level was drawn down to 33.07 m below the RWL at the end of the third step, conducted at a rate of 12. L/s, with the pump installed at 100 m (Current depth of equipped pump).

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 3 L/s due to slow recovery results over a 24-hr period, the new RWL from the CDT was 48 mbgl. The test was conducted for 48 hours (2880 minutes) and the water level was drawn down to 30.67 meters below rest water level.

The recovery of the water level was monitored for 1140 minutes. Based on the data analysis the available drawdown is assumed to be 64 m. However, no detailed geological logs could be obtained for the hole to identify the main water strike and the pumping test did not indicate a critical drawdown. The sustainable yield of the borehole is recommended to be 2.5 L/s, pumping for 24 hours per day, with a pump installed at 150 m below ground level. Only monitoring will show if the recommended rate is correct. **Figure 8** graphically indicates the CDT and recovery data.

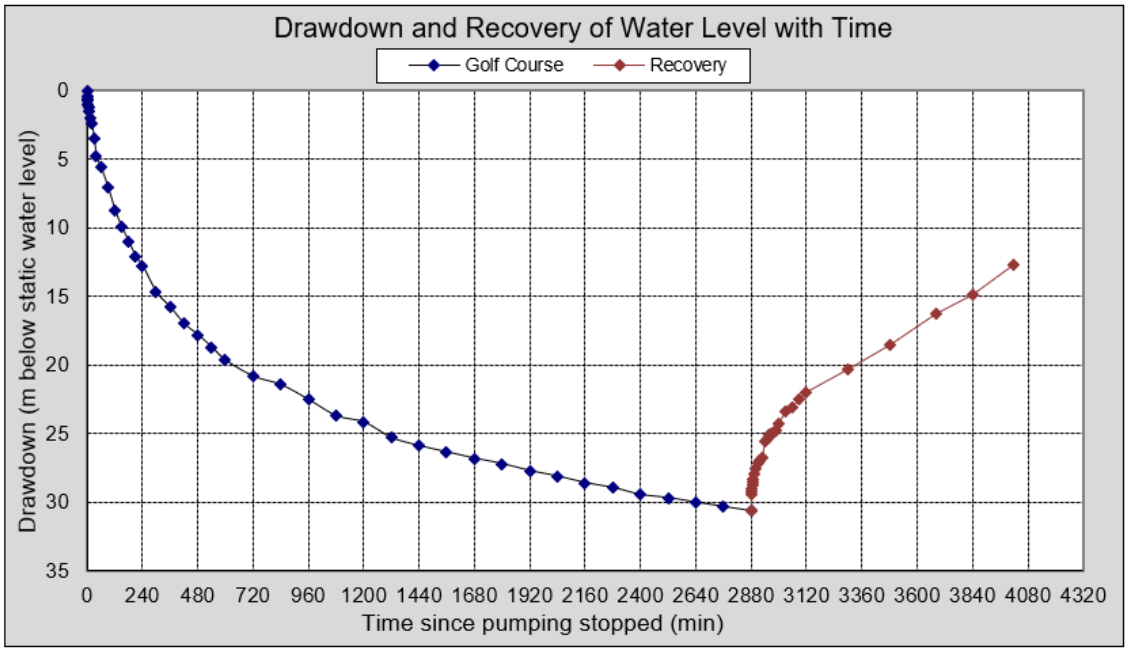


Figure 8: Constant Discharge Test and Recovery of Golf course

7.8 *Summary of results*

Table 5: Summary of existing boreholes yield test

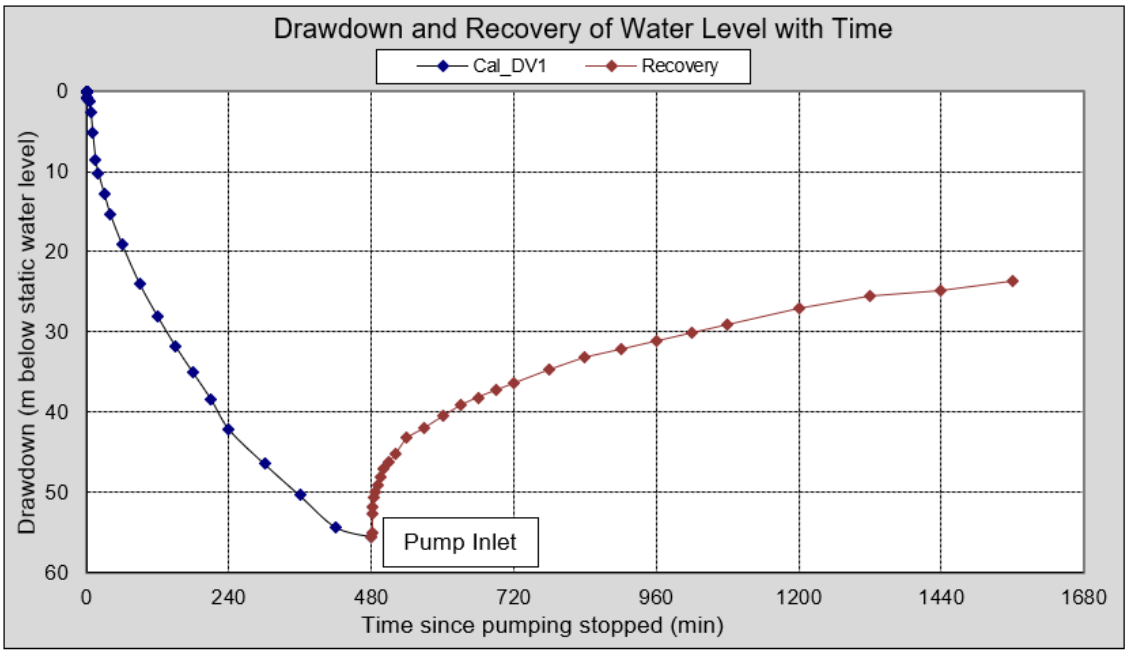
BH ID	Rest water level (mbgl)	Test pump depth (mbgl)	CDT (L/s)	CDT duration (hr)	Available drawdown (m)	Max water level reached after CDT (mbgl)	Sustainable yield (L/s)
Calvinia-Ceres Rd_BH	14.01	49	2	48	35	31	2.0
Golf_course_BH	36.39	100	3	48	51	67.06	2.5
Witwal_BH	22.9	91	10	48	67.3	42.2	6.0
Sandgat_3_BH	8.41	13.20	2.2	48	5	11.4	1.2
Sandgat_4_BH	8.59	55.1	0.85	48	33	28.37	0.8
Sandgat_5_BH	20.91	189.20	5	48	30	28.31	3.0
Breccia_BH	Not tested						
Deon_Vlok_BH	22.6	150	16	72	127m (?)	34.22	16.0

8. PUMPING TEST: EXPLORATION BOREHOLES (2018)

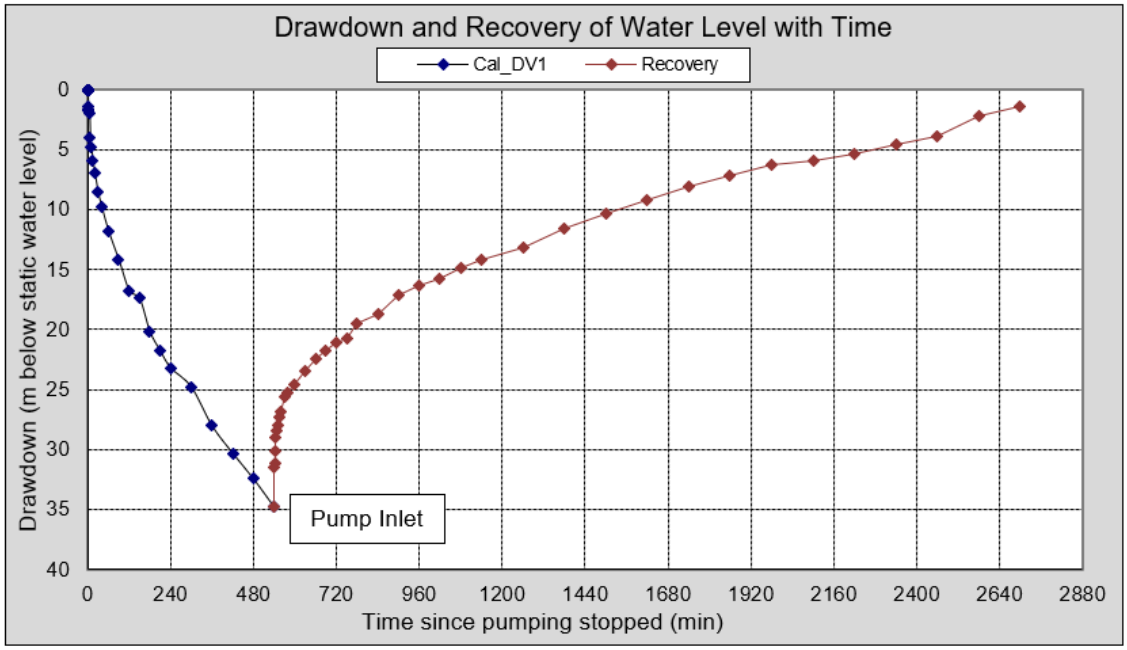
8.1 *Cal_Nat1 (Cal_DV1)*

Exploration borehole Cal_DV1 had a blow yield of around 27 L/s and was drilled to a depth of 151 m. The step test commenced on the 9 May 2018. The rest water level was 49.5 mbgl with pump installation depth at 124 mbgl. Five 100-minute steps were conducted on the borehole, the fifth step was run at 25 L/s with the water level drawing down to 55.51 m.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 22 L/s. the test was stopped prematurely as the rate proved to be too high and the water level reached pump inlet after 8 hr (480 min). The borehole was allowed to recover for 16 hrs, however, the borehole only recovered 60%. The second CDT was run at a rate of 15 L/s. Again, the rate proved too high and reached pump inlet after 8 hrs. The borehole was allowed to recover for 36 hrs. the borehole however only recovered by 45% of the original rest water level. **Figure 9 A-B** graphically indicates both the CDT and recovery data**.**



(A)



(B)

Figure 9: Constant Discharge Test and Recovery of Cal_DV1. (A) 22 L/s CDT and recovery. (B) 15 L/s CDT and Recovery.

8.2 *Cal_Nat2 (Cal_DV3)*

The testing of exploration borehole Cal_DV3 commenced on the 16 May 2018. The borehole had a blow yield of around 2.7 L/s and was drilled to a depth of 205 m. The rest water level was 41 mbgl with pump installation depth at 147 mbgl. An intended four 100-minute steps were conducted on the borehole, on the third step the water level was drawdown down to pump inlet at a rate of 3 L/s.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 0.8 L/s. this included a drawdown of 45 m after 24 hours. The borehole recovered within 3.5 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 76 m. The sustainable yield of the borehole is recommended to be 1 L/s, pumping for 24 hours per day, with a pump installed at 150 m below ground level. monitoring will show if the recommended rate is sustainable for long term use. **Figure 10** graphically indicates the CDT and recovery data.

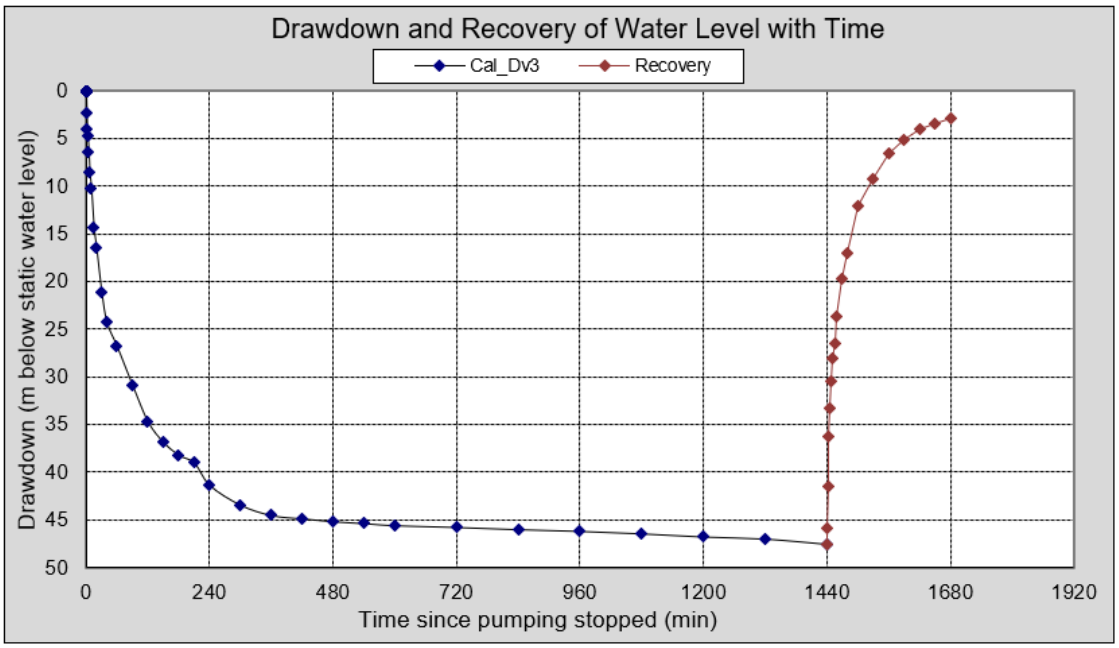


Figure 10: Constant Discharge Test (0.8 L/s) and Recovery of Cal_DV3

8.3 *Cal_Nat3 (Cal_DV4)*

The testing of exploration borehole Cal_DV4 commenced on the 20 May 2018. The borehole had a blow yield of around 2.7 L/s and was drilled to a depth of 205 m. The rest water level was 12.11 mbgl with pump installation depth at 99 mbgl. Four 100-minute steps were conducted on the borehole, the fourth step was run at 4.5 L/s with the water level drawing down to pump inlet 88 mbgl.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 2.8 L/s. this included a drawdown of 54 m after 24 hours. The borehole recovered to 83 % after 10 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 80 m. The sustainable yield of the borehole is recommended to be 1.5 L/s, pumping for 24 hours per day, with a pump installed at 100 m below ground level. monitoring will show if the recommended rate is sustainable for long term use. **Figure 11** graphically indicates the CDT and recovery data**.**

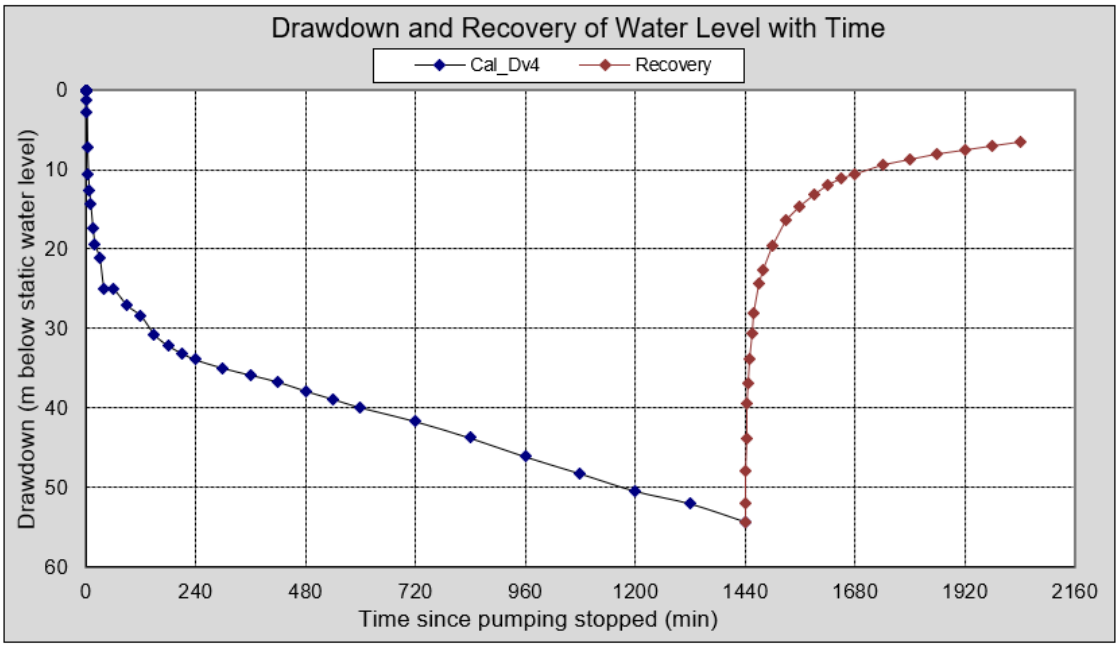


Figure 11: Constant Discharge Test (2.8 L/s) and Recovery of Cal_DV4

8.4 *Cal_KB1 (Cal_S2_3)*

The testing of exploration borehole Cal_S2_3 commenced on the 25 May 2018. The borehole had a blow yield of around 2.75 L/s and was drilled to a depth of 120 m. The rest water level was 6.92 mbgl with pump installation depth at 39.15 mbgl. Four 100-minute steps were conducted on the borehole, the fourth step attempted at rate at 4.5 L/s with the water level drawing down to pump inlet 39 mbgl.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 2.8 L/s. this included a drawdown of 23.97 m after 24 hours. The borehole recovered to 83 % after 10 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 25 m. The sustainable yield of the borehole is recommended to be 1.3 L/s, pumping for 24 hours per day, with a pump installed at 40 m below ground level. Exploration borehole Cal_S2_4 was monitored during the pumping test, the borehole showed a decrease in water level during the test. Therefore, it can be concluded that the boreholes are linked. **Figure 12** graphically indicates the CDT and recovery data.

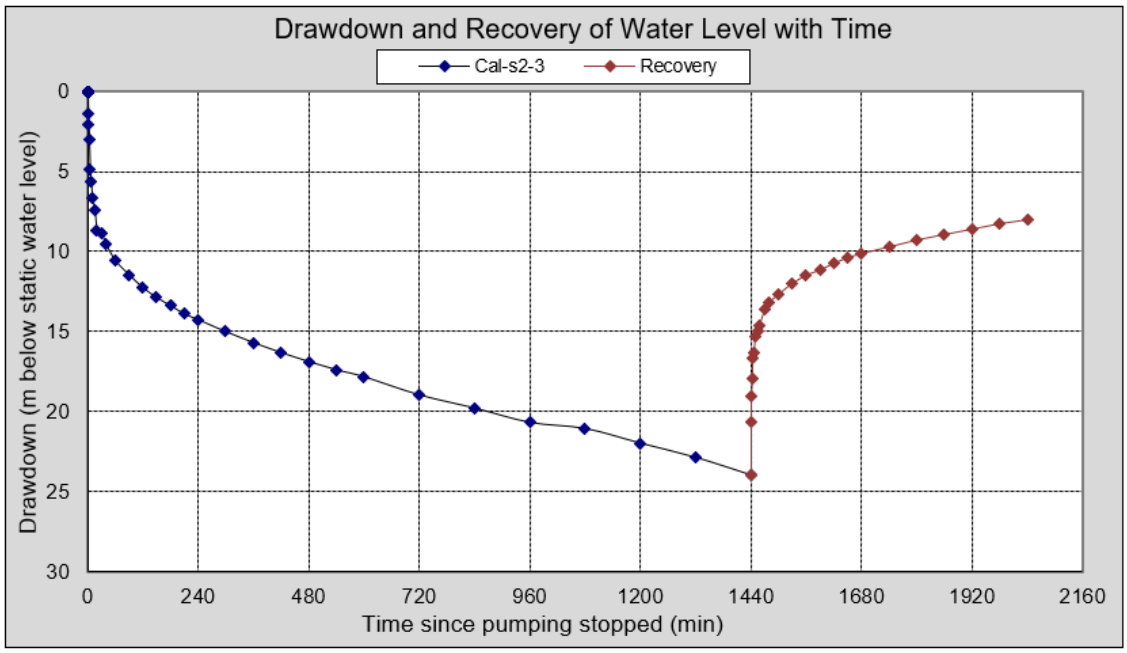


Figure 12: Constant Discharge Test (2.8 L/s) and Recovery of Cal_s2-3

8.5 *Cal_S2_4*

The testing of exploration borehole Cal_S2_4 commenced on the 25 May 2018. The borehole had a blow yield of around 4.9 L/s and was drilled to a depth of 180 m. The rest water level was 6.29 mbgl, it must be noted that the borehole was artesian after drilling and the reported rest water level is due pumping test done on Cal_S2_3 and slow recovery. The pump installation depth at 154 mbgl. Four 100-minute steps were conducted on the borehole, the fourth step rate was run at 6.8 L/s with the water level drawing down to 72.55 mbgl.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 4 L/s. this included a drawdown of 34.8 m after 24 hours. The borehole recovered to 85 % after 10 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 130 m. The sustainable yield of the borehole is recommended to be 4 L/s, pumping for 24 hours per day, with a pump installed at 150 m below ground level. Exploration borehole Cal_S2_3 was monitored during the pumping test, the borehole showed a substantial decrease in water level during the test. Based on the pumping test data, borehole Cale_S2_3 cannot be pumped at the same time as Cal_S2_4 as cone of depression caused will dewater the main Fracture at Cal_S2_3, this will make it un-useable. **Figure 13** graphically indicates the CDT and recovery data.

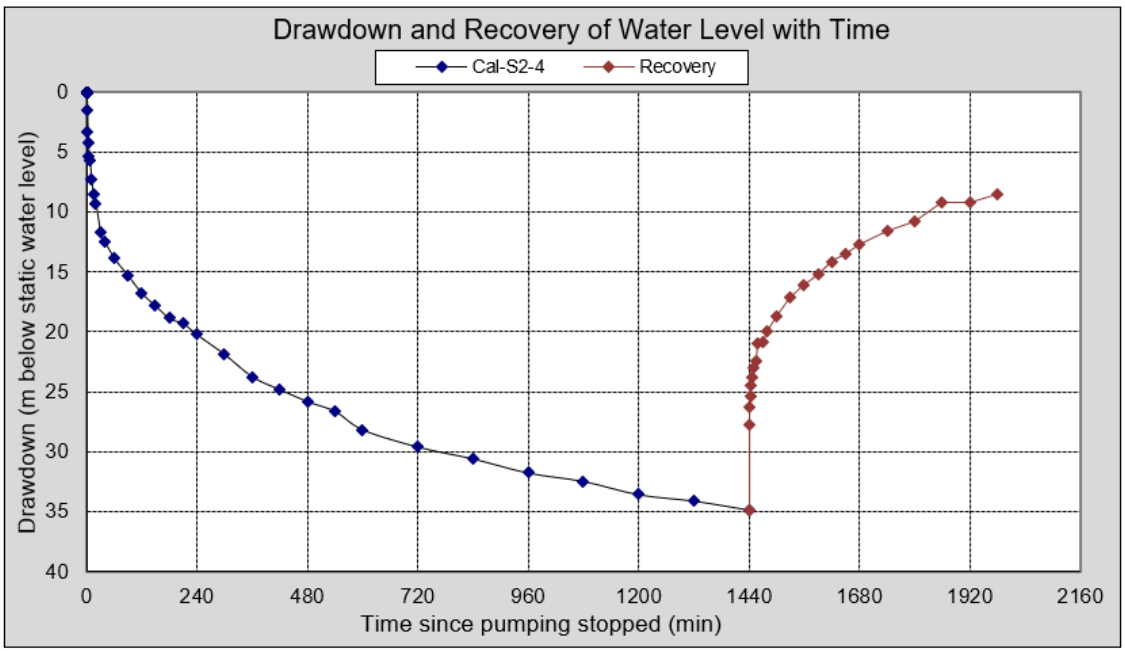


Figure 13: Constant Discharge Test (4 L/s) and Recovery of Cal-S2-4

8.6 *Cal_S2_10*

The testing of exploration borehole Cal_S2_10 commenced on the 28 June 2018. The borehole had a blow yield of around 8.8 L/s and was drilled to a depth of 151 m. The rest water level was 19.5 mbgl. The pump installation depth at 154 mbgl. Three 60-minute steps were conducted on the borehole, the duration of steps changes due time constraints. The fourth step rate was run at 19 L/s for a duration of 120-minutes during which the water level drawing down to 11.28 mbgl.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 20 L/s (Max pump rate). This included a drawdown of 18.95 m after 48 hours. The borehole recovered was rapid with a 90 % after 16 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 60 m. The sustainable yield of the borehole is recommended to be 15 L/s, pumping for 24 hours per day, with a pump installed at 80 m below ground level. Monitoring will show if the recommended rate is sustainable for long term use. **Figure 14** graphically indicates the CDT and recovery data.

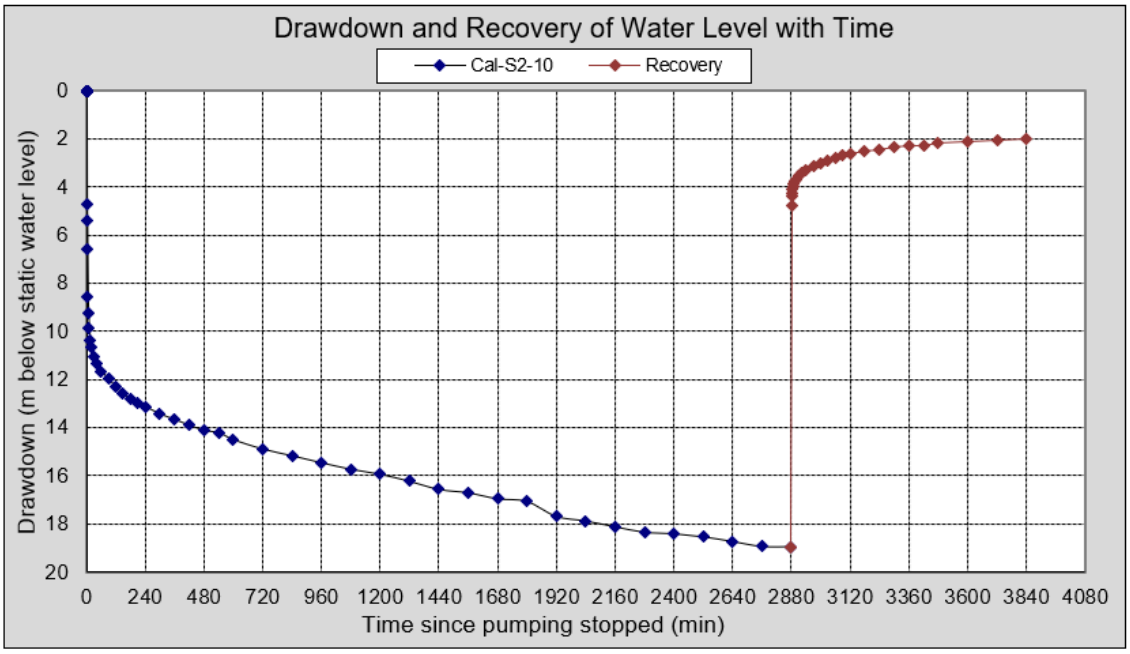


Figure 14: Constant Discharge Test (20 L/s) and Recovery of Cal-S2-10

8.7 *Cal_Nat 5*

The testing of exploration borehole Cal_Na5 commenced on the 5 July 2018. The borehole had a blow yield of around 5 L/s and was drilled to a depth of 200 m. The rest water level was 30 mbgl. The pump installation depth at 154 mbgl. Five 60-minute steps were conducted on the borehole. The fifth step rate was run at >5 L/s for a duration of 3-minutes during which the water level was drawn to pump inlet.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 5 L/s. This included a drawdown of 82.12 m after 24 hours. The borehole recovered was rapid with a 90 % after 0.5 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 107 m. The sustainable yield of the borehole is recommended to be 4.3 L/s, pumping for 24 hours per day, with a pump installed at 150 m below ground level. Monitoring will show if the recommended rate is sustainable for long term use. **Figure 15** graphically indicates the CDT and recovery data.

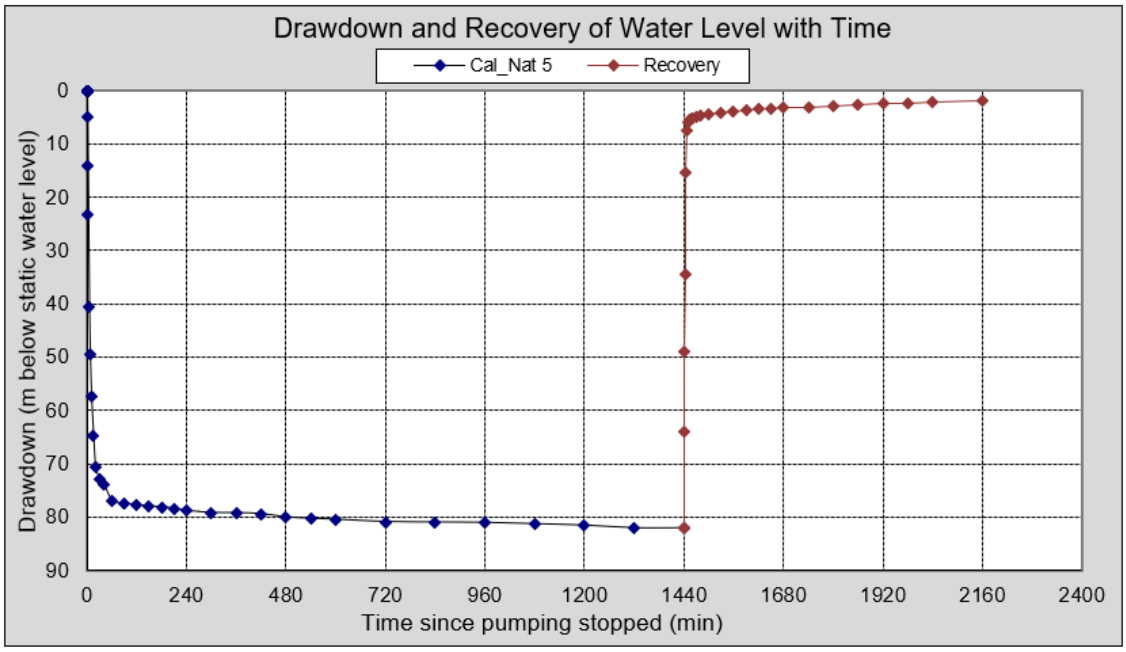


Figure 15: Constant Discharge Test (5 L/s) and Recovery of Cal_Nat 5

8.8 *Cal_Nat6*

The testing of exploration borehole Cal_Na6 commenced on the 10 July 2018. The borehole had a blow yield of around 3 L/s and was drilled to a depth of 200 m. The rest water level was 11.75 mbgl. The pump installation depth at 100 mbgl. Four 60-minute steps were conducted on the borehole. The fourth step rate was run at >5 L/s for a duration of 10-minutes during which the water level was drawn to pump inlet.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 3.5 L/s. This included a drawdown of 8 .01 m after 24 hours. The CDT rate was then increased to 4.3 L/s, the water level was drawdown to pump inlet after 3 minutes. The borehole recovered was rapid with a 90 % after 0.5 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 11 m. The sustainable yield of the borehole is recommended to be 1.2 L/s, pumping for 24 hours per day, with a pump installed at 25 m below ground level. Monitoring will show if the recommended rate is sustainable for long term use. **Figure 16** graphically indicates the CDT and recovery data.

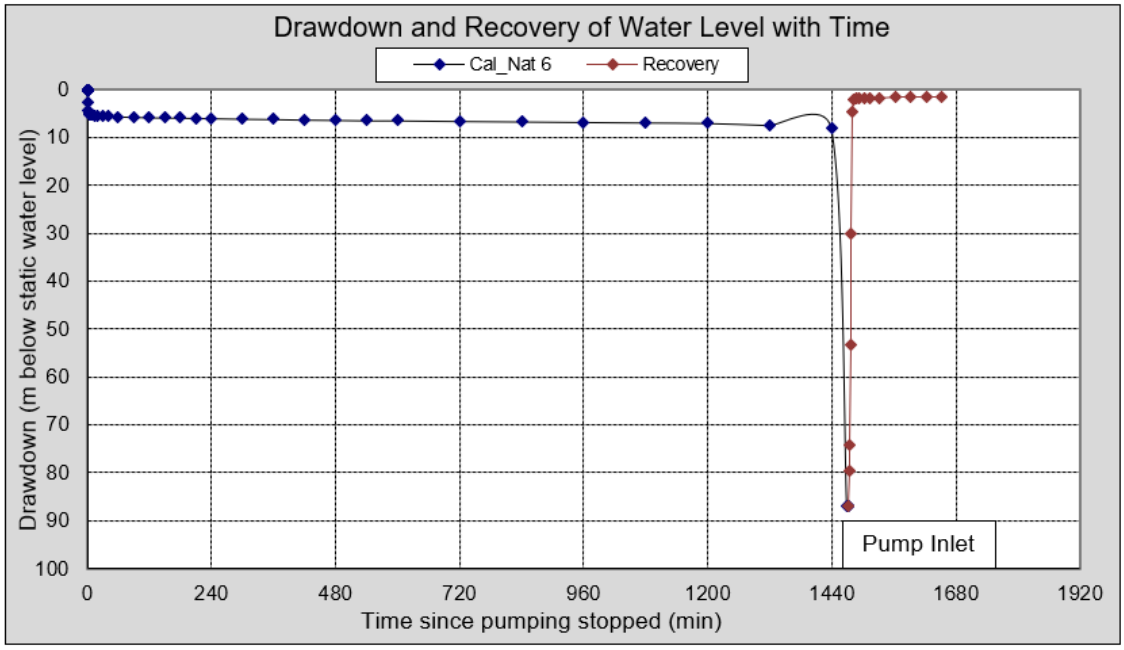


Figure 16: Constant Discharge Test (3.5 & 4.3 L/s)and Recovery of Cal_ Nat 6

8.9 *Cal_Phase3_6*

The testing of exploration borehole Cal_Phase3_6 commenced on the 28 August 2018. The borehole had a blow yield of around 25 - 30 L/s and was drilled to a depth of 111 m. The rest water level was 0.6 mbgl. The pump installation depth at 96 mbgl. Four 100-minute steps were conducted on the borehole. The fourth step rate was run at 25 L/s during which the water level drawing down to 70 mbgl.

Based on the borehole response to the Step Test and monitored recovery data, which in this case was extremely slow. After the step test the borehole recovery was monitored for 24-hrs in which the borehole only recovered to 55 %. A CDT was conducted at an abstraction rate of 12 L/s. This included a drawdown of 43.21 m after 36 hours. The borehole recovered was monitored for 24-hrs with 13 % recovery after cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 95 m. The sustainable yield of the borehole is recommended to be 2.5 L/s, pumping for 24 hours per day, with a pump installed at 96 m below ground level. Monitoring will show if the recommended rate is sustainable for long term use. **Figure 17** graphically indicates the CDT and recovery data.

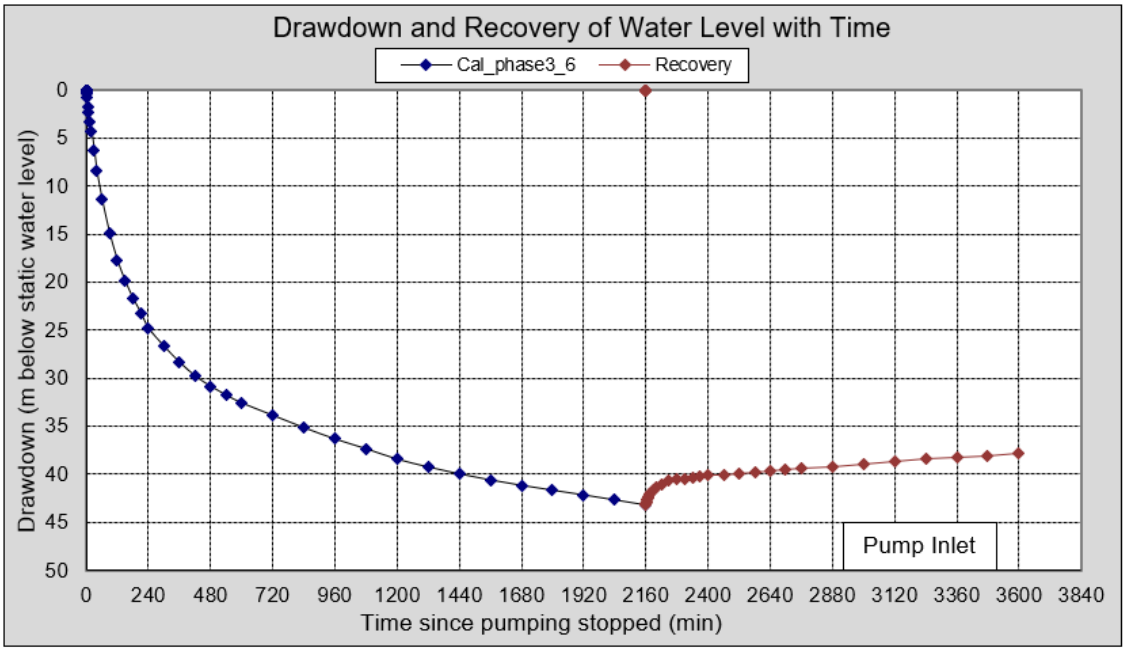


Figure 17: Constant Discharge Test (12 L/s) and Recovery of Cal_phase3_6

8.10 *Cal_Phase3_4A*

The testing of exploration borehole Cal_Phase3_4A commenced on the 21 August 2018. The borehole had a blow yield of around > 30 L/s and was drilled to a depth of 77 m, drilling stopped due to high water pressure. The rest water level was 20.16 mbgl. The pump installation depth at 70 mbgl (as recommended by the driller). Four 100-minute steps were conducted on the borehole. The fourth step rate was run at 30 L/s during which the water level drawing down to 3.6 mbgl.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 28 L/s (Pump maximum). This included a drawdown of 7.08 m after 48 hours. The borehole recovery was moderate with a 70 % after 24-hrs of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 55 m. The sustainable yield of the borehole is recommended to be 15 L/s, pumping for 24 hours per day, with a pump installed at 70 m below ground level. It is recommended that a pump be installed that is able to abstracting 25 L/s. Yield analysis data, indicated 25 L/s to be the maximum yield range, however, this will require long term monitoring to determine sustainability. **Figure 18** graphically indicates the CDT and recovery data.

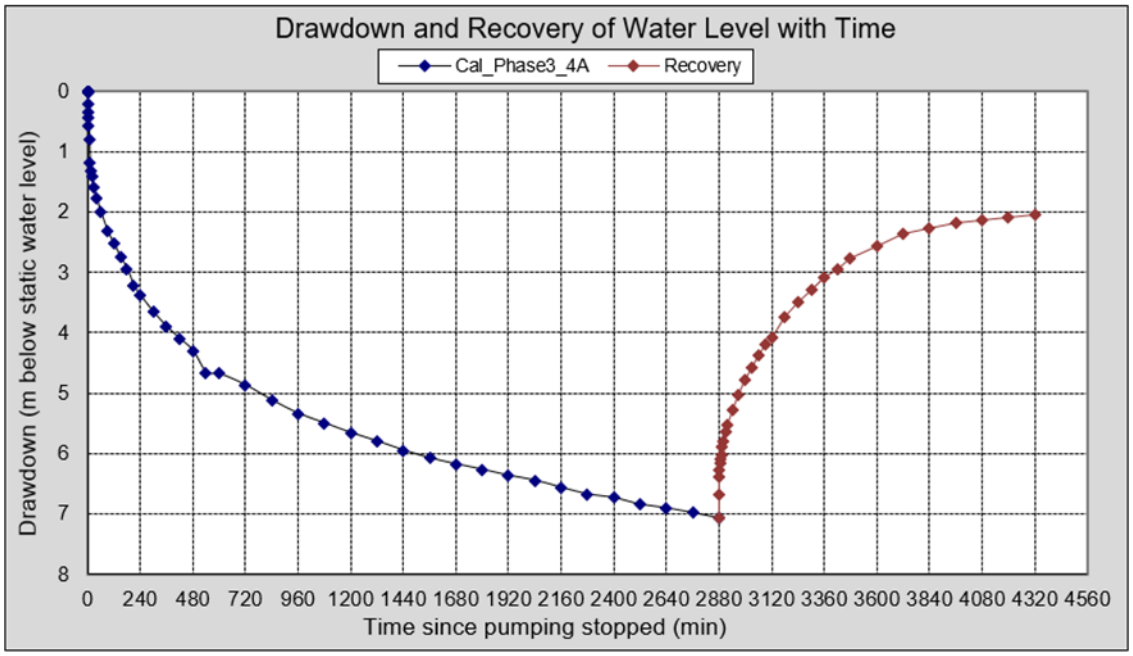


Figure 18: Constant Discharge Test (28 L/s) and Recovery of Cal_Phase3_4A

8.11 *Cal_Phase3_9*

The testing of exploration borehole Cal_Phase3_9 commenced on the 31 August 2018. The borehole had a blow yield of around >25 L/s and was drilled to a depth of 117 m. The rest water level was 22.62 mbgl. The pump installation depth at 96 mbgl. Four 100-minute steps were conducted on the borehole. The fourth step rate was run at 30 L/s during which the water level drawdown was 7.70 mbgl.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 28 L/s. This included a drawdown of 14.78 m after 48 hours. The borehole recovery was moderate with a 54 % after 24 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 75 m. The sustainable yield of the borehole is recommended to be 15 L/s, pumping for 24 hours per day, with a pump installed at 96 m below ground level. Monitoring will show if the recommended rate is sustainable for long term use. **Figure 19** graphically indicates the CDT and recovery data.

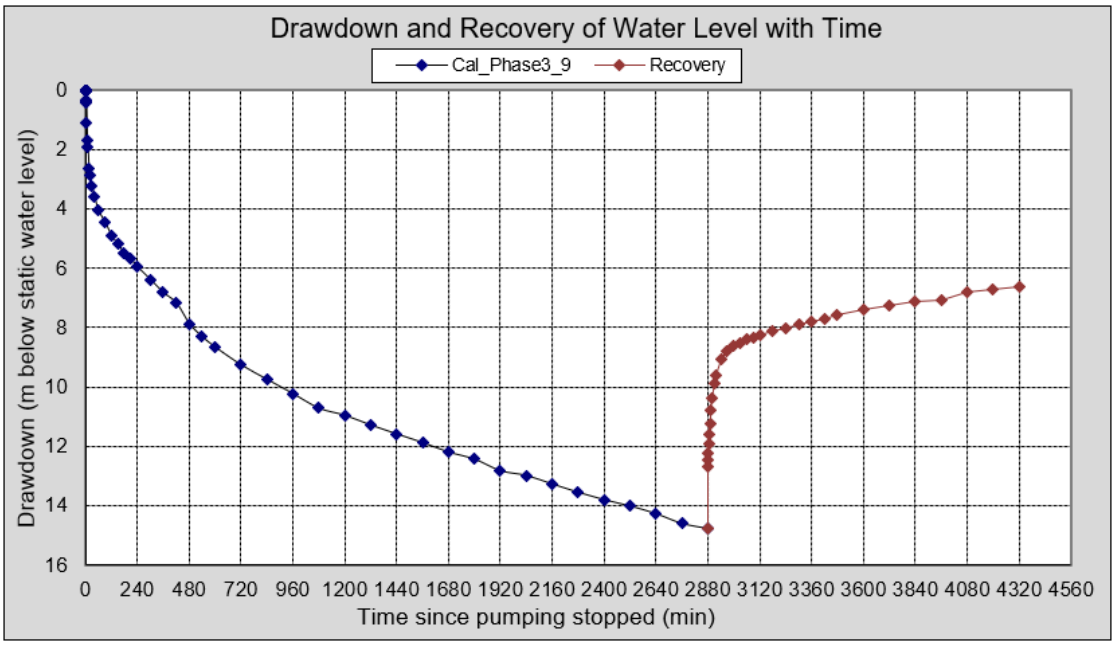


Figure 19: Constant Discharge Test (28 L/s) and Recovery of Cal_Phase3_9

8.12 *Re-Drill 39602*

The testing of exploration borehole Re-Drill 39602 commenced on the 16 August 2018. The borehole had a blow yield of around 25 L/s and was drilled to a depth of 151 m. The rest water level was 8.79 mbgl. The pump installation depth at 79.25 mbgl. Four 60-minute steps were conducted on the borehole. The fourth step rate was run at >11 L/s during which the water level drawing down to 62.17 mbgl.

Based on the borehole response to the Step Test, a CDT was conducted at an abstraction rate of 7 L/s. This included a drawdown of 28 .22 m after 48 hours. The borehole recovery was rapid with a 95 % after 2.5 hours of the cessation of pumping.

Based on the data analysis the available drawdown is assumed to be 50 m. The sustainable yield of the borehole is recommended to be 4.5 L/s, pumping for 24 hours per day, with a pump installed at 80 m below ground level. Monitoring will show if the recommended rate is sustainable for long term use. **Figure 20** graphically indicates the CDT and recovery data.

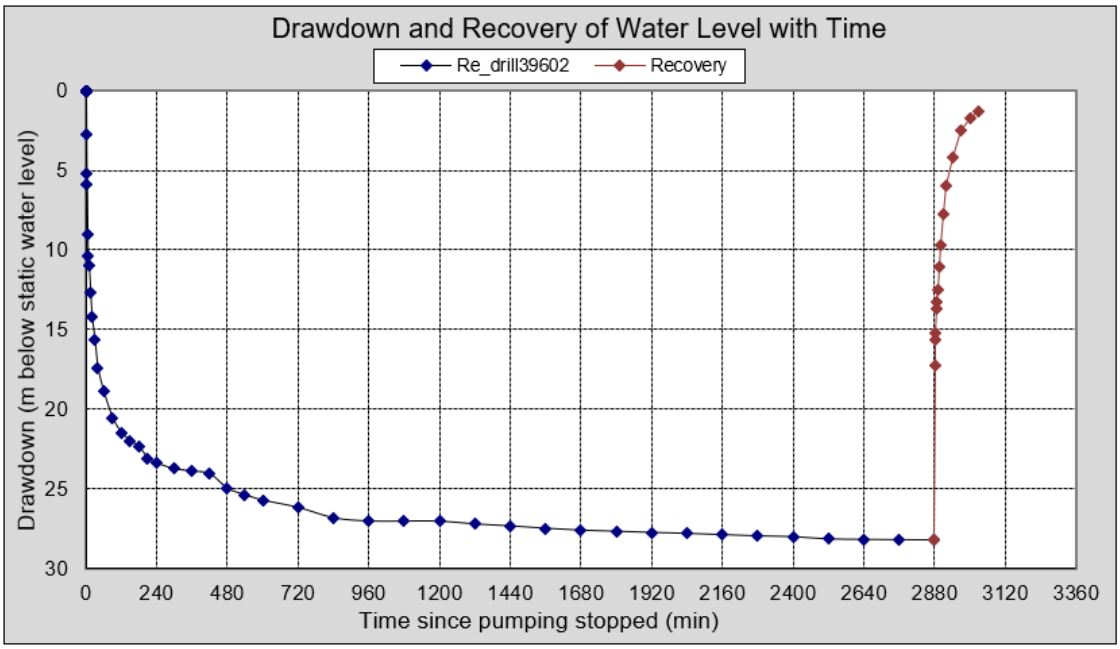


Figure 20: Constant Discharge Test (7 L/s) and Recovery of Re_drill39602

8.13 *summary of results*

Table 6: Summary of exploration boreholes yield test

Borehole Name	Latitude (DD)	Longitude (DD)	Rest water level (mbgl)	Test pump depth (mbgl)	CDT (L/s)	CDT duration (hr)	Available drawdown (m)	Max water level reached after CDT (mbgl)	Sustainable yield (L/s)
Cal_DV1	-31.455414	19.773937	49.5	150	15	2 x 8	74.5	Pump inlet	5
Cal_DV3	-31.430694	19.788300	41	150	0.8	24	76	45	0.8
Cal_DV4	-31.411629	19.775115	12.11	100	2.8	24	80	45	1
Cal-S2-3	-31.651334	19.801571	6.92	35	2.8	24	25	23.97	1.3
Cal-S2-4	-31.650359	19.801047	6.29	150	4	24	130	34.8	4
Cal_S2_10	-31.617462	19.744726	19.5	80	20	48	60	18.95	15
Cal_Nat5	-31.435236	19.784485	30	178	5	24	107	82.12	4.3
Cal_Nat6	-31.451284	19.770548	11.75	100	3.5	24	11	8	1.5
Cal_Phase3_6	-31.357725	19.691500	0.6	96	12	36	95	43.21	2
Cal_Phase3_4A	-31.401169	19.556679	20	70	28	48	55	7.08	15
Cal_Phase3_9	-31.632714	19.756781	22.62	96	28	48	74	14.78	15
Re-Drill 39602	-31.372864	19.970834	8.79	79	7	48	50	28.22	4.5

9. CHEMISTRY

Groundwater samples were collected at the end of all the yield test for each borehole. The samples were submitted for inorganic chemical analysis to a SANAS accredited laboratory. Existing production boreholes samples were sent to Bemlab in the Western Cape. Exploration borehole samples were sent to A.L Abbot & Associates in the Western Cape, the change in lab was due to different phases and budget. The certificate of analysis of the samples is presented in **Appendix C**. The chemistry results obtained have been classified according to the SANS241-1: 2015 standards for domestic water. **Table 7** enables an evaluation of the water quality with regards to the various limits. **Table 8** and **Table 9** presents the water chemistry analysis results, colour coded according to the SANS241-1: 2015 drinking water assessment standards.

Table 7: Classification table for specific limits

Acute Health
Aesthetic
Chronic health
Operational
Acceptable

9.1 *Groundwater quality analysis for existing production boreholes*

The chemistry results obtained have been classified according to the SANS241-1: 2015 standards for domestic water. The groundwater chemistry analysis results, colour coded according to the SANS241-1: 2015 drinking water assessment standards are listed in the **Table 8**.

Table 8: Water chemistry of existing production boreholes

Analyses	Ceres_RD	Sandgat_4	Golf_course	Witwal_BH	Sandgat_3	Deon_Vlok	Sandgat_5	SANS 241-1:2015
pH (at 25 °C)	7.6	7.4	7.4	8.4	7.5	7.5	7.0	≥5 - ≤9.7 Operational
Conductivity (mS/m) (at 25 °C)	59.2	598.6	214.0	93.0	605.0	150.0	279.0	≤170 Aesthetic
Total Dissolved Solids (mg/l)	379.0	3831.0	1283.0	561.0	3600.0	901.0	1670.0	≤1200 Aesthetic
Turbidity (NTU)	0.6	0.3	1.4	0.4	0.2	1.4	0.4	≤5 Aesthetic ≤1 Operational
Colour (mg/l as Pt)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤15 Aesthetic
Sodium (mg/l as Na)	38.7	706.9	190.3	175.6	929.4	128.3	305.7	≤200 Aesthetic
Potassium (mg/l as K)	1.4	1.0	5.1	7.4	1.8	3.1	4.6	N/A
Magnesium (mg/l as Mg)	12.5	118.8	60.4	0.4	139.1	55.3	70.8	N/A
Calcium (mg/l as Ca)	52.5	227.6	127.7	0.0	131.8	92.1	116.1	N/A
Chloride (mg/l as Cl)	51.0	1420.0	542.8	157.3	1564.2	225.3	761.9	≤300 Aesthetic
Sulphate (mg/l as SO4)	26.0	664.0	112.0	94.0	769.0	177.0	194.0	≤250 Aesthetic ≤500 Acute Health
Nitrate Nitrogen (mg/l as N)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	≤11 Acute Health
Nitrite Nitrogen (mg/l as N)	0.4	0.8	0.0	0.0	0.6	0.0	0.6	≤0.9 Acute Health
Ammonia Nitrogen (mg/l as N)	0.3	0.4	0.3	0.6	0.3	0.0	0.3	≤1.5 Aesthetic
Total Alkalinity (mg/l as CaCO3)	284.0	511.0	167.9	181.4	388.0	278.6	132.5	N/A
Fluoride (mg/l as F)	0.5	0.2	0.2	1.4	0.0	0.8	0.0	≤1.5 Chronic Health
Aluminium (mg/l as Al)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.3 Operational
Vanadium (mg/l as V)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A
Total Chromium (mg/l as Cr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.05 Chronic Health
Manganese (mg/l as Mn)	0.0	0.0	0.0	0.0	0.0	0.0	0.4	≤0.1 Aesthetic ≤0.4 Chronic Health
Iron (mg/l as Fe)	0.1	0.1	0.2	0.2	0.2	0.2	0.1	≤0.3 Aesthetic ≤2 Chronic Health
Cobalt (mg/l as Co)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A
Nickel (mg/l as Ni)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.07 Chronic Health
Copper (mg/l as Cu)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤2 Chronic Health
Zinc (mg/l as Zn)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	≤5 Aesthetic
Arsenic (mg/l as As)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.01 Chronic Health
Selenium (mg/l as Se)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.04 Chronic Health
Cadmium (mg/l as Cd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.003 Chronic Health
Antimony (mg/l as Sb)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.02 Chronic Health
Mercury (mg/l as Hg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.006 Chronic Health
Lead (mg/l as Pb)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.01 Chronic Health
Uranium (mg/l as U)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.03 Chronic Health
Cyanide (mg/l as CN-)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	≤0.2 Acute Health

9.2 *Groundwater quality analysis on newly drilled exploration boreholes 2018*

The chemistry results obtained have been classified according to the DWAF (1998) standards for domestic water. **Table 9** enables an evaluation of the water quality with regards to the various parameters measured (DWAF, 1998). **Table 10** presents the water chemistry analysis results colour coded according to the DWAF drinking water assessment standards.

Table 9: 2018 exploration borehole results classified according the SANS241-1:2015

Analyses	DV1	DV3	DV4	Cal-NAT5	Cal-NAT6	CalS2-3	SANS 241-1:2015
pH (at 25 ºC)	8.4	9.6	8.3	8.2	7.4	9.2	≥5 - ≤9.7 Operational
Conductivity (mS/m) (at 25 ºC)	54.5	49.5	73.5	45.0	60.5	70.5	≤170 Aesthetic
Total Dissolved Solids (mg/l)	361.0	327.0	495.0	265.0	381.0	474.0	≤1200 Aesthetic
Turbidity (NTU)	2.1	2.0	10.3	0.4	0.13	8.8	≤5 Aesthetic ≤1 Operational
Colour (mg/l as Pt)	<4	<4	<4	<4	<4	<4	≤15 Aesthetic
Sodium (mg/l as Na)	86.0	76.1	116.0	70.8	53.5	125.0	≤200 Aesthetic
Potassium (mg/l as K)	0.7	0.5	1.4	0.7	0.7	1.2	N/A
Magnesium (mg/l as Mg)	<1.1	<1.1	6.4	1.7	18.9	<1.1	N/A
Calcium (mg/l as Ca)	5.0	3.4	16.2	6.7	41.6	2.8	N/A
Chloride (mg/l as Cl)	66.4	89.9	60.7	41.7	36.6	58.1	≤300 Aesthetic
Sulphate (mg/l as SO4)	19.0	4.3	7.9	6.6	27.2	10.0	≤250 Aesthetic ≤500 Acute Health
Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	<0.2	0.2	<0.20	<0.2	0.3	≤12 Acute Health
Combined Nitrate plus Nitrite (mg/l as N)	0.22	0.22	0.23	0.22	0.22	0.23	≤1.0
Nitrate Nitrogen (mg/l as N)	<0.2	<0.2	<0.2	<0.20	<0.2	<0.2	≤11 Acute Health
Nitrite Nitrogen (mg/l as N)	<0.2	<0.2	<0.2	<0.20	<0.2	<0.2	≤0.9 Acute Health
Ammonia Nitrogen (mg/l as N)	0.20	0.28	0.23	<0.10	<0.1	0.47	≤1.5 Aesthetic
Total Alkalinity (mg/l as CaCO3)	105.0	36.3	285.0	124.0	222.0	254.0	N/A
Fluoride (mg/l as F)	3.3	6.8	3.1	5.1	1.3	3.6	≤1.5 Chronic Health
Aluminium (mg/l as Al)	0.108	0.092	0.187	0.039	<0.012	0.323	≤0.3 Operational
Total Chromium (mg/l as Cr)	<0.007	<0.007	0.014	<0.007	<0.007	0.0	≤0.05 Chronic Health
Manganese (mg/l as Mn)	<0.019	<0.019	0.037	<0.019	0.1	<0.019	≤0.1 Aesthetic ≤0.4 Chronic Health
Iron (mg/l as Fe)	0.080	0.083	0.175	<0.024	<0.024	0.294	≤0.3 Aesthetic ≤2 Chronic Health
Nickel (mg/l as Ni)	0.006	0.005	0.004	0.004	0.004	0.004	≤0.07 Chronic Health
Copper (mg/l as Cu)	0.016	0.014	0.015	<0.006	<0.006	0.015	≤2 Chronic Health
Zinc (mg/l as Zn)	0.020	0.007	0.010	0.003	0.003	0.006	≤5 Aesthetic
Arsenic (mg/l as As)	0.167	<0.003	<0.003	<0.003	<0.003	<0.003	≤0.01 Chronic Health
Selenium (mg/l as Se)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	≤0.04 Chronic Health
Cadmium (mg/l as Cd)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	≤0.003 Chronic Health
Antimony (mg/l as Sb)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	≤0.02 Chronic Health
Mercury (mg/l as Hg)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	≤0.006 Chronic Health
Lead (mg/l as Pb)	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	≤0.01 Chronic Health
Uranium (mg/l as U)	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	≤0.03 Chronic Health
Cyanide (mg/l as CN-)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	≤0.2 Acute Health
Total Organic Carbon (mg/l as C)	13.2	2.1	1.0	0.82	0.58	0.98	N/A

Analyses	CalS2-4	CalS2-10	Cal-Ph3-4	Cal-Ph-3-6	Cal-Ph-3-9	Cal-39602-redrill	SANS 241-1:2015
pH (at 25 ºC)	9.8	7.4	7.5	9.5	8.6	8.1	≥5 - ≤9.7 Operational
Conductivity (mS/m) (at 25 ºC)	74.0	127.0	173.0	48.5	75.5	175.0	≤170 Aesthetic
Total Dissolved Solids (mg/l)	488.0	823.0	1354.0	377.0	553.0	1381.0	≤1200 Aesthetic
Turbidity (NTU)	7.20	0.4	82.0	0.6	0.2	0.5	≤5 Aesthetic ≤1 Operational
Colour (mg/l as Pt)	6.0	<4	<4	5.0	<4	5.0	≤15 Aesthetic
Sodium (mg/l as Na)	127.0	108.0	95.7	77.1	77.9	160.0	≤200 Aesthetic
Potassium (mg/l as K)	1.0	2.9	6.2	0.6	2.8	2.3	N/A
Magnesium (mg/l as Mg)	<1.1	28.0	92.7	<1.1	20.1	58.3	N/A
Calcium (mg/l as Ca)	0.4	97.0	130.0	5.7	31.8	80.2	N/A
Chloride (mg/l as Cl)	66.0	188.0	96.9	96.2	98.1	307.0	≤300 Aesthetic
Sulphate (mg/l as SO4)	5.5	100.0	616.0	4.4	18.0	118.0	≤250 Aesthetic ≤500 Acute Health
Nitrate & Nitrite Nitrogen (mg/l as N)	0.2	<0.2	<0.2	<0.20	<0.20	2.1	≤12 Acute Health
Combined Nitrate plus Nitrite (mg/l as N)	0.22	0.22	0.22	0.22	0.22	0.39	≤1.0
Nitrate Nitrogen (mg/l as N)	<0.2	<0.2	<0.2	<0.2	<0.2	1.9	≤11 Acute Health
Nitrite Nitrogen (mg/l as N)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	≤0.9 Acute Health
Ammonia Nitrogen (mg/l as N)	0.31	<0.1	<0.1	<0.1	<0.1	<0.1	≤1.5 Aesthetic
Total Alkalinity (mg/l as CaCO3)	238.0	247.0	96.4	41.3	201.0	281.0	N/A
Fluoride (mg/l as F)	7.2	1.6	1.5	3.4	1.8	0.9	≤1.5 Chronic Health
Aluminium (mg/l as Al)	0.238	<0.012	<0.012	0.020	0.141	<0.012	≤0.3 Operational
Total Chromium (mg/l as Cr)	0.011	<0.007	<0.007	<0.007	<0.007	<0.007	≤0.05 Chronic Health
Manganese (mg/l as Mn)	<0.019	<0.019	1.0	<0.019	<0.019	<0.019	≤0.1 Aesthetic ≤0.4 Chronic Health
Iron (mg/l as Fe)	0.296	<0.024	22.4	0.027	0.053	<0.024	≤0.3 Aesthetic ≤2 Chronic Health
Nickel (mg/l as Ni)	0.004	0.005	0.010	<0.001	<0.001	<0.001	≤0.07 Chronic Health
Copper (mg/l as Cu)	0.016	<0.006	<0.006	<0.006	<0.006	<0.006	≤2 Chronic Health
Zinc (mg/l as Zn)	0.006	0.003	0.004	<0.001	0.006	0.003	≤5 Aesthetic
Arsenic (mg/l as As)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	≤0.01 Chronic Health
Selenium (mg/l as Se)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	≤0.04 Chronic Health
Cadmium (mg/l as Cd)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	≤0.003 Chronic Health
Antimony (mg/l as Sb)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	≤0.02 Chronic Health
Mercury (mg/l as Hg)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	≤0.006 Chronic Health
Lead (mg/l as Pb)	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	≤0.01 Chronic Health
Uranium (mg/l as U)	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	≤0.03 Chronic Health
Cyanide (mg/l as CN-)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	≤0.2 Acute Health
Total Organic Carbon (mg/l as C)	0.79	0.52	<0.10	<0.01	<0.01	40.0	N/A

Table 10: Classification table for the groundwater results (DWAF, 1998)

Blue	**(Class 0)**	**Ideal water quality** - suitable for lifetime use.
Green	**(Class I)**	**Good water quality** - suitable for use, rare instances of negative effects.
Yellow	**(Class II)**	**Marginal water quality** - conditionally acceptable. Negative effects may occur.
Red	**(Class III)**	**Poor water quality** - unsuitable for use without treatment. Chronic effects may occur.
Purple	**(Class IV)**	**Dangerous water quality** - totally unsuitable for use. Acute effects may occur.

Table 11: Classified existing production borehole results

Sample Marked :	Ceres_RD	Sandgat_4	Golf_course	Witwal_BH	Sandgat_3	Deon_Vlok	Sandgat_5	DWA (1998) Drinking Water Assessment Guide				
								Class 0	Class I	Class II	Class III	Class IV
pH	7.6	7.4	7.4	8.4	7.5	7.5	7	5-9.5	4.5-5 & 9.5-10	4-4.5 & 10-10.5	3-4 & 10.5-11	< 3 & >11
Conductivity (mS/m)	59.2	598.6	214	93	605	150	279	<70	70-150	150-370	370-520	>520
Turbidity (NTU)	0.6	0.34	1.36	0.38	0.23	1.41	0.36	<0.1	0.1-1	1.0-20	20-50	>50
	mg/L											
Total Dissolved Solids	379	3831	1283	561	3600	901	1670	<450	450-1000	1000-2400	2400-3400	>3400
Sodium (as Na)	38.7	706.9	190.3	175.6	929.4	128.3	305.7	<100	100-200	200-400	400-1000	>1000
Potassium (as K)	1.4	1	5.1	7.4	1.8	3.1	4.6	<25	25-50	50-100	100-500	>500
Magnesium (as Mg)	12.5	118.8	60.4	0.4	139.1	55.3	70.8	<70	70-100	100-200	200-400	>400
Calcium (as Ca)	52.5	227.6	127.7	0	131.8	92.1	116.1	<80	80-150	150-300	>300	
Chloride (as Cl)	51	1420	542.8	157.3	1564.2	225.3	761.9	<100	100-200	200-600	600-1200	>1200
Sulphate (as SO4)	26	664	112	94	769	177	194	<200	200-400	400-600	600-1000	>1000
Nitrate& Nitrite (as N)	0	0	0	0	0	0	0	<6	6.0-10	10.0-20	20-40	>40
Fluoride (as F)	0.5	0.2	0.2	1.4	0	0.8	0	<0.7	0.7-1.0	1.0-1.5	1.5-3.5	>3.5
Manganese (as Mn)	0.03	0	0	0	0	0	0.38	<0.1	0.1-0.4	0.4-4	4.0-10.0	>10
Iron (as Fe)	0.1	0.1	0.2	0.2	0.2	0.2	0.1	<0.5	0.5-1.0	1.0-5.0	5.0-10.0	>10
Copper (as Cu)	0	0	0	0	0	0	0	<1	1-1.3	1.3-2	2.0-15	>15
Zinc (as Zn)	0	0	0	0	0	0	0.15	<20	>20			
Arsenic (as As)	0.007	0.005	0	0	0.0084	0	0.0072	<0.010	0.01-0.05	0.05-0.2	0.2-2.0	>2.0
Cadmium (as Cd)	0	0	0	0	0	0	0	<0.003	0.003-0.005	0.005-0.020	0.020-0.050	>0.050
Hardness (as CaCO3)	0	0	0	0	0	0	0	<200	200-300	300-600	>600	

Table 12: Classified exploration borehole results

Sample Marked :	Cal_DV1	Cal_DV3	Cal_DV4	Cal-NAT5	Cal-NAT6	CalS2-3	CalS2-4	CalS2-10	Cal-Ph3-4	Cal-Ph-3-6	Cal-Ph-3-9	Cal-39602-redrill	DWA (1998) Drinking Water Assessment Guide				
													Class 0	Class I	Class II	Class III	Class IV
pH	8.39	9.59	8.32	8.18	7.36	9.22	9.83	7.39	7.45	9.45	8.55	8.09	5-9.5	4.5-5 & 9.5-10	4-4.5 & 10-10.5	3-4 & 10.5-11	< 3 & >11
Conductivity (mS/m)	54.5	49.5	73.5	45	60.5	70.5	74	127	173	48.5	75.5	175	<70	70-150	150-370	370-520	>520
Turbidity (NTU)	2.1	2	10.3	0.37	0.13	8.8	7.2	0.37	82	0.6	0.18	0.52	<0.1	0.1-1	1.0-20	20-50	>50
	mg/L																
Total Dissolved Solids	361	327	495	265	381	474	488	823	1354	377	553	1381	<450	450-1000	1000-2400	2400-3400	>3400
Sodium (as Na)	86	76.1	116	70.8	53.5	125	127	108	95.7	77.1	77.9	160	<100	100-200	200-400	400-1000	>1000
Potassium (as K)	0.73	0.52	1.4	0.68	0.67	1.2	1	2.9	6.2	0.63	2.8	2.3	<25	25-50	50-100	100-500	>500
Magnesium (as Mg)	<1.1	<1.1	6.4	1.7	18.9	<1.1	<1.1	28	92.7	<1.1	20.1	58.3	<70	70-100	100-200	200-400	>400
Calcium (as Ca)	5	3.4	16.2	6.7	41.6	2.8	0.43	97	130	5.7	31.8	80.2	<80	80-150	150-300	>300	
Chloride (as Cl)	66.4	89.9	60.7	41.7	36.6	58.1	66	188	96.9	96.2	98.1	307	<100	100-200	200-600	600-1200	>1200
Sulphate (as SO4)	19	4.3	7.9	6.6	27.2	10	5.5	100	616	4.4	18	118	<200	200-400	400-600	600-1000	>1000
Nitrate& Nitrite (as N)	<0.20	<0.2	0.24	<0.20	<0.2	0.26	0.22	<0.2	<0.2	<0.20	<0.20	2.1	<6	6.0-10	10.0-20	20-40	>40
Fluoride (as F)	3.3	6.8	3.1	5.1	1.3	3.6	7.2	1.6	1.5	3.4	1.8	0.91	<0.7	0.7-1.0	1.0-1.5	1.5-3.5	>3.5
Manganese (as Mn)	<0.019	<0.019	0.037	<0.019	0.067	<0.019	<0.019	<0.019	1.005	<0.019	<0.019	<0.019	<0.1	0.1-0.4	0.4-4	4.0-10.0	>10
Iron (as Fe)	0.08	0.083	0.175	<0.024	<0.024	0.294	0.296	<0.024	22.4	0.027	0.053	<0.024	<0.5	0.5-1.0	1.0-5.0	5.0-10.0	>10
Copper (as Cu)	0.016	0.014	0.015	<0.006	<0.006	0.015	0.016	<0.006	<0.006	<0.006	<0.006	<0.006	<1	1-1.3	1.3-2	2.0-15	>15
Zinc (as Zn)	0.02	0.007	0.01	0.003	0.003	0.006	0.006	0.003	0.004	<0.001	0.006	0.003	<20	>20			
Arsenic (as As)	0.167	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.010	0.01-0.05	0.05-0.2	0.2-2.0	>2.0
Cadmium (as Cd)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	0.003-0.005	0.005-0.020	0.020-0.050	>0.050

From the chemical results presented in **Table 11** and **Table 12** it is clear that the groundwater from the boreholes are predominantly marginal quality in terms of dissolved mineral concentrations (which is in line with the expected groundwater quality of the area). There is however, elevated levels of fluoride, sulphate, chloride and sodium in some of the groundwater samples analysed. Exploration borehole Cal_Phase3_4A water sampled showed high levels of iron. Boreholes selected for production boreholes will require treatment if used for regular human consumption.

10. DISCUSSION

The geohydrology of the area has been characterized by means of a historical data. GEOSS identified four new sites to be explored for groundwater potential. Exploration boreholes were drilled on geological structures and geophysical anomalies identified through both onsite and regional data sets. A total of 31 exploration boreholes were drilled, 12 boreholes met the yield requirements and were yield tested for sustainable yield and groundwater chemistry.

GEOSS identified two areas that could be potentially developed into wellfield for bulk water supply, Ceres Karroo area (Kruitberg) and the North-west region (study area 4).

Overall the groundwater quality is classified as good to moderate. The fluoride concentration of all the tested sites is a concern (of varying degrees) and should be addressed before production begins. Exploration borehole Cal_Phase3_4A had an anomalous high iron concentration of 22 mg/L, typical iron concentration range between 0.024 – 0.3 mg/L.

Groundwater usage needs regular monitoring and management. If a groundwater scheme is left unattended it will eventually fail. Regular monitoring and site visits to the abstraction boreholes will ensure their long-term viability. This is especially important in such a low rainfall area.

11. RECOMMENDATIONS

The newly drilled and completed boreholes should be equipped and connected to the water supply scheme and using the abstraction rates recommended by GEOSS in order to maintain sustainability. The boreholes will also require monitoring infrastructure and need to be authorised via a Water Use License Application.

It is recommended that the abstraction boreholes' water levels be monitored with in-situ logger monitoring, to be assessed quarterly for two years, before optimisation can be done, potentially reducing monitoring to bi-annual data analyses.

The following pumping recommendations and comments are made in order to begin abstraction:

Site	Latitude (WGS84)	Longitude (WGS84)	Abstraction Rate (L/s)	Pump Depth (m)
Cal_DV1	-31.455414	19.773937	5	150
Cal_DV3	-31.430694	19.788300	0.8	150
Cal_DV4	-31.411629	19.775115	1	100
Cal-S2-3	-31.651334	19.801571	1.3	35
Cal-S2-4	-31.650359	19.801047	4	150
Cal_S2_10	-31.617462	19.744726	15	80
Cal_Nat5	-31.435236	19.784485	4.3	178
Cal_Nat6	-31.451284	19.770548	1.5	100
Cal_Phase3_6	-31.357725	19.691500	2	96
Cal_Phase3_4A	-31.401169	19.556679	15	70
Cal_Phase3_9	-31.632714	19.756781	15	96
Re-Drill 39602	-31.372864	19.970834	4.5	79

It is recommended that that the Hantam Municipality look to develop the Ceres Karroo area (Kruitberg), the North-west region (study area 4) and Calvinia nature reserve into functional well fields. The wellfields should then be used in a rotation, this will allow for groundwater levels to recovery and not over stress the system.

12. ACKNOWLEDGEMENTS

The following people are gratefully thanked for their input and support into this project:

- Gert Meiring (BVi) is thanked for his guidance into the project.

13. REFERENCES

DWAF, (1998). Quality of domestic water supplies, Volume 1: Assessment guide. Department of Water Affairs and Forestry, Department of Health, Water Research Commission, 1998.

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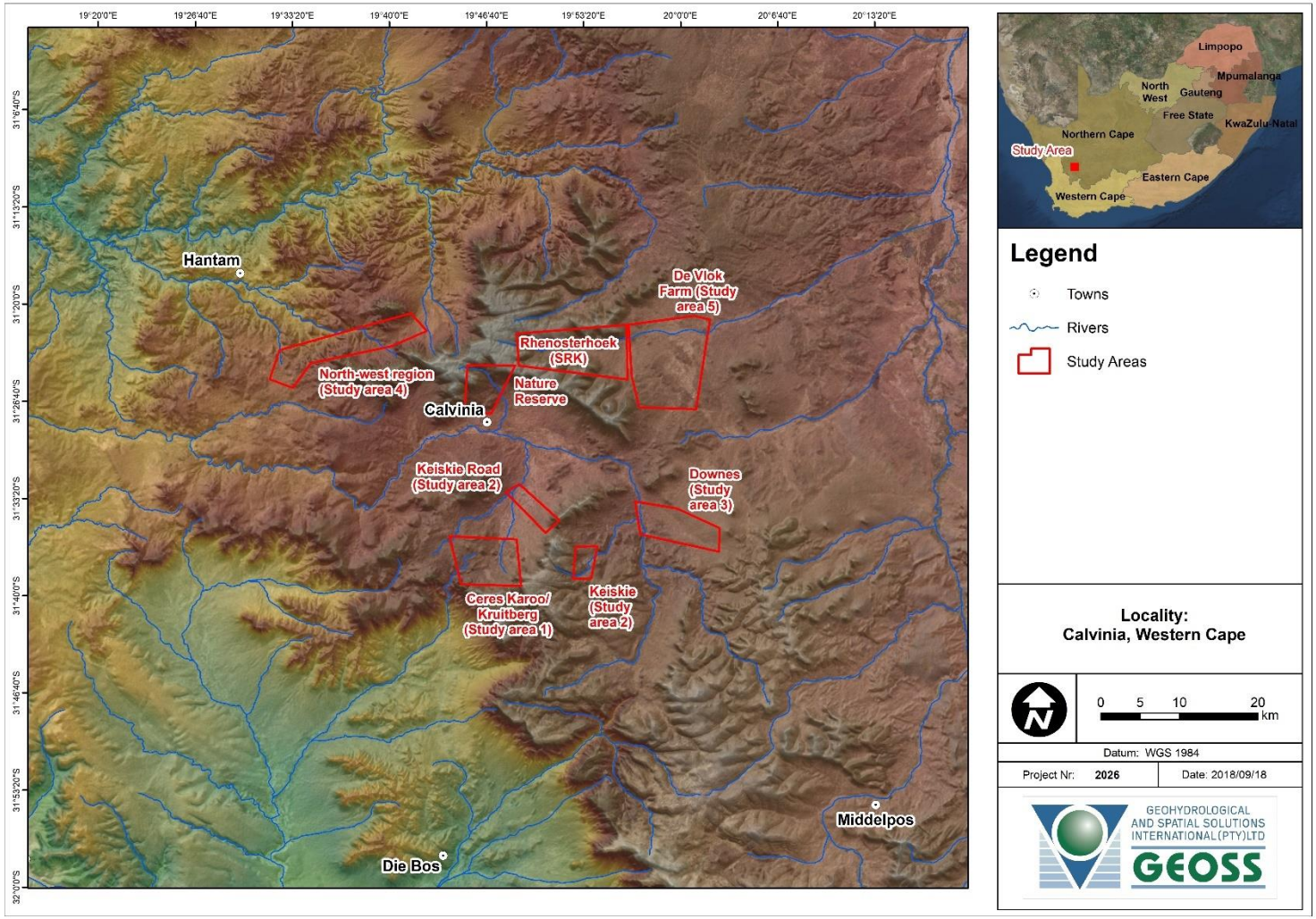
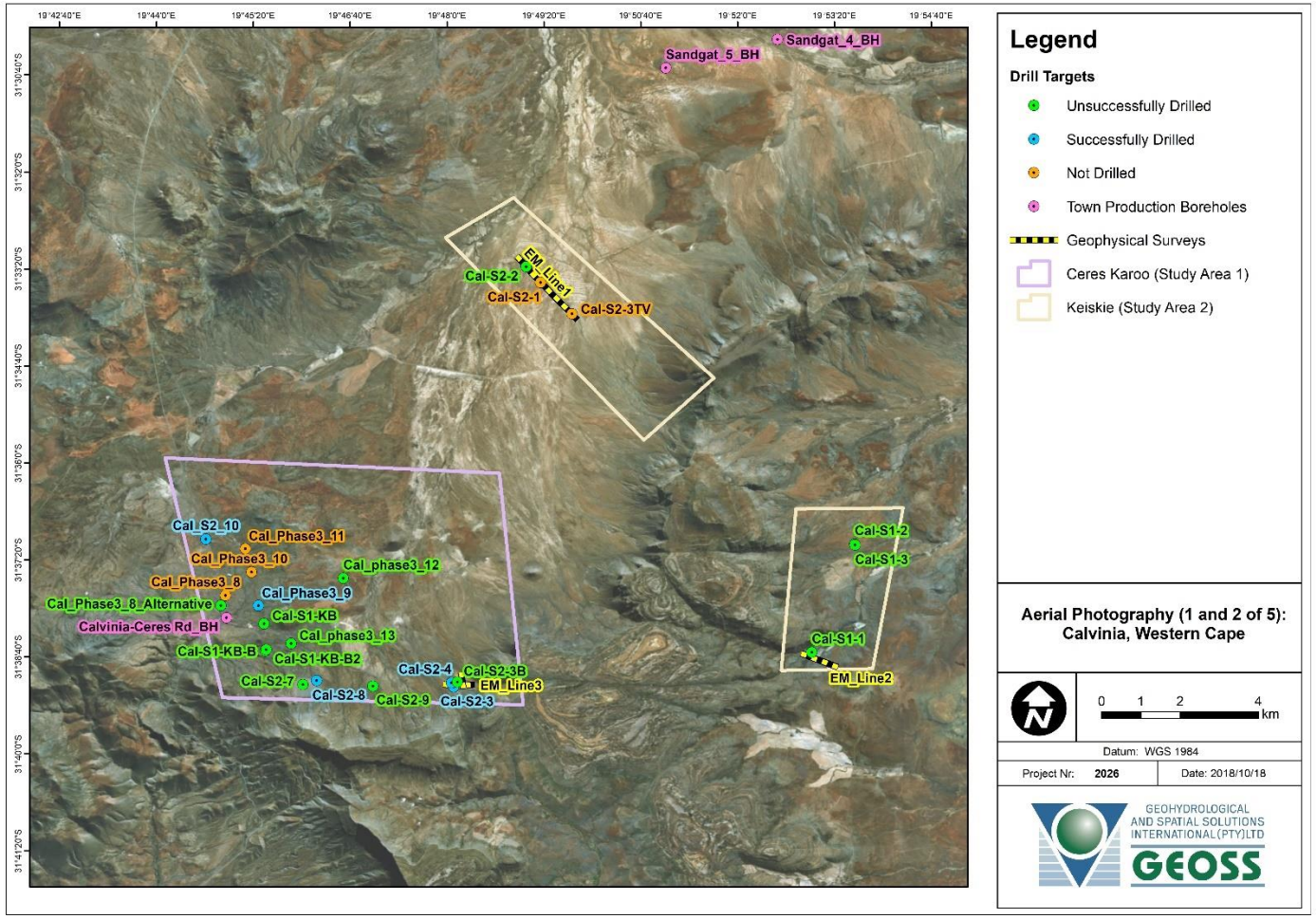
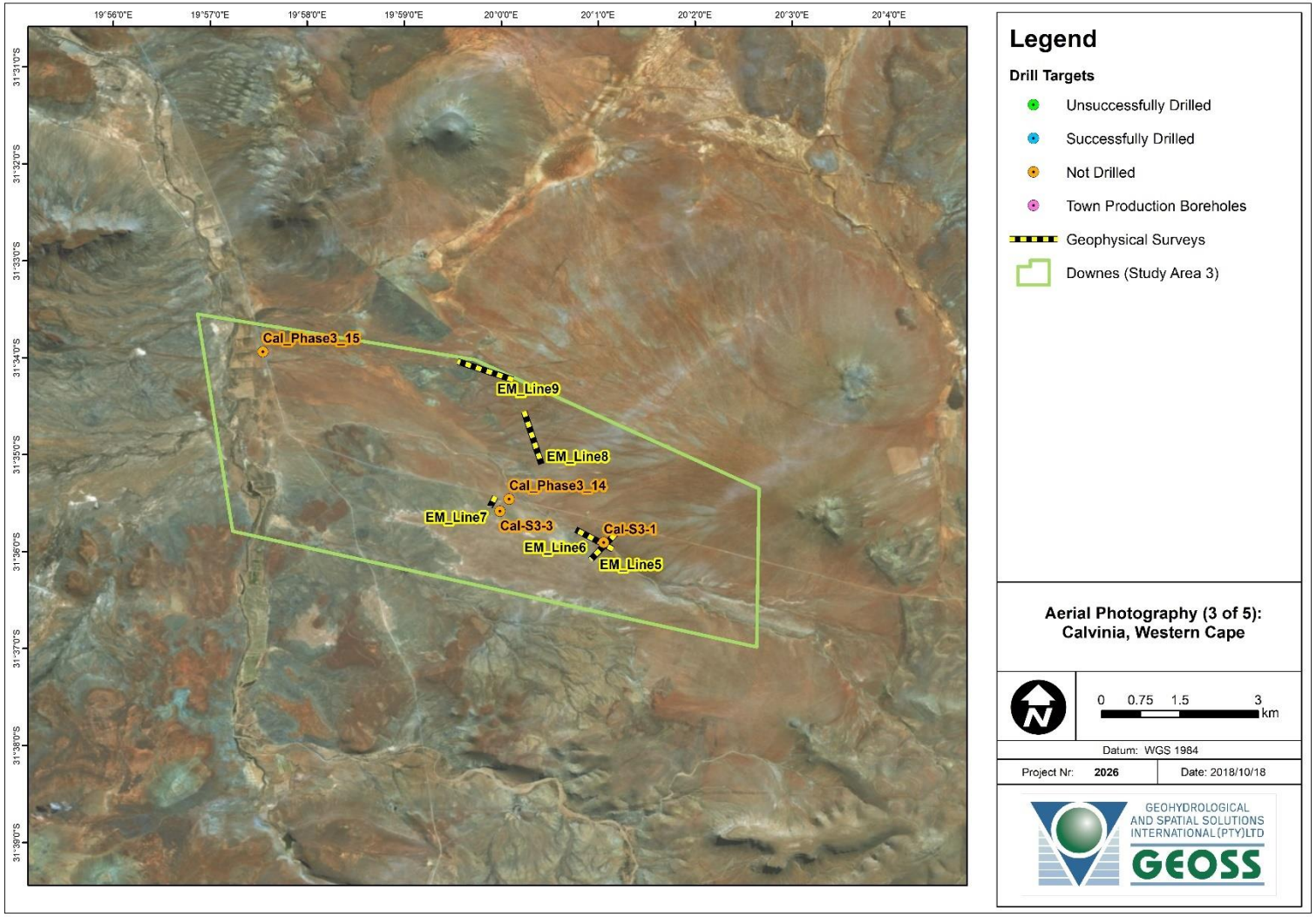
14. APPENDIX A: MAPS



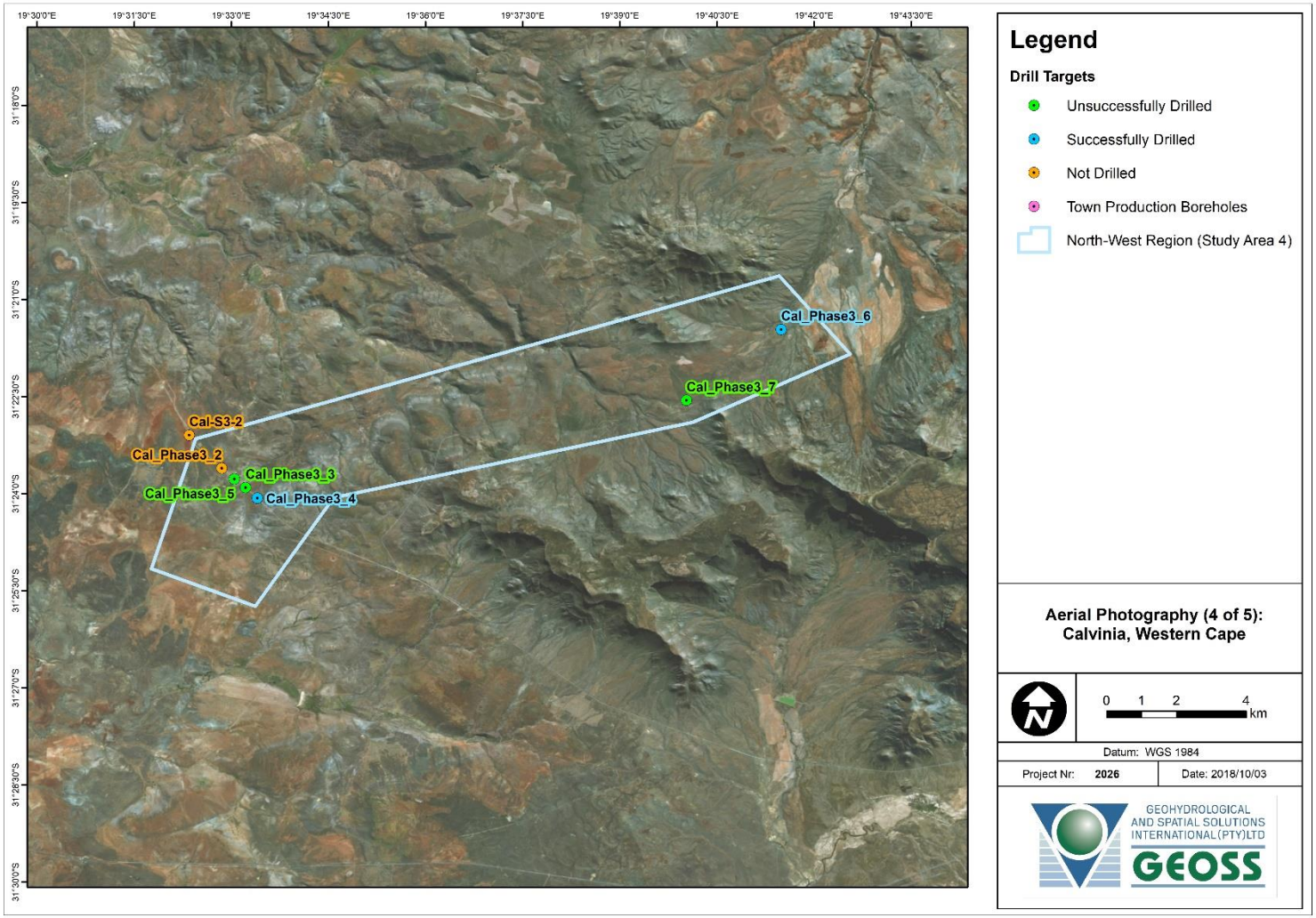
Map 1: Location of the study areas within a regional setting



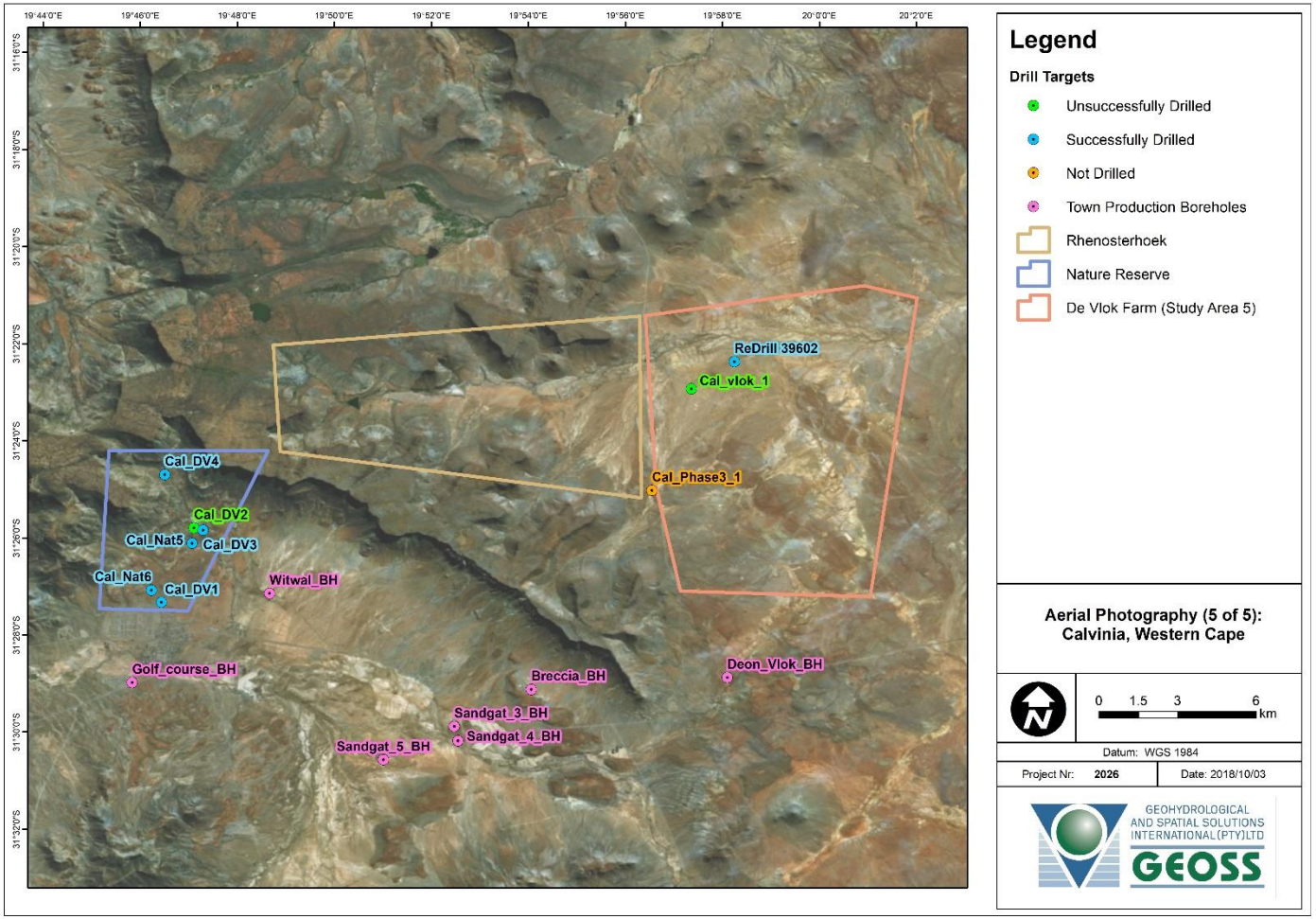
Map 2-1: The study site, Exploration borehole details (ESRI base map – Bing imagery)



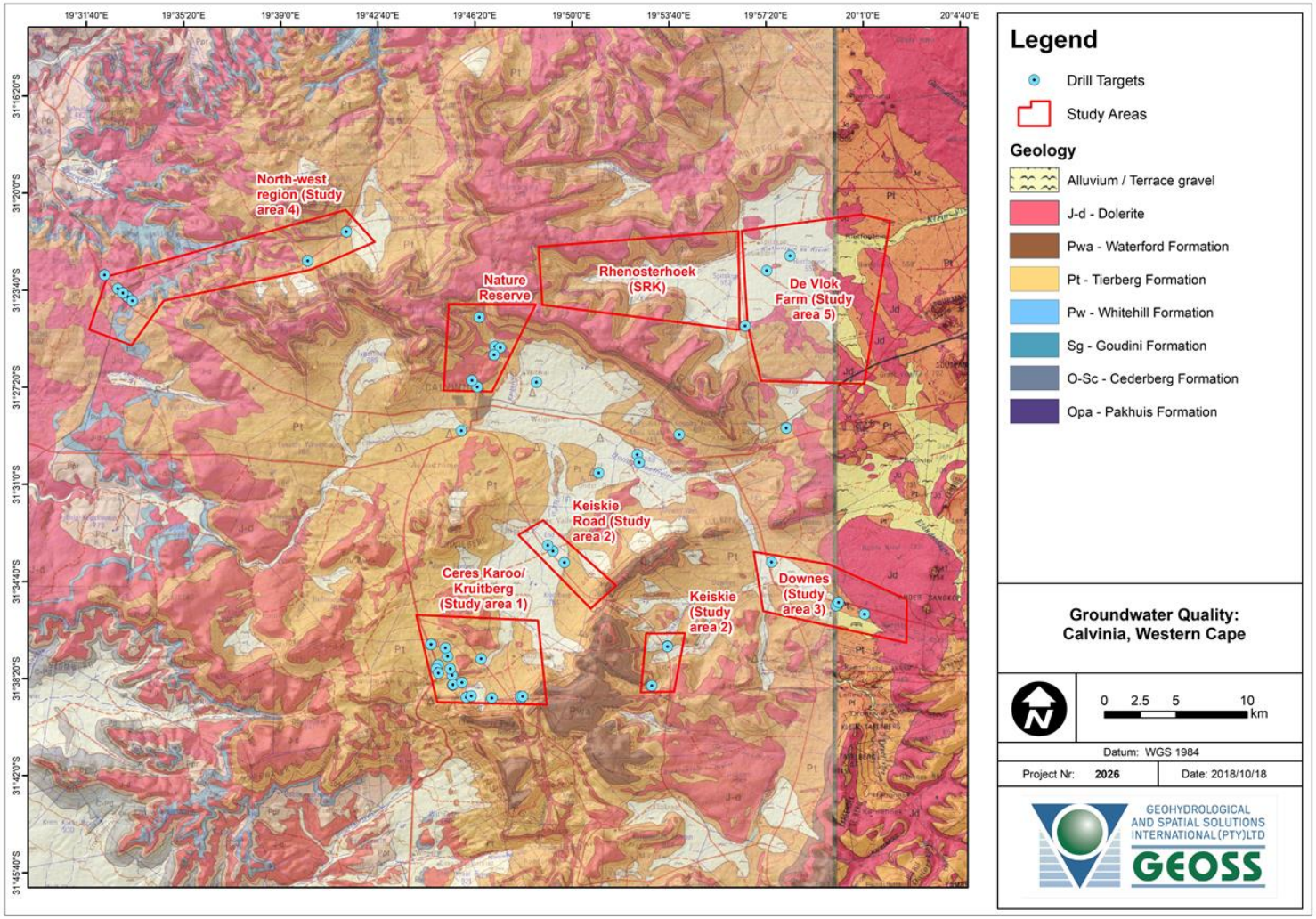
Map 2-2: The study site, Exploration borehole details (ESRI base map – Bing imagery)



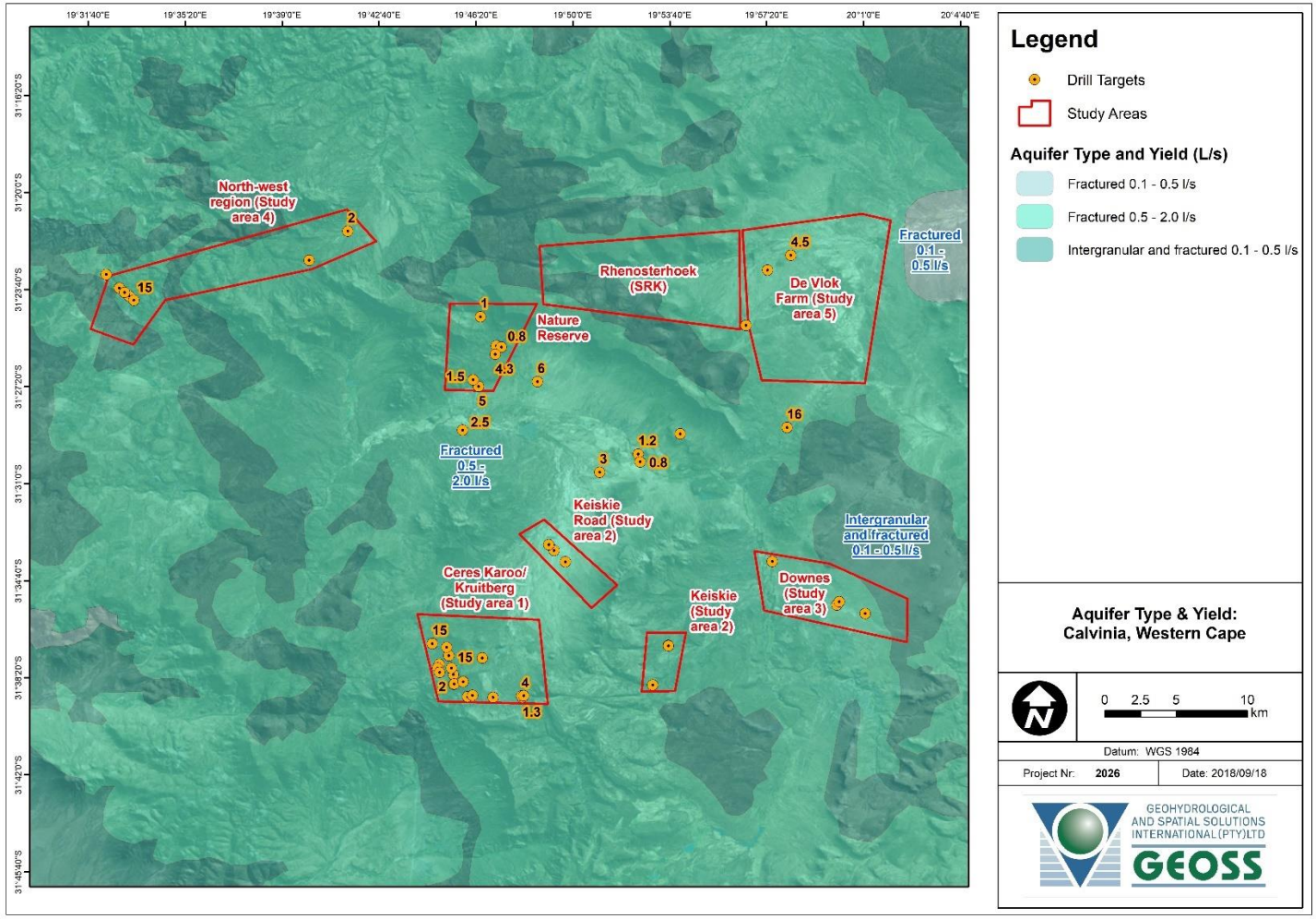
Map 2-3: The study site, Exploration borehole details (ESRI base map – Bing imagery)



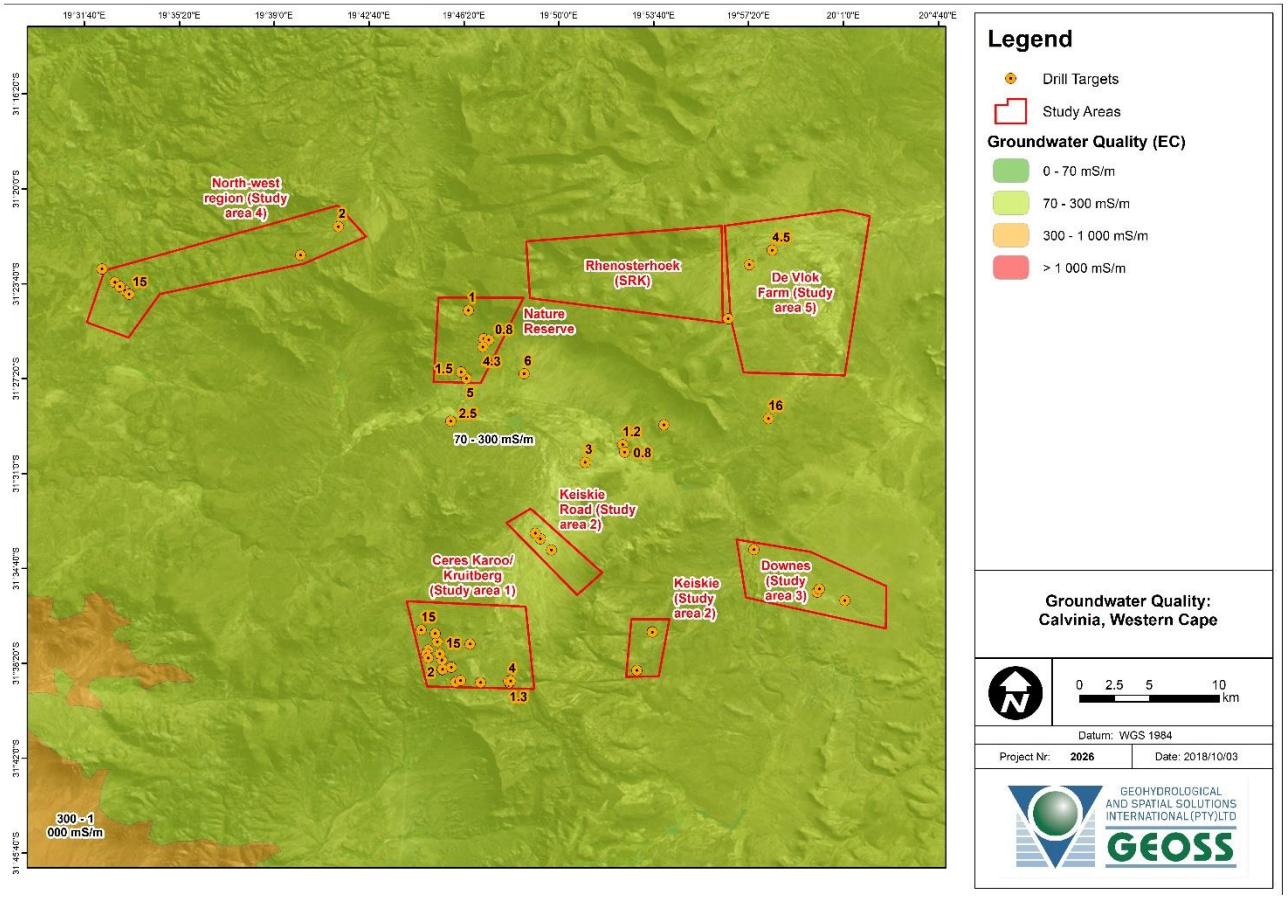
Map 2-4: The study site, Exploration borehole details (ESRI base map – Bing imagery)



Map 3: Geological setting of the study area and exploration boreholes (Council for Geoscience map: 1:250 000 scale 3118 Calvinia)

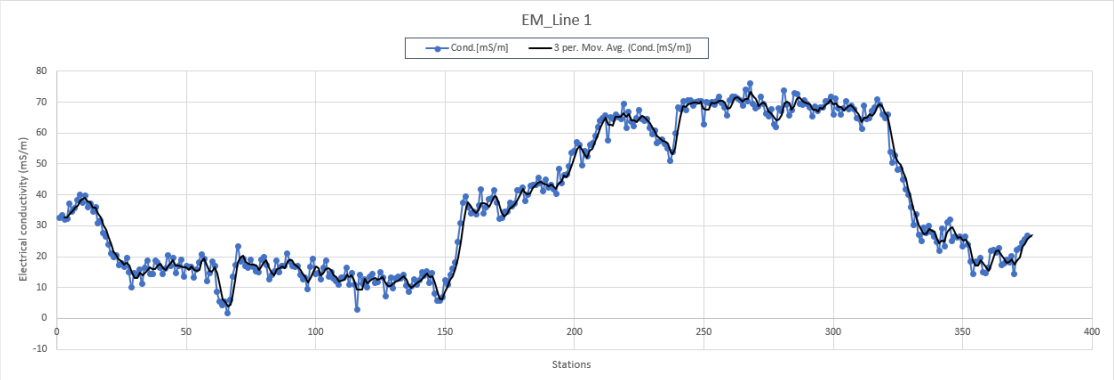


Map 4: Regional aquifer type and yields with tested borehole yields for exploration boreholes (L/s) (Background data 1:500 000 DWAF map 3118 - Calvinia)



Map 5: Regional groundwater quality (EC in mS/m) with measured borehole quality (EC in mS/m) (Background data 1:500 000 DWAF map 3118 - Calvinia)

15. APPENDIX B: GEOPHYSICS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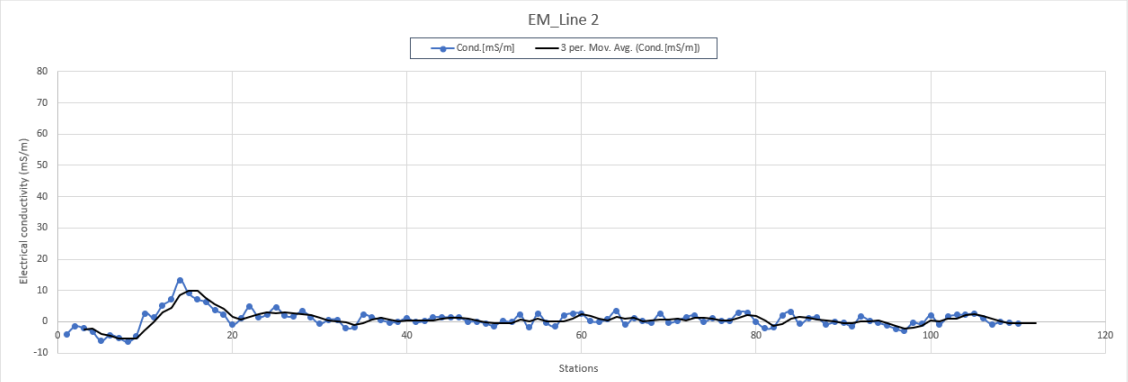
Cond.[mS/m]
3 per. Mov. Avg. (Cond.[mS/m])
Electrical conductivity (mS/m)
Stations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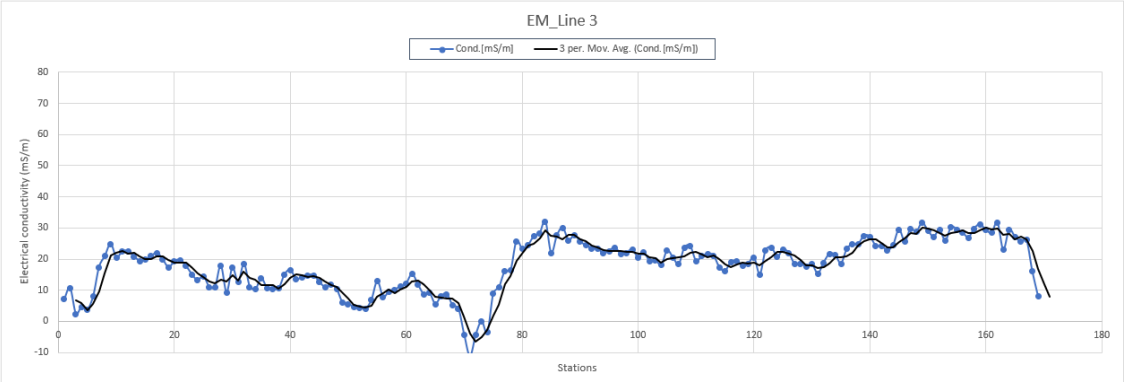
Electrical conductivity (mS/m)
Stations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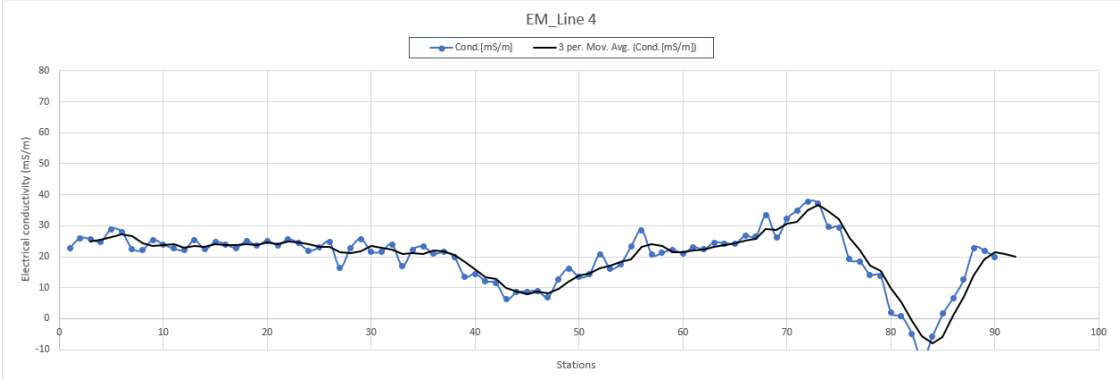
Electrical conductivity (mS/m)
Stations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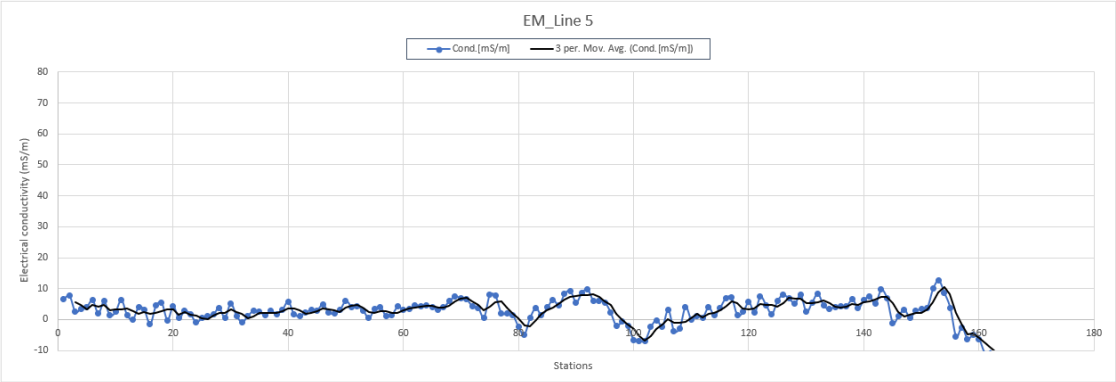
Electrical conductivity (mS/m)
Stations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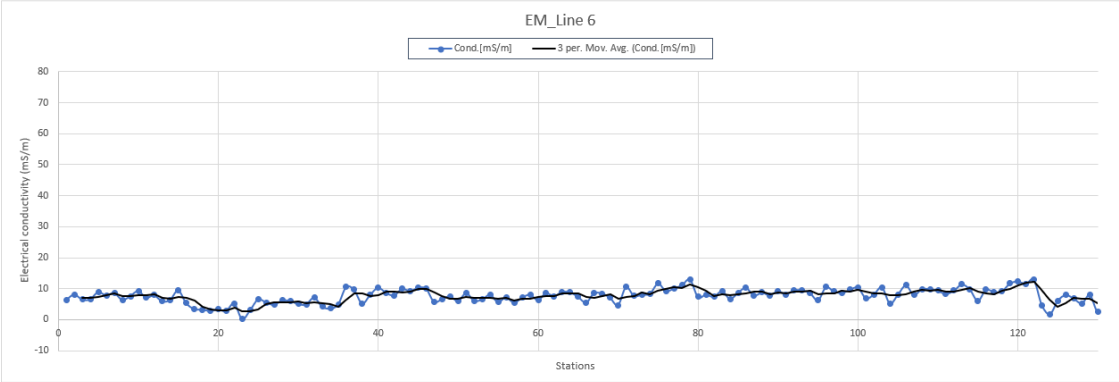
3 per. Mov. Avg. (Cond.[mS/m])
Electrical conductivity (mS/m)
Stations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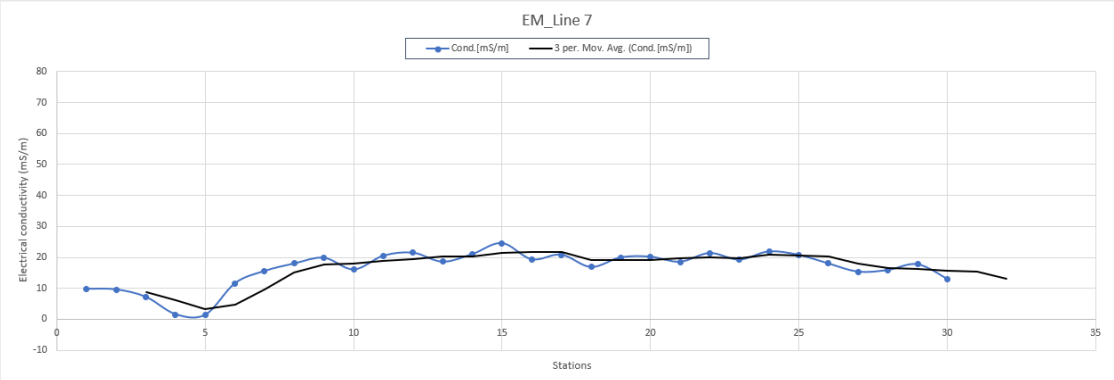
Cond.[mS/m]
3 per. Mov. Avg. (Cond.[mS/m])
Electrical conductivity (mS/m)
Stations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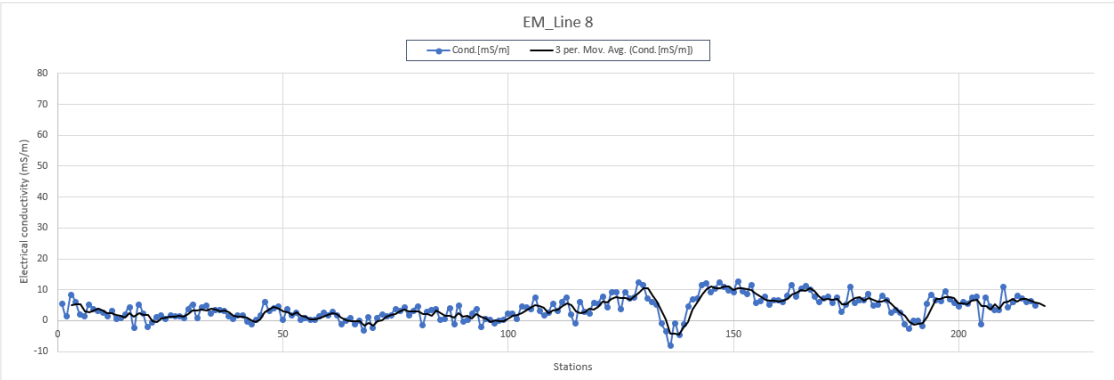
Electrical conductivity (mS/m)
Stations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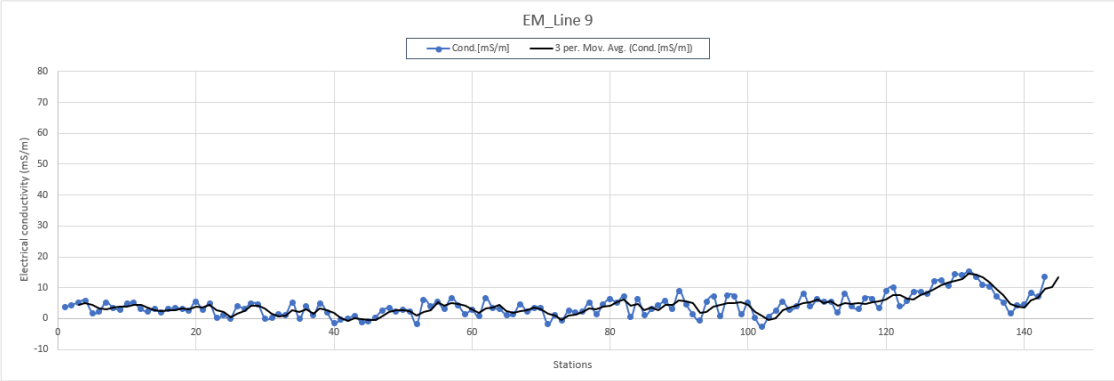
Electrical conductivity (mS/m)
Stations


EM_Line 9
Cond.[mS/m]
3 per. Mov. Avg. (Cond.[mS/m])
Electrical conductivity (mS/m)
80
70
60
50
40
30
20
10
0
-10
0
20
40
60
80
100
120
140
Stations

16. APPENDIX C: LABORATORY RESULTS – BEMLAB/ A.L ABBOT AND ASSOCIATES

CERTIFICATE OF ANALYSES

Report Nr.: **WT014712.DOC**

Julian Conrad
GEOSS (Pty) Ltd
Unit 19, Technostell Building
9 Quantum Street, Technopark
Stellenbosch
7600

Date received: **22-09-2017**
Order nr.: **#2026**

Sampled by client

Water Analyses Report

SANS241

Origin	Lab. Nr.	pH @ 25°C	EC @ 25°C mS/m	Na mg/l	K mg/l	Ca mg/l	Mg mg/l	Fe mg/l	Cl mg/l	SO_4 mg/l	B mg/l	Mn mg/l	Cu mg/l	Zn mg/l	P mg/l	NH_4-N mg/l	NO_3-N mg/l	*NO_2-N mg/l
Calvinia BH1/Ceres R	14712	7.6	59.2	38.7	1.4	52.5	12.5	0.1	51.0	26	0.13	0.03	<0.02	<0.03	<0.01	<0.28	0.37	0.02
Sandgat BH4	14713	7.4	598.6	706.9	1.0	227.6	118.8	0.1	1420.0	664	1.01	<0.03	<0.02	<0.03	0.02	0.44	0.82	0.02
Norm		≥5.0-≤9.7	≤170.0	≤200.0				≤2.0	≤300.0	≤500	≤2.40	≤0.40	≤2.00	≤5.00		≤1.50	≤11.00	≤0.90

Origin	Lab. Nr.	*F mg/l	*TDS mg/l	Alkalinity mg/l	Al µg/l	As µg/l	Ba µg/l	Cd µg/l	Co µg/l	Cr µg/l	*Hg µg/l	Ni µg/l	Pb µg/l	Sb µg/l	Se µg/l	*U µg/l	V µg/l	*CN µg/l	Date Sampled
Calvinia BH1/Ceres R	14712	0.5	379.0	284.00	<30	7.7	6.3	<3.1	<1	<27	5.7	0.6	<7	12.5	<12	<13.8	1.6	15.0	14/09/2017
Sandgat BH4	14713	0.2	3831.0	511.00	<30	<5	41.7	<3.1	<1	<27	8.6	0.6	<7	<2	15.8	<13.8	5.6	12.0	18/09/2017
Norm		≤1.5	≤1200.0		≤300.00	≤10.0	≤700.0	≤3.0		≤50.0	≤6.0	≤70.0	≤10.0	≤20.0	≤40.0	≤30.0		≤200.0	

Origin	Lab. Nr.	Temperature at reception (°C)	*Colour mg/l Pt	*Turbidity NTU	*TOC mg/l	*Cl_2 (Free) mg/l	Date Analysed
Calvinia BH1/Ceres R	14712	20.5	<1	0.60	6.80	0.28	27/09/2017
Sandgat BH4	14713	20.6	<1	0.34	30.20	0.29	27/09/2017
Norm			≤15	≤5	≤10.00	≤5.00	

**** = Not SANAS Accredited***

Norms according to SANS 241-1:2015.

Statement: The reported results may be applied only to samples received. Any recommendations included with this report are based on the assumption that the samples were representative of the source from which they were taken.

\\172.17.48.240\bemlab\bemlims\reports\2017\water\word\wt014712.doc **This Laboratory participate in the Agrilasa proficiency and SABS water testing scheme** Page 1 of 2

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sanas
T0054

16 Van der Berg Crescent
Gant's Centre
Strand

P O Box 684
Somerset Mall,
7137

Tel. (021) 853-1490
Fax (021) 853-1423

E-Mail admin@bemlab.co.za

Vat Reg. Nr. 4200161414

CERTIFICATE OF ANALYSES

Report Nr.: **WT008965.DOC**

Julian Conrad
GEOSS (Pty) Ltd
Unit 19, Technostell Building
9 Quantum Street, Technopark
Stellenbosch
7600

Date received: **19-06-2017**
Order nr.: **369/PhJ/T6**

Sampled by client

Water Analyses Report

SANS241

Origin	Lab. Nr.	pH @ 25°C	EC @ 25°C mS/m	Na mg/l	K mg/l	Ca mg/l	Mg mg/l	Fe mg/l	Cl mg/l	SO_4 mg/l	B mg/l	Mn mg/l	Cu mg/l	Zn mg/l	P mg/l	NH_4-N mg/l	NO_3-N mg/l	*NO_2-N mg/l
Dysseldorp_Drill 3	8965	5.0	24.1	19.9	2.4	8.4	5.7	0.2	44.0	36	<0.08	0.69	<0.02	0.10	0.03	<0.28	<0.36	0.01
Vermaaks_Drill- BH1	8966	5.3	12.5	13.0	0.6	2.3	2.2	0.3	36.0	4	<0.08	<0.03	<0.02	<0.03	<0.01	<0.28	<0.36	0.02
Vermaaks_Drill- BH4	8967	5.9	18.8	16.6	2.2	3.8	4.6	1.0	45.0	10	<0.08	2.19	<0.02	<0.03	0.02	<0.28	<0.36	0.03
Norm		≥5.0-≤9.7	≤170.0	≤200.0				≤2.0	≤300.0	≤500	≤2.40	≤0.40	≤2.00	≤5.00		≤1.50	≤11.00	≤0.90

Origin	Lab. Nr.	*F mg/l	*TDS mg/l	Alkalinity mg/l	Al µg/l	As µg/l	Ba µg/l	Cd µg/l	Co µg/l	Cr µg/l	*Hg µg/l	Ni µg/l	Pb µg/l	Sb µg/l	Se µg/l	*U µg/l	V µg/l	*CN µg/l	Date Sampled
Dysseldorp_Drill 3	8965	0.1	154.0	<11.49	<30	<5	10.6	<3.1	4.3	<27	7.1	34.5	<7	8.6	27.0	19.4	2.6	9.0	12/06/2017
Vermaaks_Drill- BH1	8966	0.0	80.0	<11.49	62.69	<5	6.4	<3.1	1.8	<27	<3.1	4.7	16.1	15.1	66.2	<13.8	0.9	6.0	14/06/2017
Vermaaks_Drill- BH4	8967	0.0	120.0	20.00	<30	<5	5.2	<3.1	6.6	<27	<3.1	6.7	43.3	9.4	49.8	14.3	0.5	0.0	13/06/2017
Norm		≤1.5	≤1200.0		≤300.00	≤10.0	≤700.0	≤3.0		≤50.0	≤6.0	≤70.0	≤10.0	≤20.0	≤40.0	≤30.0		≤200.0	

Origin	Lab. Nr.	Temperature at reception (°C)	*Colour mg/l Pt	*Turbidity NTU	*TOC mg/l	*Cl_2 (Free) mg/l	Date Analysed
Dysseldorp_Drill 3	8965	9.2	<1	1.35	7.00	0.07	20/06/2017
Vermaaks_Drill- BH1	8966	9.1	7	8.49	6.20	0.08	20/06/2017
Vermaaks_Drill- BH4	8967	9.8	6	15.20	7.20	0.17	20/06/2017
Norm			≤15	≤5	≤10.00	≤5.00	

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sanas
T0654

16 Van der Berg Crescent
Gant's Centre
Strand

P O Box 684
Somerset Mall,
7137

Tel. (021) 853-1490
Fax (021) 853-1423

E-Mail admin@bemlab.co.za

Vat Reg. Nr. 4200161414

CERTIFICATE OF ANALYSES

Report Nr.: **WT015384.DOC**

Julian Conrad
GEOSS (Pty) Ltd
Unit 19, Technostell Building
9 Quantum Street, Technopark
Stellenbosch
7600

Date received: **04-10-2017**
Order nr.: **#2026**

Sampled by client

Water Analyses Report

SANS241

Origin	Lab. Nr.	pH @ 25°C	EC @ 25°C mS/m	Na mg/l	K mg/l	Ca mg/l	Mg mg/l	Fe mg/l	Cl mg/l	SO_4 mg/l	B mg/l	Mn mg/l	Cu mg/l	Zn mg/l	P mg/l	NH_4-N mg/l	NO_3-N mg/l	*NO_2-N mg/l	*F mg/l
Gof Course_BH	15384	7.4	214	190.3	5.1	124.7	60.4	0.2	542.8	112	0.18	<0.03	<0.02	<0.03	<0.01	0.29	<0.36	0.02	0.2
Witwal_BH3	15385	8.4	93	175.6	7.4	<0.05	0.4	0.2	157.3	94	0.53	<0.03	<0.02	<0.03	<0.01	0.57	<0.36	0.09	1.4
Sandgat_3_BH4	15386	7.5	605	929.4	1.8	131.8	139.1	0.2	1564.2	869	1.36	<0.03	<0.02	<0.03	<0.01	0.31	0.61	0.01	0.1
Deon_Vlok_BH	15387	7.5	150	128.3	3.1	92.1	55.3	0.2	225.3	177	0.30	<0.03	<0.02	<0.03	<0.01	<0.28	<0.36	0.02	0.8
Sandgat_5_BH3	15388	7.0	279	305.7	4.6	116.1	70.8	0.1	761.9	194	0.32	0.38	<0.02	0.15	<0.01	0.31	0.64	0.06	0.0
Norm		≥5.0-≤9.7	≤170	≤200.0				≤2.0	≤300.0	≤500	≤2.40	≤0.40	≤2.00	≤5.00		≤1.50	≤11.00	≤0.90	≤1.5

Origin	Lab. Nr.	*TDS mg/l	Alkalinity mg/l	Al µg/l	As µg/l	Ba µg/l	Cd µg/l	Co µg/l	Cr µg/l	*Hg µg/l	Ni µg/l	Pb µg/l	Sb µg/l	Se µg/l	*U µg/l	V µg/l	*CN µg/l	Date Sampled	Temperature at reception (°C)
Gof Course_BH	15384	1283.0	167.86	<30	<5	<5	<3.1	<1	<27	<3.1	5.7	<7	11.2	<12	<13.8	<0.13	5.0	25/09/2017	13.3
Witwal_BH3	15385	561.0	181.40	<30	<5	69.2	<3.1	<1	<27	3.2	29.1	<7	13.2	<12	<13.8	<0.13	6.0	29/09/2017	13.6
Sandgat_3_BH4	15386	3600.0	388.04	<30	8.4	15.2	<3.1	<1	47.7	<3.1	23.7	9.3	11.9	<12	20.0	2.2	4.0	29/09/017	11.8
Deon_Vlok_BH	15387	901.0	278.56	<30	<5	41.3	<3.1	<1	<27	<3.1	28.8	<7	10.3	<12	15.2	1.7	7.0	29/09/017	14.3
Sandgat_5_BH3	15388	1670.0	132.51	<30	7.2	56.5	<3.1	1.2	<27	<3.1	26.6	8.1	5.5	17.5	14.4	<0.13	6.0	29/09/017	13.0
Norm		≤1200.0		≤300.00	≤10.0	≤700.0	≤3.0		≤50.0	≤6.0	≤70.0	≤10.0	≤20.0	≤40.0	≤30.0		≤200.0		

Origin	Lab. Nr.	*Colour mg/l Pt	*Turbidity NTU	*TOC mg/l	*Cl_2 (Free) mg/l	Date Analysed
Gof Course_BH	15384	<1	1.36	4.80	0.04	05/10/2017
Witwal_BH3	15385	<1	0.38	5.90	0.06	05/10/2017
Sandgat_3_BH4	15386	<1	0.23	16.70	0.06	05/10/2017
Deon_Vlok_BH	15387	<1	1.41	8.70	0.10	05/10/2017
Sandgat_5_BH3	15388	<1	0.36	3.60	0.09	05/10/2017
Norm		≤15	≤5	≤10.00	≤5.00	

**** = Not SANAS Accredited***

Norms according to SANS 241-1:2015.

Statement: The reported results may be applied only to samples received. Any recommendations included with this report are based on the assumption that the samples were representative of the source from which they were taken.

Notes:

To ensure sample integrity, samples are stored only for seven days after release of the report. Thereafter it is disposed of and a fresh sample will be required if additional analyses are requested.

Results marked with "**Not SANAS Accredited**" in this report are not included in the SANAS Schedule of Accreditation for this laboratory. These results relate to the items tested.

This test report shall not be reproduced except in full, without written approval of the laboratory.

Opinions and interpretations expressed herein are outside the scope of SANAS accreditation.

Refer to website for uncertainty of measurement and referenced methods.

Sample condition: Samples received in good condition.

Dr. Pieter Raath
General Manager

Lauren Taylor
Technical Signatory(Microbiology)

13-10-2017
Date reported

————END OF REPORT————

A.L. ABBOTT AND ASSOCIATES (PTY) LTD
(Reg. No. 1982/004379/07)

Consulting Analytical & Industrial Chemists
Specialists in Water & Waste Water Treatment
Telephone (021)448 6340/1
After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
info@alabbott.co.za

T0276

No. 1, Vine Park
Vine Road
7925
P.O. Box 483
WOODSTOCK, CAPE
7915

Doc.No. 5.10/1 Rev.4

Certificate of Analysis

GEOSS
ANALYSIS
CALVINIA DV1

DATE SAMPLED : 2018/05/22
DATE RECEIVED : 2018/05/22
DATE ANALYSIS COMMENCED : 2018/05/22

OUR REF. : 2018/05/22/14687
REPORT NO . : 3606

	Sample Number	14687	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 ºC)	54.5	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	361	≤1200 Aesthetic
27	Turbidity (NTU)	2.1	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 ºC)	8.39	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	19.0	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	3.3	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	0.20	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	66.4	≤300 Aesthetic
92	Sodium (mg/l as Na)	86.0	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.02	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	167	≤10 Chronic Health
92	Barium (µg/l as Ba)	37	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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Telephone (021)448 6340/1
After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
info@alabbott.co.za

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OUR REF. : 2018/05/22/14687
REPORT NO . : 3606

	Sample Number	14687	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	16	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	80	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	6	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	108	≤300 Operational
105	Total Organic Carbon (mg/l as C)	13.2	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	18.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethane	0.43	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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OUR REF. : 2018/05/22/14687
REPORT NO . : 3606

	Sample Number	14687	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	10	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	902	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	5.0	N/A
92	Magnesium (mg/l as Mg)	<1.1	N/A
92	Potassium (mg/l as K)	0.73	N/A
94	Total Alkalinity (mg/l as CaCO3)	105	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
04 June 2018

A.L. ABBOTT AND ASSOCIATES (PTY) LTD
(Reg. No. 1982/004379/07)

Consulting Analytical & Industrial Chemists
Specialists in Water & Waste Water Treatment
Telephone (021)448 6340/1
After Hours (0833263887)
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No. 1, Vine Park
Vine Road
7925
P.O. Box 483
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ANALYSIS
CALVINIA DV3

DATE SAMPLED : 2018/05/22
DATE RECEIVED : 2018/05/22
DATE ANALYSIS COMMENCED : 2018/05/22

OUR REF. : 2018/05/22/14688
REPORT NO. : 3606

	Sample Number	14688	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	49.5	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	327	≤1200 Aesthetic
27	Turbidity (NTU)	2.0	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	9.59	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	4.3	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	6.8	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	0.28	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	89.9	≤300 Aesthetic
92	Sodium (mg/l as Na)	76.1	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.007	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	2	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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GEOSS
ANALYSIS
CALVINIA DV3

DATE SAMPLED : 2018/05/22
DATE RECEIVED : 2018/05/22
DATE ANALYSIS COMMENCED : 2018/05/22

OUR REF. : 2018/05/22/14688
REPORT NO. : 3606

	Sample Number	14688	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	14	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	83	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	5	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	92	≤300 Operational
105	Total Organic Carbon (mg/l as C)	2.1	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	11.2	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethane	0.40	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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Telefax (021)448 6342
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No. 1, Vine Park
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7925
P.O. Box 483
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GEOSS
ANALYSIS
CALVINIA DV3

DATE SAMPLED : 2018/05/22
DATE RECEIVED : 2018/05/22
DATE ANALYSIS COMMENCED : 2018/05/22

OUR REF. : 2018/05/22/14688
REPORT NO. : 3606

	Sample Number	14688	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	7	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	>1000	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	3.4	N/A
92	Magnesium (mg/l as Mg)	<1.1	N/A
92	Potassium (mg/l as K)	0.52	N/A
94	Total Alkalinity (mg/l as CaCO3)	36.3	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
05 June 2018

TO: 'Julian Conrad' <jconrad@geoss.co.za>

'Alison McDuling' <amcduling@geoss.co.za>

A.L. ABBOTT AND ASSOCIATES (PTY) LTD
(Reg. No. 1982/004379/07)

Consulting Analytical & Industrial Chemists
Specialists in Water & Waste Water Treatment
Telephone (021)448 6340/1
After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
info@alabbott.co.za

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P.O. Box 483
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Certificate of Analysis

BVI CONSULTING ENGINEERS
ANALYSIS
CALVINIA-CAL-DV4

DATE SAMPLED : 2018/05/21
DATE RECEIVED : 2018/05/30
DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/21/15509
REPORT NO. : 3840

	Sample Number	15509	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	73.5	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	495	≤1200 Aesthetic
27	Turbidity (NTU)	10.3	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	8.32	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	0.24	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.23	≤1.0
102	Sulphate (mg/l as SO4)	7.9	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	3.1	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	0.23	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	60.7	≤300 Aesthetic
92	Sodium (mg/l as Na)	116	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.01	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	388	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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CALVINIA-CAL-DV4

DATE SAMPLED : 2018/05/21
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DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/21/15509
REPORT NO. : 3840

	Sample Number	15509	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	14	≤50 Chronic Health
92	Copper (µg/l as Cu)	15	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	175	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	37	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	4	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	187	≤300 Operational
105	Total Organic Carbon (mg/l as C)	1.0	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	54.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	120	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	192	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethane	3.5	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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Specialists in Water & Waste Water Treatment
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After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
info@alabbott.co.za

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ANALYSIS

CALVINIA-CAL-DV4

DATE SAMPLED : 2018/05/21
DATE RECEIVED : 2018/05/30
DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/21/15509
REPORT NO. : 3840

	Sample Number	15509	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	1	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	>1000	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	16.2	N/A
92	Magnesium (mg/l as Mg)	6.4	N/A
92	Potassium (mg/l as K)	1.4	N/A
94	Total Alkalinity (mg/l as CaCO3)	285	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
13 June 2018

TO: BVI CONSULTING ENGINEERS
P O Box 1155
UPINGTON
8800

Attention : GERT MEIRING

A.L. ABBOTT AND ASSOCIATES (PTY) LTD
(Reg. No. 1982/004379/07)

Consulting Analytical & Industrial Chemists
Specialists in Water & Waste Water Treatment
Telephone (021)448 6340/1
After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
info@alabbott.co.za

No. 1, Vine Park
Vine Road
7925
P.O. Box 483
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ANALYSIS

KRUITBERG CALVINIA-CAL-S2-3

DATE SAMPLED : 2018/05/30
DATE RECEIVED : 2018/05/30
DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/30/15510
REPORT NO. : 3840

	Sample Number	15510	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	70.5	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	474	≤1200 Aesthetic
27	Turbidity (NTU)	8.8	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	9.22	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	0.26	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.23	≤1.0
102	Sulphate (mg/l as SO4)	10.0	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	3.6	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	0.47	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	58.1	≤300 Aesthetic
92	Sodium (mg/l as Na)	125	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.006	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	10	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
info@alabbott.co.za

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Vine Road
7925
P.O. Box 483
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ANALYSIS

KRUITBERG CALVINIA-CAL-S2-3

DATE SAMPLED : 2018/05/30
DATE RECEIVED : 2018/05/30
DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/30/15510
REPORT NO. : 3840

	Sample Number	15510	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	11	≤50 Chronic Health
92	Copper (µg/l as Cu)	15	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	294	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	4	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	323	≤300 Operational
105	Total Organic Carbon (mg/l as C)	0.98	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	103	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	130	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	317	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethane	5.0	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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BVI CONSULTING ENGINEERS
ANALYSIS
KRUITBERG CALVINIA-CAL-S2-3

DATE SAMPLED : 2018/05/30
DATE RECEIVED : 2018/05/30
DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/30/15510
REPORT NO. : 3840

	Sample Number	15510	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	4	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	>1000	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	2.8	N/A
92	Magnesium (mg/l as Mg)	<1.1	N/A
92	Potassium (mg/l as K)	1.2	N/A
94	Total Alkalinity (mg/l as CaCO3)	254	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
13 June 2018

TO: BVI CONSULTING ENGINEERS
P O Box 1155
UPINGTON
8800

Attention : GERT MEIRING

A.L. ABBOTT AND ASSOCIATES (PTY) LTD

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Consulting Analytical & Industrial Chemists
Specialists in Water & Waste Water Treatment
Telephone (021)448 6340/1
After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
info@alabbott.co.za

No. 1, Vine Park
Vine Road
7925
P.O. Box 483
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ANALYSIS

KRUITBERG-CAL-S2-4

DATE SAMPLED : 2018/05/30
DATE RECEIVED : 2018/05/30
DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/30/15511
REPORT NO . : 3840

	Sample Number	15511	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	6	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	74.0	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	488	≤1200 Aesthetic
27	Turbidity (NTU)	7.2	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	9.83	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	0.22	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	5.5	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	7.2	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	0.31	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	66.0	≤300 Aesthetic
92	Sodium (mg/l as Na)	127	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.006	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	2	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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ANALYSIS
KRUITBERG-CAL-S2-4

DATE SAMPLED : 2018/05/30
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DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/30/15511
REPORT NO . : 3840

	Sample Number	15511	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	11	≤50 Chronic Health
92	Copper (µg/l as Cu)	16	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	296	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	4	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	238	≤300 Operational
105	Total Organic Carbon (mg/l as C)	0.79	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	<10.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethane	0.40	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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ANALYSIS

KRUITBERG-CAL-S2-4

DATE SAMPLED : 2018/05/30
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DATE ANALYSIS COMMENCED : 2018/05/30

OUR REF. : 2018/05/30/15511
REPORT NO . : 3840

	Sample Number	15511	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	727	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	>1000	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	0.43	N/A
92	Magnesium (mg/l as Mg)	<1.1	N/A
92	Potassium (mg/l as K)	1.0	N/A
94	Total Alkalinity (mg/l as CaCO3)	238	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
11 June 2018

TO: BVI CONSULTING ENGINEERS
P O Box 1155
UPINGTON
8800

Attention : GERT MEIRING

A.L. ABBOTT AND ASSOCIATES (PTY) LTD
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After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
info@alabbott.co.za

No. 1, Vine Park
Vine Road
7925
P.O. Box 483
WOODSTOCK, CAPE
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GEOSS
ANALYSIS
CAL-NAT5-NATURE RESERVE CALVINIA

DATE SAMPLED : 2018/07/20
DATE RECEIVED : 2018/07/20
DATE ANALYSIS COMMENCED : 2018/07/20

OUR REF. : 2018/07/20/20641
REPORT NO . : 4995

	Sample Number	20641	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	45.0	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	265	≤1200 Aesthetic
27	Turbidity (NTU)	0.37	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	8.18	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	6.6	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	5.1	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	<0.10	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	41.7	≤300 Aesthetic
92	Sodium (mg/l as Na)	70.8	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.003	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	1	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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Vine Road
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ANALYSIS
CAL-NAT5-NATURE RESERVE CALVINIA

DATE SAMPLED : 2018/07/20
DATE RECEIVED : 2018/07/20
DATE ANALYSIS COMMENCED : 2018/07/20

OUR REF. : 2018/07/20/20641
REPORT NO . : 4995

	Sample Number	20641	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	<6	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	<24	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	4	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	39	≤300 Operational
105	Total Organic Carbon (mg/l as C)	0.82	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	<10.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethane	0.40	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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GEOSS
ANALYSIS
CAL-NAT5-NATURE RESERVE CALVINIA

DATE SAMPLED : 2018/07/20
DATE RECEIVED : 2018/07/20
DATE ANALYSIS COMMENCED : 2018/07/20

OUR REF. : 2018/07/20/20641
REPORT NO . : 4995

	Sample Number	20641	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	7	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	660	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	6.7	N/A
92	Magnesium (mg/l as Mg)	1.7	N/A
92	Potassium (mg/l as K)	0.68	N/A
94	Total Alkalinity (mg/l as CaCO3)	124	N/A

JOSE DA SILVA (Cert.Sci.Nat.)
TECHNICAL MANAGER
26 July 2018

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CAL-NET6-CALVINIA

DATE SAMPLED : 2018/07/20
DATE RECEIVED : 2018/07/20
DATE ANALYSIS COMMENCED : 2018/07/20

OUR REF. : 2018/07/20/20642
REPORT NO . : 4995

	Sample Number	20642	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	60.5	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	381	≤1200 Aesthetic
27	Turbidity (NTU)	0.13	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	7.36	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	27.2	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	1.3	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	<0.10	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	36.6	≤300 Aesthetic
92	Sodium (mg/l as Na)	53.5	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.003	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	5	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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ANALYSIS
CAL-NET6-CALVINIA

DATE SAMPLED : 2018/07/20
DATE RECEIVED : 2018/07/20
DATE ANALYSIS COMMENCED : 2018/07/20

OUR REF. : 2018/07/20/20642
REPORT NO . : 4995

	Sample Number	20642	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	<6	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	<24	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	67	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	4	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	<12	≤300 Operational
105	Total Organic Carbon (mg/l as C)	0.58	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	<10.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethane	0.40	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	4	Not Detected

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CAL-NET6-CALVINIA

DATE SAMPLED : 2018/07/20
DATE RECEIVED : 2018/07/20
DATE ANALYSIS COMMENCED : 2018/07/20

OUR REF. : 2018/07/20/20642
REPORT NO . : 4995

	Sample Number	20642	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	6	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	>1000	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	41.6	N/A
92	Magnesium (mg/l as Mg)	18.9	N/A
92	Potassium (mg/l as K)	0.76	N/A
94	Total Alkalinity (mg/l as CaCO3)	222	N/A

JOSE DA SILVA (Cert.Sci.Nat.)
TECHNICAL MANAGER
26 July 2018

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GEOSS
ANALYSIS
CALS2-10

DATE SAMPLED : 2018/07/20
DATE RECEIVED : 2018/07/20
DATE ANALYSIS COMMENCED : 2018/07/20

OUR REF. : 2018/07/20/20643
REPORT NO . : 4995

	Sample Number	20643	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	127	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	823	≤1200 Aesthetic
27	Turbidity (NTU)	0.37	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	7.39	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	100	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	1.6	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	<0.10	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	188	≤300 Aesthetic
92	Sodium (mg/l as Na)	108	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.003	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	3	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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ANALYSIS
CALS2-10

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OUR REF. : 2018/07/20/20643
REPORT NO . : 4995

	Sample Number	20643	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	<6	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	<24	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	5	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	<12	≤300 Operational
105	Total Organic Carbon (mg/l as C)	0.52	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	<10.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethane	0.40	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

Samples : CUSTOMER

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ANALYSIS
CALS2-10

DATE SAMPLED : 2018/07/20
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DATE ANALYSIS COMMENCED : 2018/07/20

OUR REF. : 2018/07/20/20643
REPORT NO . : 4995

	Sample Number	20643	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	<1	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	330	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	97.0	N/A
92	Magnesium (mg/l as Mg)	28.0	N/A
92	Potassium (mg/l as K)	2.9	N/A
94	Total Alkalinity (mg/l as CaCO3)	247	N/A

JOSE DA SILVA (Cert.Sci.Nat.)
TECHNICAL MANAGER
26 July 2018

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GEOSS
ANALYSIS
CAL PHASE-39 (KREITZBERG)

DATE SAMPLED : 2018/08/21
DATE RECEIVED : 2018/08/21
DATE ANALYSIS COMMENCED : 2018/08/21

OUR REF. : 2018/08/21/22876
REPORT NO . : 5505

	Sample Number	22876	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	75.0	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	531	≤1200 Aesthetic
27	Turbidity (NTU)	0.90	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	7.66	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	<1.0	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	1.7	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	<0.10	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	95.2	≤300 Aesthetic
92	Sodium (mg/l as Na)	71.0	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.004	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	7	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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CAL PHASE-39 (KREITZBERG)

DATE SAMPLED : 2018/08/21
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DATE ANALYSIS COMMENCED : 2018/08/21

OUR REF. : 2018/08/21/22876
REPORT NO . : 5505

	Sample Number	22876	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	25	≤50 Chronic Health
92	Copper (µg/l as Cu)	10	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	59	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<10	≤10 Chronic Health
92	Manganese (µg/l as Mn)	34	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	8	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	27	≤300 Operational
105	Total Organic Carbon (mg/l as C)	0.10	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	91.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	11.0	≤60 Chronic Health
N/A	Combined Trihalomethane	0.69	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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OUR REF. : 2018/08/21/22876
REPORT NO . : 5505

	Sample Number	22876	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	687	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	>1000	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	36.5	N/A
92	Magnesium (mg/l as Mg)	17.8	N/A
92	Potassium (mg/l as K)	2.6	N/A
94	Total Alkalinity (mg/l as CaCO3)	207	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
24 August 2018

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ANALYSIS

CALVINIA CAL PHASE 3-4

DATE SAMPLED : 2018/08/24 **TIME:07H50**

DATE RECEIVED : 2018/09/07 **OUR REF. :** 2018/08/24/24444

DATE ANALYSIS COMMENCED : 2018/09/07 **REPORT NO . :** 5871

	Sample Number	24444	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	173	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	1354	≤1200 Aesthetic
27	Turbidity (NTU)	82.0	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	7.45	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	616	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	1.5	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	<0.10	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	96.9	≤300 Aesthetic
92	Sodium (mg/l as Na)	95.7	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.004	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	15	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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BVI CONSULTING ENGINEERS
ANALYSIS
CALVINIA CAL PHASE 3-4

DATE SAMPLED : 2018/08/24
DATE RECEIVED : 2018/09/07
DATE ANALYSIS COMMENCED : 2018/09/07

OUR REF. : 2018/08/24/24444
REPORT NO . : 5871

	Sample Number	24444	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	<6	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	22400	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	1005	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	10	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	<12	≤300 Operational
105	Total Organic Carbon (mg/l as C)	<0.10	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	<10.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethanes (µg/l)	0.40	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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Telefax (021)448 6342
e-Mail Address :
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BVI CONSULTING ENGINEERS
ANALYSIS
CALVINIA CAL PHASE 3-4

DATE SAMPLED : 2018/08/24
DATE RECEIVED : 2018/09/07
DATE ANALYSIS COMMENCED : 2018/09/07

OUR REF. : 2018/08/24/24444
REPORT NO . : 5871

	Sample Number	24444	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	<1	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	176	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	130	N/A
92	Magnesium (mg/l as Mg)	92.7	N/A
92	Potassium (mg/l as K)	6.2	N/A
94	Total Alkalinity (mg/l as CaCO3)	96.4	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
17 September 2018

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BVI CONSULTING ENGINEERS
ANALYSIS
CALVINIA CAL PHASE 3-6

DATE SAMPLED : 2018/08/29 **TIME:01H20**
DATE RECEIVED : 2018/09/07 **OUR REF. :** 2018/08/29/24445
DATE ANALYSIS COMMENCED : 2018/09/07 **REPORT NO . :** 5871

	Sample Number	24445	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	5	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	48.5	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	377	≤1200 Aesthetic
27	Turbidity (NTU)	0.60	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	9.45	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	4.4	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	3.4	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	<0.10	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	96.2	≤300 Aesthetic
92	Sodium (mg/l as Na)	77.1	≤200 Aesthetic
92	Zinc (mg/l as Zn)	<0.001	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	1	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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ANALYSIS
CALVINIA CAL PHASE 3-6

DATE SAMPLED : 2018/08/29
DATE RECEIVED : 2018/09/07
DATE ANALYSIS COMMENCED : 2018/09/07

OUR REF. : 2018/08/29/24445
REPORT NO . : 5871

	Sample Number	24445	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	<6	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	27	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	<1	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	20	≤300 Operational
105	Total Organic Carbon (mg/l as C)	<0.10	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	14.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethanes (µg/l)	0.41	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

Sampler : CUSTOMER

*Refer to attached Appendix 1 : Indicating * Tests marked "SANAS Accredited", Tests Methods and Detection Limits.*

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ANALYSIS
CALVINIA CAL PHASE 3-6

DATE SAMPLED : 2018/08/29
DATE RECEIVED : 2018/09/07
DATE ANALYSIS COMMENCED : 2018/09/07

OUR REF. : 2018/08/29/24445
REPORT NO . : 5871

	Sample Number	24445	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	2	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	264	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	5.7	N/A
92	Magnesium (mg/l as Mg)	<1.1	N/A
92	Potassium (mg/l as K)	0.63	N/A
94	Total Alkalinity (mg/l as CaCO3)	41.3	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
17 September 2018

Att: Gert Meiring <gertm@bvinc.co.za>

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(Reg. No. 1982/004379/07)

Consulting Analytical & Industrial Chemists
Specialists in Water & Waste Water Treatment
Telephone (021)448 6340/1
After Hours (0833263887)
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BVI CONSULTING ENGINEERS
ANALYSIS
CALVINIA KREITZBERG CAL PHASE 3-9

DATE SAMPLED : 2018/09/03 **TIME:08H25**
DATE RECEIVED : 2018/09/07 **OUR REF. :** 2018/09/03/24446
DATE ANALYSIS COMMENCED : 2018/09/07 **REPORT NO . :** 5871

	Sample Number	24446	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	<4	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 ºC)	75.5	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	553	≤1200 Aesthetic
27	Turbidity (NTU)	0.18	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 ºC)	8.55	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	<0.20	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	<0.20	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.22	≤1.0
102	Sulphate (mg/l as SO4)	18.0	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	1.8	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	<0.10	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	98.1	≤300 Aesthetic
92	Sodium (mg/l as Na)	77.9	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.006	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	8	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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After Hours (0833263887)
Telefax (021)448 6342
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info@alabbott.co.za

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ANALYSIS
CALVINIA KREITZBERG CAL PHASE 3-9

DATE SAMPLED : 2018/09/03
DATE RECEIVED : 2018/09/07
DATE ANALYSIS COMMENCED : 2018/09/07

OUR REF. : 2018/09/03/24446
REPORT NO . : 5871

	Sample Number	24446	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	<6	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	53	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	<1	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	141	≤300 Operational
105	Total Organic Carbon (mg/l as C)	<0.10	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	<10.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethanes (µg/l)	0.40	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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After Hours (0833263887)
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ANALYSIS
CALVINIA KREITZBERG CAL PHASE 3-9

ATE SAMPLED : 2018/09/03
ATE RECEIVED : 2018/09/07
ATE ANALYSIS OMMENCED : 2018/09/07

OUR REF. : 2018/09/03/24446
REPORT NO . : 5871

	Sample Number	24446	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	7	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	132	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	31.8	N/A
92	Magnesium (mg/l as Mg)	20.1	N/A
92	Potassium (mg/l as K)	2.8	N/A
94	Total Alkalinity (mg/l as CaCO3)	201	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
17 September 2018

Att: Gert Meiring <gertm@bvinc.co.za>

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Specialists in Water & Waste Water Treatment
Telephone (021)448 6340/1
After Hours (0833263887)
Telefax (021)448 6342
e-Mail Address :
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Vine Road
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ANALYSIS

SPITZHOP REDRILL 39602

DATE SAMPLED : 2018/08/19 **TIME:15H15**

DATE RECEIVED : 2018/09/07 **OUR REF. :** 2018/08/19/24447

DATE ANALYSIS COMMENCED : 2018/09/07 **REPORT NO . :** 5871

	Sample Number	24447	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
97	Colour (mg/l as Pt)	5	≤15 Aesthetic
9	Conductivity (mS/m) (at 25 °C)	175	≤170 Aesthetic
7	Total Dissolved Solids (mg/l)	1381	≤1200 Aesthetic
27	Turbidity (NTU)	0.52	≤1 Operational : ≤5 Aesthetic
19	pH (at 25 °C)	8.09	≥5 - ≤9.7 Operational
66	Free Chlorine (mg/l)	<0.05	≤5 Chronic Health
N/A	Monochloramine (mg/l)	<0.05	≤3 Chronic Health
Calc	Nitrate Nitrogen (mg/l as N)	1.9	≤11 Acute Health
99	Nitrite Nitrogen (mg/l as N)	<0.20	≤0.9 Acute Health
100	Nitrate & Nitrite Nitrogen (mg/l as N)	2.1	≤12 Acute Health
N/A	Combined Nitrate plus Nitrite (mg/l as N)	0.39	≤1.0
102	Sulphate (mg/l as SO4)	118	≤250 Aesthetic ≤500 Acute Health
98	Fluoride (mg/l as F)	0.91	≤1.5 Chronic Health
95	Ammonia Nitrogen (mg/l as N)	<0.10	≤1.5 Aesthetic
96	Chloride (mg/l as Cl)	307	≤300 Aesthetic
92	Sodium (mg/l as Na)	160	≤200 Aesthetic
92	Zinc (mg/l as Zn)	0.003	≤5 Aesthetic
92	Antimony (µg/l as Sb)	<10	≤20 Chronic Health
92	Arsenic (µg/l as As)	<3	≤10 Chronic Health
92	Barium (µg/l as Ba)	19	≤700 Chronic Health
47	Boron (mg/l as B)	<0.10	≤2.4 Chronic Health

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ANALYSIS
SPITZHOP REDRILL 39602

DATE SAMPLED : 2018/08/19
DATE RECEIVED : 2018/09/07
DATE ANALYSIS COMMENCED : 2018/09/07

OUR REF. : 2018/08/19/24447
REPORT NO . : 5871

	Sample Number	24447	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
92	Cadmium (µg/l as Cd)	<1	≤3 Chronic Health
92	Total Chromium (µg/l as Cr)	<7	≤50 Chronic Health
92	Copper (µg/l as Cu)	<6	≤2000 Chronic Health
51	Cyanide (µg/l as CN-)	<20	≤200 Acute Health
92	Iron (µg/l as Fe)	<24	≤300 Aesthetic ≤2000 Chronic Health
92	Lead (µg/l as Pb)	<7	≤10 Chronic Health
92	Manganese (µg/l as Mn)	<19	≤100 Aesthetic ≤400 Chronic Health
92	Mercury (µg/l as Hg)	<5	≤6 Chronic Health
92	Nickel (µg/l as Ni)	<1	≤70 Chronic Health
92	Selenium (µg/l as Se)	<10	≤40 Chronic Health
92	Uranium (µg/l as U)	<15	≤30 Chronic Health
92	Aluminium (µg/l as Al)	<12	≤300 Operational
105	Total Organic Carbon (mg/l as C)	40.0	≤10 Chronic Health
N/A	Trihalomethane (Chloroform) (µg/l)	<10.0	≤300 Chronic Health
N/A	Trihalomethane (Bromoform) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Dibromochloromethane) (µg/l)	<10.0	≤100 Chronic Health
N/A	Trihalomethane (Bromodichloromethane) (µg/l)	<10.0	≤60 Chronic Health
N/A	Combined Trihalomethanes (µg/l)	0.40	≤1.0
N/A	Total Microcystin (µg/l)	<0.15	≤1
45	Phenols (mg/l)	<0.01	≤0.01 Aesthetic
84	E.coli (count per 100 ml)	<1	Not Detected

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ANALYSIS

SPITZHOP REDRILL 39602

DATE SAMPLED : 2018/08/19
DATE RECEIVED : 2018/09/07
DATE ANALYSIS COMMENCED : 2018/09/07

OUR REF. : 2018/08/19/24447
REPORT NO . : 5871

	Sample Number	24447	
Mthd ALA No.	**Analyses**	**Results**	**SANS 241-1:2015**
85	Total Coliform Bacteria (count per 100 ml)	<1	≤10 Operational
88	Heterotrophic Plate Count (count per ml)	>1000	≤1000 Operational
N/A	Somatic Coliphages (count per 10 ml)	<1	Not Detected Operational
92	Calcium (mg/l as Ca)	80.2	N/A
92	Magnesium (mg/l as Mg)	58.3	N/A
92	Potassium (mg/l as K)	2.3	N/A
94	Total Alkalinity (mg/l as CaCO3)	281	N/A

N. VAN BINSBERGEN (Pr.Sci.Nat.)
DIRECTOR
17 September 2018

Att: Gert Meiring <gertm@bvinc.co.za>

17. APPENDIX D: – PUMPING TEST DATA SHEETS – AB PUMPS

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PROJECT #	P1848
BBR	CHIRTSOPHER
PRODUCTION BONUS:	
EC meter number	

CONSULTANT: GEOSS

DISTRICT: CALVINIA

PROVINCE: NC

FARM / VILLAGE NAME : CALVINIA- CERES RD

DATE TESTED: 12/09/2017

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR 31.64347

LONGITUDE: ° ' " ° ' 19.74949

BOREHOLE NO: BH01 CALVINIA -CERES RD

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: OPEN CASING

BOREHOLE DEPTH: (mbgl) 51.90

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	AVN
Date sample taken	14/09/2017		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	17H30						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	51.90
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	14.53
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	50
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____

DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	0	PROVINCE:	NC
BOREHOLE NO:	BH01 CALVINIA -CERES RD			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	CALVINIA- CERES RD
ALT BH NO:	0				

BOREHOLE DEPTH (m)	51.90	DATUM LEVEL ABOVE CASING (m):	0.23	EXISTING PUMP:	0
WATER LEVEL (mbdl):	14.01	CASING HEIGHT: (magl):	0.20	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	49.10	DIAM PUMP INLET (mm):	210.00	PUMP TYPE:	BP50

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	12/09/2017	TIME:	12H25		DATE:	12/09/2017	TIME:	13H25		DATE:	12/09/201	TIME:	14H25	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	4.21		**5**		**1**	16.73		**1**		**1**	24.07		**1**	21.65
2	8.19		**2**		**2**	17.35		**2**		**2**	26.15		**2**	14.84
3	9.55		**3**		**3**	18.24		**3**		**3**	28.42	5.06	**3**	11.03
5	10.66	1.74	**5**		**5**	19.87	2.54	**5**		**4**	30.36		**5**	6.14
7	13.14		**7**		**7**	21.05		**7**		**5**	35.09	5.06	**7**	3.73
10	14.45	1.74	**10**		**10**	21.82	2.51	**10**		**6**	35.09	3.40	**10**	2.03
15	14.62		**15**		**15**	22.31		**15**		**7**	35.09	3.02	**15**	
20	14.74	1.73	**20**		**20**	22.53	2.51	**20**		**7**	35.09	2.88	**20**	
30	14.81		**30**		**30**	22.68		**30**					**30**	
40	14.89	1.70	**40**		**40**	22.73	2.53	**40**					**40**	
50	14.96		**50**		**50**	22.85		**50**					**50**	
60	15.02	1.72	**60**		**60**	22.94	2.51	**60**					**60**	
70			**70**		**70**			**70**					**70**	
80			**80**		**80**			**80**					**80**	
90			**90**		**90**			**90**					**90**	
100			**100**		**100**			**100**					**100**	
110			**110**		**110**			**110**					**110**	
120			**120**		**120**			**120**					**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	21.40	°C	**180**		**TEMP**	20.80	°C	**180**		**TEMP**		°C	**180**	
EC	365.00	µS/cm	**210**		**EC**	376.00	µS/cm	**210**		**EC**		µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:		TIME:			DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1			**1**		**1**			**1**		**1**			**1**	
2			**2**		**2**			**2**		**2**			**2**	
3			**3**		**3**			**3**		**3**			**3**	
5			**5**		**5**			**5**		**5**			**5**	
7			**7**		**7**			**7**		**7**			**7**	
10			**10**		**10**			**10**		**10**			**10**	
15			**15**		**15**			**15**		**15**			**15**	
20			**20**		**20**			**20**		**20**			**20**	
30			**30**		**30**			**30**		**30**			**30**	
40			**40**		**40**			**40**		**40**			**40**	
50			**50**		**50**			**50**		**50**			**50**	
60			**60**		**60**			**60**		**60**			**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 13.7

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	31.64347	PROVINCE:	NC
BOREHOLE NO:	BH01 CALVINIA -CERES RD		19.74949	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	CALVINIA- CERES RD
ALT BH NO:	0				
BOREHOLE DEPTH:	51.90	DATUM LEVEL ABOVE CASING (m):	0.23	EXISTING PUMP:	0
WATER LEVEL (mbdl):	14.52	CASING HEIGHT: (magl):	0.20	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	49.10	DIAM PUMP INLET(mm):	210	PUMP TYPE:	BP50

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	12/09/2017	TIME:	17H40	DATE:		TIME:		TYPE OF PUMP:	BP50

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	2.52		**1**	10.51	**1**			**1**			**1**	
2	4.07		**2**	7.44	**2**			**2**			**2**	
3	6.89	2.05	**3**	5.92	**3**			**3**			**3**	
5	8.82		**5**	4.11	**5**			**5**			**5**	
7	10.76	2.06	**7**	3.27	**7**			**7**			**7**	
10	12.29		**10**	2.61	**10**			**10**			**10**	
15	13.01	2.04	**15**	2.24	**15**			**15**			**15**	
20	14.16		**20**	2.07	**20**			**20**			**20**	
30	14.41	2.04	**30**	1.92	**30**			**30**			**30**	
40	14.55		**40**	1.83	**40**			**40**			**40**	
60	14.63	2.01	**60**	1.75	**60**			**60**			**60**	
90	14.76		**90**		**90**			**90**			**90**	
120	14.82	2.02	**120**		**120**			**120**			**120**	
150	14.87		**150**		**150**			**150**			**150**	
180	14.91	2.02	**180**		**180**			**180**			**180**	
210	14.94		**210**		**210**			**210**			**210**	
240	14.97	2.02	**240**		**240**			**240**			**240**	
300	15.00		**300**		**300**			**300**			**300**	
360	15.04	2.05	**360**		**360**			**360**			**360**	
420	15.07		**420**		**420**			**420**			**420**	
480	15.11	2.02	**480**		**480**			**480**			**480**	
540	15.13		**540**		**540**			**540**			**540**	
600	15.16	2.04	**600**		**600**			**600**			**600**	
720	15.19		**720**		**720**			**720**			**720**	
840	15.36	2.01	**840**		**840**			**840**			**840**	
960	15.48		**960**		**960**			**960**			**960**	
1080	15.64	2.01	**1080**		**1080**			**1080**			**1080**	
1200	15.82		**1200**		**1200**			**1200**			**1200**	
1320	16.05	2.03	**1320**		**1320**			**1320**			**1320**	
1440	16.23		**1440**		**1440**			**1440**			**1440**	
1560	16.49	2.00	**1560**		**1560**			**1560**			**1560**	
1680	16.57		**1680**		**1680**			**1680**			**1680**	
1800	16.70	2.04	**1800**		**1800**			**1800**			**1800**	
1920	16.79		**1920**		**1920**			**1920**			**1920**	
2040	16.91	2.04	**2040**		**2040**			**2040**			**2040**	
2160	17.16		**2160**		**2160**			**2160**			**2160**	
2280	17.27	2.06	**2280**		**2280**			**2280**			**2280**	
2400	17.41		**2400**		**2400**			**2400**			**2400**	
2520	17.55	2.02	**2520**		**2520**			**2520**			**2520**	
2640	17.63		**2640**		**2640**			**2640**			**2640**	
2760	17.78	2.02	**2760**		**2760**			**2760**			**2760**	
2880	17.94		**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2880		**W/L**			**W/L**			**W/L**
Average yield (l/s):				2.02								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

Ground water solutions t/a AB Pumps CC

BOREHOLE TEST RECORD

PROJECT #	P1848
BBR	
PRODUCTION BONUS:	
EC meter number	

CONSULTANT: GEOSS
DISTRICT: HANTAM
PROVINCE: NC
FARM / VILLAGE NAME : SANDGAT / CALVINIA
DATE TESTED: 15/09/2017

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR 31.49796
LONGITUDE: ° ' " ° ' 19.87455

BOREHOLE NO: SANDGAT 3 BH04
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: SUBMERSIBLE
BOREHOLE DEPTH: (mbgl) 15.12

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	AVN
Date sample taken	18/07/2017		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	08h00						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	15.12
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	9.41
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	1	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ SIGNATURE: _____
DESIGNATION: _____ DATE: _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	0	PROVINCE:	NC
BOREHOLE NO:	SANDGAT 3 BH04			DISTRICT:	HANTAM
ALT BH NO:	0			SITE NAME:	SANDGAT / CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH (m)	15.12	DATUM LEVEL ABOVE CASING (m):	0.26	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	8.41	CASING HEIGHT: (magl):	0.00	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	13.20	DIAM PUMP INLET (mm):	200.00	PUMP TYPE:	BP50

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	15/09/2017	TIME:	13H20		DATE:	15/09/201	TIME:	14H20		DATE:	15/09/201	TIME:	13H20	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.15		**1**		**1**	0.37		**1**		**1**	0.61		**1**	
2	0.17		**2**		**2**	0.38		**2**		**2**	0.63		**2**	
3	0.19		**3**		**3**	0.39		**3**		**3**	0.60	1.71	**3**	
5	0.22	0.59	**5**		**5**	0.41	1.10	**5**		**5**	0.69		**5**	
7	0.23		**7**		**7**	0.42		**7**		**7**	0.71	1.72	**7**	
10	0.24	0.57	**10**		**10**	0.44	1.10	**10**		**10**	0.73		**10**	
15	0.25		**15**		**15**	0.46		**15**		**15**	0.75	1.70	**15**	
20	0.26	0.58	**20**		**20**	0.48	1.11	**20**		**20**	0.77		**20**	
30	0.28		**30**		**30**	0.50		**30**		**30**	0.80	1.73	**30**	
40	0.30	0.29	**40**		**40**	0.52	1.10	**40**		**40**	0.84		**40**	
50	0.32		**50**		**50**	0.54		**50**		**50**	0.87	1.70	**50**	
60	0.34	0.57	**60**		**60**	0.57	1.12	**60**		**60**			**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	19.50	°C	**180**		**TEMP**	19.10	°C	**180**		**TEMP**	19.20	°C	**180**	
EC	810.00	µS/cm	**210**		**EC**	820.00	µS/cm	**210**		**EC**	831.00	µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	15/09/2017	TIME:	16H20		DATE:	15/109/201	TIME:	17H20		DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.94		**1**		**1**	2.38		**1**	1.17	**1**			**1**	
2	0.97		**2**		**1**	3.16	4.20	**2**	0.92	**2**			**2**	
3	1.01		**3**		**2**	4.79		**3**	0.84	**3**			**3**	
5	1.03	2.66	**5**		**2**	4.79	2.94	**5**	0.79	**5**			**5**	
7	1.05		**7**		**3**	4.79	2.75	**7**	0.74	**7**			**7**	
10	1.09	2.63	**10**		**3**	4.79	2.51	**10**	0.69	**10**			**10**	
15	1.12		**15**					**15**	0.63	**15**			**15**	
20	1.14	2.65	**20**					**20**	0.59	**20**			**20**	
30	1.17		**30**					**30**	0.57	**30**			**30**	
40	1.20	2.64	**40**					**40**	0.54	**40**			**40**	
50	1.22		**50**					**50**	0.48	**50**			**50**	
60	1.25	2.67	**60**					**60**	0.43	**60**			**60**	
70			**70**					**70**		**70**			**70**	
80			**80**					**80**		**80**			**80**	
90			**90**					**90**		**90**			**90**	
100			**100**					**100**		**100**			**100**	
110			**110**					**110**		**110**			**110**	
120			**120**					**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	17.20	°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 8.13

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	31.49796	PROVINCE:	NC
BOREHOLE NO:	SANDGAT 3 BH04		19.87455	DISTRICT:	HANTAM
ALT BH NO:	0			SITE NAME:	SANDGAT / CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH:	15.12	DATUM LEVEL ABOVE CASING (m):	0.26	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	8.61	CASING HEIGHT: (magl):	0.00	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	13.20	DIAM PUMP INLET(mm):	200	PUMP TYPE:	BP50

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	16/09/2017	TIME:	08H10	DATE:		TIME:		TYPE OF PUMP:	BP50

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:	**39632**		NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);		107	Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	0.25		**1**	1.76	**1**			**1**			**1**	
2	0.36		**2**	1.61	**2**			**2**			**2**	
3	0.41		**3**	1.59	**3**			**3**			**3**	
5	0.47	2.26	**5**	1.58	**5**			**5**			**5**	
7	0.54		**7**	1.55	**7**			**7**			**7**	
10	0.62	2.28	**10**	1.53	**10**			**10**			**10**	
15	0.68		**15**	1.49	**15**			**15**			**15**	
20	0.73	2.25	**20**	1.45	**20**	0.00		**20**			**20**	
30	0.79		**30**	1.41	**30**	0.00		**30**			**30**	
40	0.85	2.27	**40**	1.38	**40**	0.00		**40**			**40**	
60	0.93		**60**	1.31	**60**	0.00		**60**			**60**	
90	1.01	2.25	**90**	1.25	**90**	0.00		**90**			**90**	
120	1.07		**120**	1.19	**120**	0.00		**120**			**120**	
150	1.12	2.27	**150**	1.12	**150**	0.00		**150**			**150**	
180	1.17		**180**	1.08	**180**	0.00		**180**			**180**	
210	1.21	2.26	**210**	1.06	**210**	0.00		**210**			**210**	
240	1.25		**240**	1.03	**240**	0.00		**240**			**240**	
300	1.32	2.28	**300**	0.97	**300**	0.00		**300**			**300**	
360	1.38		**360**	0.95	**360**	0.00		**360**			**360**	
420	1.45	2.28	**420**	0.91	**420**	0.00		**420**			**420**	
480	1.51		**480**	0.87	**480**	0.00		**480**			**480**	
540	1.53	2.26	**540**		**540**	0.00		**540**			**540**	
600	1.57		**600**		**600**	0.00		**600**			**600**	
720	1.62	2.25	**720**		**720**	0.00		**720**			**720**	
840	1.68		**840**		**840**	0.00		**840**			**840**	
960	1.74	2.27	**960**		**960**	0.00		**960**			**960**	
1080	1.81		**1080**		**1080**	0.00		**1080**			**1080**	
1200	1.89	2.25	**1200**		**1200**	0.00		**1200**			**1200**	
1320	1.96		**1320**		**1320**	0.00		**1320**			**1320**	
1440	2.03	2.28	**1440**		**1440**	0.00		**1440**			**1440**	
1560	2.10		**1560**		**1560**	0.00		**1560**			**1560**	
1680	2.18	2.25	**1680**		**1680**	0.00		**1680**			**1680**	
1800	2.26		**1800**		**1800**	0.00		**1800**			**1800**	
1920	2.34	2.28	**1920**		**1920**	0.00		**1920**			**1920**	
2040	2.43		**2040**		**2040**	0.00		**2040**			**2040**	
2160	2.49	2.25	**2160**		**2160**	0.00		**2160**			**2160**	
2280	2.53		**2280**		**2280**	0.00		**2280**			**2280**	
2400	2.58	2.27	**2400**		**2400**	0.00		**2400**			**2400**	
2520	2.62		**2520**		**2520**	0.00		**2520**			**2520**	
2640	2.67	2.25	**2640**		**2640**	0.00		**2640**			**2640**	
2760	2.73		**2760**		**2760**	0.00		**2760**			**2760**	
2880	2.77	2.25	**2880**		**2880**	0.00		**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2880		**W/L**	**9.06**		**W/L**			**W/L**
Average yield (l/s):				2.25								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P1848
BBR	MORGAN
PRODUCTION BONUS:	
EC meter number	

CONSULTANT: GEOSS
DISTRICT: CALVINIA
PROVINCE: PC
FARM / VILLAGE NAME : NC
SANDGAT
DATE TESTED: 27/09/2017

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR 31.50302
LONGITUDE: ° ' " ° ' 19.87588

BOREHOLE NO: SANDGAT 4 BH05
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: SUBMERSIBLE PUMP
BOREHOLE DEPTH: (mbgl) 59.00

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	AVN
Date sample taken	29/09/2017		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	18H20						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	59.00
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	8.33
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____
DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	0	PROVINCE:	PC
BOREHOLE NO:	SANDGAT 4 BH05			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	NC
ALT BH NO:	0				

BOREHOLE DEPTH (m)	59.00	DATUM LEVEL ABOVE CASING (m):	0.12	EXISTING PUMP:	BP50
WATER LEVEL (mbdl):	8.59	CASING HEIGHT: (magl):	0.13	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	55.10	DIAM PUMP INLET (mm):	170.00	PUMP TYPE:	BP50

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	27/09/2017	TIME:	13H15		DATE:	27/09/2017	TIME:	14H15		DATE:	27/09/201	TIME:	15H15	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	1.81		**1**		**1**	15.53		**1**		**1**	25.47		**1**	40.89
2	2.14		**2**		**2**	15.84		**2**		**2**	26.71	1.67	**2**	37.76
3	2.42	0.67	**3**		**3**	16.01	1.04	**3**		**3**	28.12		**3**	35.33
5	3.67		**5**		**5**	16.77		**5**		**5**	30.07	2.03	**5**	31.96
7	4.01	0.65	**7**		**7**	17.25	1.04	**7**		**7**	35.16		**7**	26.30
10	4.80		**10**		**10**	18.27		**10**		**10**	40.81	2.00	**10**	21.04
15	6.75	0.67	**15**		**15**	20.09	1.03	**15**		**15**	46.51		**15**	12.86
20	8.41		**20**		**20**	21.46		**20**		**20**	46.51	1.22	**20**	3.81
30	11.45	0.68	**30**		**30**	23.05	1.00	**30**		**30**	46.51	1.03	**30**	
40	13.51		**40**		**40**	23.94		**40**		**40**	46.51	0.76	**40**	
50	14.54	0.67	**50**		**50**	24.61	1.02	**50**					**50**	
60	15.17		**60**		**60**	24.90		**60**					**60**	
70			**70**		**70**			**70**					**70**	
80			**80**		**80**			**80**					**80**	
90			**90**		**90**			**90**					**90**	
100			**100**		**100**			**100**					**100**	
110			**110**		**110**			**110**					**110**	
120			**120**		**120**			**120**					**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	23.50	°C	**180**		**TEMP**	22.60	°C	**180**		**TEMP**		°C	**180**	
EC	6.24	µS/cm	**210**		**EC**	6.40	µS/cm	**210**		**EC**		µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:		TIME:			DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1			**1**		**1**			**1**		**1**			**1**	
2			**2**		**2**			**2**		**2**			**2**	
3			**3**		**3**			**3**		**3**			**3**	
5			**5**		**5**			**5**		**5**			**5**	
7			**7**		**7**			**7**		**7**			**7**	
10			**10**		**10**			**10**		**10**			**10**	
15			**15**		**15**			**15**		**15**			**15**	
20			**20**		**20**			**20**		**20**			**20**	
30			**30**		**30**			**30**		**30**			**30**	
40			**40**		**40**			**40**		**40**			**40**	
50			**50**		**50**			**50**		**50**			**50**	
60			**60**		**60**			**60**		**60**			**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 8.32

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	31.50302	PROVINCE:	PC
BOREHOLE NO:	SANDGAT 4 BH05		19.87588	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	NC
ALT BH NO:	0				
BOREHOLE DEPTH:	59.00	DATUM LEVEL ABOVE CASING (m):	0.12	EXISTING PUMP:	BP50
WATER LEVEL (mbdl):	8.59	CASING HEIGHT: (magl):	0.13	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	55.10	DIAM PUMP INLET(mm):	170	PUMP TYPE:	BP50

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	27/09/2017	TIME:	18H30	DATE:		TIME:		TYPE OF PUMP:	BP50

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	1.66		**1**	16.06	**1**			**1**			**1**	
2	2.05		**2**	13.20	**2**			**2**			**2**	
3	2.65	0.75	**3**	11.36	**3**			**3**			**3**	
5	3.40	0.85	**5**	7.82	**5**			**5**			**5**	
7	4.65		**7**	4.38	**7**			**7**			**7**	
10	5.52	0.83	**10**	0.15	**10**			**10**			**10**	
15	7.08		**15**	0.13	**15**			**15**			**15**	
20	8.23	0.84	**20**	0.12	**20**			**20**			**20**	
30	9.85		**30**		**30**			**30**			**30**	
40	11.04	0.84	**40**		**40**			**40**			**40**	
60	14.45		**60**		**60**			**60**			**60**	
90	14.60	0.82	**90**		**90**			**90**			**90**	
120	14.73		**120**		**120**			**120**			**120**	
150	14.86	0.00	**150**		**150**			**150**			**150**	
180	14.98		**180**		**180**			**180**			**180**	
210	15.05	0.85	**210**		**210**			**210**			**210**	
240	15.12		**240**		**240**			**240**			**240**	
300	15.27	0.83	**300**		**300**			**300**			**300**	
360	15.37		**360**		**360**			**360**			**360**	
420	15.49	0.84	**420**		**420**			**420**			**420**	
480	15.56		**480**		**480**			**480**			**480**	
540	15.62	0.82	**540**		**540**			**540**			**540**	
600	15.68		**600**		**600**			**600**			**600**	
720	15.83	0.80	**720**		**720**			**720**			**720**	
840	15.91		**840**		**840**			**840**			**840**	
960	16.12	0.83	**960**		**960**			**960**			**960**	
1080	16.45		**1080**		**1080**			**1080**			**1080**	
1200	16.67	0.85	**1200**		**1200**			**1200**			**1200**	
1320	16.89		**1320**		**1320**			**1320**			**1320**	
1440	17.05	0.82	**1440**		**1440**			**1440**			**1440**	
1560	17.22		**1560**		**1560**			**1560**			**1560**	
1680	17.47	0.81	**1680**		**1680**			**1680**			**1680**	
1800	17.70		**1800**		**1800**			**1800**			**1800**	
1920	17.96	0.85	**1920**		**1920**			**1920**			**1920**	
2040	18.21		**2040**		**2040**			**2040**			**2040**	
2160	18.48	0.83	**2160**		**2160**			**2160**			**2160**	
2280	18.68		**2280**		**2280**			**2280**			**2280**	
2400	18.81	0.85	**2400**		**2400**			**2400**			**2400**	
2520	19.03		**2520**		**2520**			**2520**			**2520**	
2640	19.25	0.83	**2640**		**2640**			**2640**			**2640**	
2760	19.54		**2760**		**2760**			**2760**			**2760**	
2880	19.78	0.84	**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2880		**W/L**			**W/L**			**W/L**
Average yield (l/s):				0.80								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P1848
BBR	ISAAC
PRODUCTION BONUS:	CHRISTOPHER
	AMOS
	PIETER
	SIYABULELA
	AYANDA
EC meter number	

CONSULTANT: GEOSS
DISTRICT: CALVINIA
PROVINCE: NORTHERN CAPE
FARM / VILLAGE NAME : CALVINIA SANDGAT
DATE TESTED: 19/09/2017

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE:	° ' "	OR ° '	OR S31.50953
LONGITUDE:	° ' "	° '	E019.85025

BOREHOLE NO: SANDGAT 5 - BH 06
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: SUBMERSIBLE
BOREHOLE DEPTH: (mbgl) 197.80

COMMENTS: FIRST TEST WE INSTALLED 2.5 PUMP , WE WERE SUPPOSED TO MONITOR SANDGAT 5 BUT THE BOREHOLE IS DRY (18M - NO WATER)

SAMPLE INSTRUCTIONS :

Water sample taken	Yes		Test for:	macro	bacterio-logical	DATA CAPTURED BY:	KVN
Date sample taken	23/09/2017		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	22H30						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	NO	BOREHOLE DEPTH AFTER TEST:	M	197.80
VERTICALLY TEST:	NO	NO	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	26.27
CASING DETECTION:	NO	YES	SAND/GRAVEL/SILT PUMPED?	YES/NO	NO
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	NO	DATA REPORTING AND RECORDING	NO	YES
BOREHOLE MARKING	NO	NO	SLUG TEST:	NO	NO
SITE CLEANING & FINISHING	NO	YES	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	NO	LOGGERS FOR pH AND EC:	NO	NO

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____
DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	S31.50953	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	SANDGAT 5 - BH 06		E019.85025	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	CALVINIA SANDGAT
ALT BH NO:	0				

BOREHOLE DEPTH (m)	197.80	DATUM LEVEL ABOVE CASING (m):	0.75	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	20.91	CASING HEIGHT: (magl):	GROUND LE	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	189.20	DIAM PUMP INLET (mm):	170.00	PUMP TYPE:	GW1302

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	21/09/2017	TIME:	07H55		DATE:	21/09/2017	TIME:	08H55		DATE:	21/09/201	TIME:	09H55	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.22		**1**		**1**	3.95		**1**		**1**	6.11		**1**	
2	0.76		**2**		**2**	4.28	7.91	**2**		**2**	7.18		**2**	
3	1.03	5.05	**3**		**3**	4.40	8.05	**3**		**3**	7.72	10.50	**3**	
5	1.36		**5**		**5**	4.54		**5**		**5**	9.13		**5**	
7	1.74	5.07	**7**		**7**	4.58	8.04	**7**		**7**	9.91	12.09	**7**	
10	1.90		**10**		**10**	4.61		**10**		**10**	10.55		**10**	
15	2.06	5.04	**15**		**15**	4.70	8.08	**15**		**15**	11.64	12.04	**15**	
20	2.13		**20**		**20**	4.87		**20**		**20**	11.89		**20**	
30	2.19	5.08	**30**		**30**	5.34	8.09	**30**		**30**	12.21	12.07	**30**	
40	2.23		**40**		**40**	5.66		**40**		**40**	12.56		**40**	
50	2.29	5.07	**50**		**50**	5.78	8.05	**50**		**50**	12.93	12.11	**50**	
60	2.34		**60**		**60**	5.86		**60**		**60**	13.05		**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	20.20	°C	**180**		**TEMP**	22.80	°C	**180**		**TEMP**	24.00	°C	**180**	
EC	2340.00	µS/cm	**210**		**EC**	2576.00	µS/cm	**210**		**EC**	2743.00	µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	21/09/2017	TIME:	10H55		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	15.15		**1**	7.14	**1**			**1**		**1**			**1**	
2	16.81		**2**	5.04	**2**			**2**		**2**			**2**	
3	17.76	16.50	**3**	4.32	**3**			**3**		**3**			**3**	
5	18.03	18.02	**5**	3.88	**5**			**5**		**5**			**5**	
7	18.48		**7**	2.92	**7**			**7**		**7**			**7**	
10	19.96	18.08	**10**	2.81	**10**			**10**		**10**			**10**	
15	23.34		**15**	2.67	**15**			**15**		**15**			**15**	
20	24.14	18.04	**20**	2.48	**20**			**20**		**20**			**20**	
30	24.44		**30**		**30**			**30**		**30**			**30**	
40	25.02	18.09	**40**		**40**			**40**		**40**			**40**	
50	25.39		**50**		**50**			**50**		**50**			**50**	
60	25.74	18.07	**60**		**60**			**60**		**60**			**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	24.40	°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	2754.00	µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 20.22

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	S31.50953	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	SANDGAT 5 - BH 06		E019.85025	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	CALVINIA SANDGAT
ALT BH NO:	0				
BOREHOLE DEPTH:	197.80	DATUM LEVEL ABOVE CASING (m):	0.75	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	23.54	CASING HEIGHT: (magl):	GROUND	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	189.20	DIAM PUMP INLET(mm):	170	PUMP TYPE:	GW1302

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	22/09/2017	TIME:	06H40	DATE:	21/09/2017	TIME:	18H30	TYPE OF PUMP:	GW1302

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	0.12		**1**	6.23	**1**			**1**			**1**	
2	0.28		**2**	6.04	**2**			**2**			**2**	
3	0.44		**3**	5.75	**3**			**3**			**3**	
5	1.08	5.09	**5**	5.49	**5**			**5**			**5**	
7	1.26		**7**	5.36	**7**			**7**			**7**	
10	1.53	5.06	**10**	5.12	**10**			**10**			**10**	
15	1.64		**15**	4.98	**15**			**15**			**15**	
20	1.83	5.04	**20**	4.89	**20**			**20**			**20**	
30	1.98		**30**	4.80	**30**			**30**			**30**	
40	2.04	5.03	**40**	4.69	**40**			**40**			**40**	
60	2.15		**60**	4.61	**60**			**60**			**60**	
90	2.38	5.08	**90**	4.56	**90**			**90**			**90**	
120	2.50		**120**	4.49	**120**			**120**			**120**	
150	2.62	5.06	**150**	4.42	**150**			**150**			**150**	
180	2.71		**180**	4.36	**180**			**180**			**180**	
210	2.79	5.08	**210**	4.29	**210**			**210**			**210**	
240	2.86		**240**	4.23	**240**			**240**			**240**	
300	2.94	5.03	**300**	4.14	**300**			**300**			**300**	
360	3.09		**360**	4.07	**360**			**360**			**360**	
420	3.21	5.09	**420**	3.99	**420**			**420**			**420**	
480	3.32		**480**	3.91	**480**			**480**			**480**	
540	3.46	5.06	**540**		**540**			**540**			**540**	
600	3.53		**600**		**600**			**600**			**600**	
720	3.89	5.02	**720**		**720**			**720**			**720**	
840	4.03		**840**		**840**			**840**			**840**	
960	4.28	5.01	**960**		**960**			**960**			**960**	
1080	4.51		**1080**		**1080**			**1080**			**1080**	
1200	4.76	5.04	**1200**		**1200**			**1200**			**1200**	
1320	5.02		**1320**		**1320**			**1320**			**1320**	
1440	5.37	5.02	**1440**		**1440**			**1440**			**1440**	
1560	5.56		**1560**		**1560**			**1560**			**1560**	
1680	5.82	5.07	**1680**		**1680**			**1680**			**1680**	
1800	6.08		**1800**		**1800**			**1800**			**1800**	
1920	6.33	5.08	**1920**		**1920**			**1920**			**1920**	
2040	6.58		**2040**		**2040**			**2040**			**2040**	
2160	6.84	5.06	**2160**		**2160**			**2160**			**2160**	
2280	7.14		**2280**		**2280**			**2280**			**2280**	
2400	7.39	5.08	**2400**		**2400**			**2400**			**2400**	
2520			**2520**		**2520**			**2520**			**2520**	
2640			**2640**		**2640**			**2640**			**2640**	
2760			**2760**		**2760**			**2760**			**2760**	
2880			**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2400		**W/L**			**W/L**			**W/L**
Average yield (l/s):				5.08								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P1848
BBR	
PRODUCTION BONUS:	AMOS
	FRANS
EC meter number	

CONSULTANT: GEOSS
DISTRICT: CALVINIA
PROVINCE: NC
FARM / VILLAGE NAME : DEON VLOK
DATE TESTED: 26/09/2017

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR 31.48128
LONGITUDE: ° ' " ° ' 19.96844

BOREHOLE NO: G-39972
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: SUBMERSIBLE
BOREHOLE DEPTH: (mbgl) 249.37

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	AVN
Date sample taken	29/09/2017		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	17H30						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	249.37
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	28.39
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	2	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____
DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	0	PROVINCE:	NC
BOREHOLE NO:	G-39972			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	DEON VLOK
ALT BH NO:	0				
BOREHOLE DEPTH (m)	249.37	DATUM LEVEL ABOVE CASING (m):	0.42	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	22.60	CASING HEIGHT: (magl):	0.10	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	150.00	DIAM PUMP INLET (mm):	210.00	PUMP TYPE:	GW9002

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM 380		DISCHARGE RATE 2			RPM 669		DISCHARGE RATE 3			RPM 795	
DATE:	26/09/2017	TIME:	10H40		DATE:	26/09/2017	TIME:	11H40		DATE:	26/09/201	TIME:	12H40	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.03		**1**		**1**	0.77	4.89	**1**		**1**	3.01	12.06	**1**	
2	0.05	2.09	**2**		**2**	0.84	5.74	**2**		**2**	3.12		**2**	
3	0.08	2.86	**3**		**3**	0.87	8.02	**3**		**3**	3.14		**3**	
5	0.09		**5**		**5**	0.89		**5**		**5**	3.19		**5**	
7	0.10		**7**		**7**	0.91		**7**		**7**	3.24		**7**	
10	0.16		**10**		**10**	0.95	8.05	**10**		**10**	3.27	12.08	**10**	
15	0.21	2.81	**15**		**15**	1.09		**15**		**15**	3.41		**15**	
20	0.29		**20**		**20**	1.21		**20**		**20**	3.52	12.12	**20**	
30	0.35	2.84	**30**		**30**	1.52	8.01	**30**		**30**	3.64		**30**	
40	0.40		**40**		**40**	1.81		**40**		**40**	3.79	12.02	**40**	
50	0.43	2.80	**50**		**50**	2.12	8.00	**50**		**50**	3.90		**50**	
60	0.47		**60**		**60**	2.24		**60**		**60**	3.99	12.01	**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	17.90	°C	**180**		**TEMP**	19.70	°C	**180**		**TEMP**	21.60	°C	**180**	
EC	1168.00	µS/cm	**210**		**EC**	1142.00	µS/cm	**210**		**EC**	1124.00	µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	26/09/2017	TIME:	13H40		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	4.97	15.31	**1**	3.37	**1**			**1**		**1**			**1**	
2	5.34	18.11	**2**	3.29	**2**			**2**		**2**			**2**	
3	5.78		**3**	3.23	**3**			**3**		**3**			**3**	
5	6.03		**5**	3.10	**5**			**5**		**5**			**5**	
7	6.28		**7**	3.05	**7**			**7**		**7**			**7**	
10	6.40	18.20	**10**	2.90	**10**			**10**		**10**			**10**	
15	6.67		**15**	2.73	**15**			**15**		**15**			**15**	
20	6.80	18.24	**20**	2.47	**20**			**20**		**20**			**20**	
30	7.10		**30**	2.15	**30**			**30**		**30**			**30**	
40	7.36	18.16	**40**	1.89	**40**			**40**		**40**			**40**	
50	7.63		**50**	1.68	**50**			**50**		**50**			**50**	
60	7.89	18.21	**60**	1.56	**60**			**60**		**60**			**60**	
70			**70**	1.36	**70**			**70**		**70**			**70**	
80			**80**	1.17	**80**			**80**		**80**			**80**	
90			**90**	1.10	**90**			**90**		**90**			**90**	
100			**100**	1.06	**100**			**100**		**100**			**100**	
110			**110**	1.02	**110**			**110**		**110**			**110**	
120			**120**	0.95	**120**			**120**		**120**			**120**	
pH			**150**	0.78	**pH**			**150**		**pH**			**150**	
TEMP	20.40	°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	1137.00	µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 22.19

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	31.48128	PROVINCE:	NC
BOREHOLE NO:	G-39972		19.96844	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	DEON VLOK
ALT BH NO:	0				
BOREHOLE DEPTH:	249.37	DATUM LEVEL ABOVE CASING (m):	0.42	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	23.38	CASING HEIGHT: (magl):	0.10	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	150.00	DIAM PUMP INLET(mm):	210	PUMP TYPE:	GW9002

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	26/09/2017	TIME:	18h00	DATE:		TIME:		TYPE OF PUMP:	GW9002

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:	**G39594**		NR:	**G39595**		NR:	
DISCHARGE BOREHOLE					Distance(m);		23.5	Distance(m);		16.8	Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	0.86		**1**	9.07	**1**		8.84	**1**			**1**	
2	1.29	14.62	**2**	9.05	**2**		8.82	**2**		DRY	**2**	
3	2.45	16.04	**3**	8.94	**3**		8.80	**3**			**3**	
5	2.77		**5**	8.86	**5**		8.74	**5**			**5**	
7	3.01		**7**	8.82	**7**		8.67	**7**			**7**	
10	3.14		**10**	8.74	**10**		8.57	**10**			**10**	
15	3.25		**15**	8.62	**15**		8.45	**15**			**15**	
20	3.38	16.05	**20**	8.49	**20**	2.04	8.31	**20**			**20**	
30	3.74		**30**	8.32	**30**		8.14	**30**		DRY	**30**	
40	4.01	16.05	**40**	8.14	**40**		8.01	**40**			**40**	
60	4.69		**60**	8.01	**60**	2.04	7.87	**60**	0.00		**60**	
90	5.10	16.02	**90**	7.84	**90**		7.72	**90**			**90**	
120	5.41		**120**	7.73	**120**	2.65	7.58	**120**	0.00		**120**	
150	5.79	16.00	**150**	7.52	**150**		7.32	**150**			**150**	
180	5.92		**180**	7.35	**180**	2.94	7.16	**180**	0.79	DRY	**180**	
210	6.04	16.09	**210**	7.19	**210**		7.03	**210**			**210**	
240	6.18		**240**	6.99	**240**	3.27	6.69	**240**	1.12		**240**	
300	6.39	16.12	**300**	6.71	**300**	3.59	6.55	**300**	1.30		**300**	
360	6.82		**360**	6.59	**360**	3.87	6.48	**360**	1.57		**360**	
420	6.98	16.07	**420**	6.45	**420**	4.09	6.35	**420**	1.72		**420**	
480	7.23		**480**	6.33	**480**	4.55	6.12	**480**	2.11	DRY	**480**	
540	7.54	16.02	**540**		**540**	4.89		**540**	2.21		**540**	
600	7.75		**600**		**600**	5.02		**600**	2.33		**600**	
720	7.97	16.05	**720**		**720**	5.23		**720**	2.51		**720**	
840	8.20		**840**		**840**	5.48		**840**	2.59		**840**	
960	8.41	16.03	**960**		**960**	5.72		**960**	2.67		**960**	
1080	8.60		**1080**		**1080**	5.90		**1080**	2.81		**1080**	
1200	8.79	16.05	**1200**		**1200**	6.10		**1200**	2.97		**1200**	
1320	8.94		**1320**		**1320**	6.24		**1320**	3.50		**1320**	
1440	9.15	16.02	**1440**		**1440**	6.36		**1440**	3.88		**1440**	
1560	9.39		**1560**		**1560**	6.59		**1560**	4.12		**1560**	
1680	9.62	16.05	**1680**		**1680**	6.71		**1680**	4.49		**1680**	
1800	9.83	16.08	**1800**		**1800**	6.88		**1800**	4.82		**1800**	
1920	9.91		**1920**		**1920**	6.95		**1920**	5.01		**1920**	
2040	9.96	16.08	**2040**		**2040**	7.11		**2040**	5.43		**2040**	
2160	10.02		**2160**		**2160**	7.35		**2160**	5.87		**2160**	
2280	10.08	16.01	**2280**		**2280**	7.50		**2280**	5.93		**2280**	
2400	10.28		**2400**		**2400**	7.60		**2400**	6.24		**2400**	
2520	10.36	16.06	**2520**		**2520**	7.69		**2520**	6.54		**2520**	
2640	10.53		**2640**		**2640**	7.80		**2640**	6.65		**2640**	
2760	10.68	16.03	**2760**		**2760**	7.94		**2760**	DRY		**2760**	
2880	10.79		**2880**		**2880**	8.09		**2880**			**2880**	
3000	10.92	16.02	**3000**		**3000**	8.16		**3000**			**3000**	
3120	11.08		**3120**		**3120**	8.33		**3120**			**3120**	
3240	11.24	16.08	**3240**		**3240**	8.48		**3240**			**3240**	
3360	11.31		**3360**		**3360**	8.54		**3360**			**3360**	
3480	11.36	16.04	**3480**		**3480**	8.69		**3480**			**3480**	
3600	11.41		**3600**		**3600**	8.78		**3600**			**3600**	
3720	11.50	16.06	**3720**		**3720**	8.80		**3720**			**3720**	
3840	11.54		**3840**		**3840**	8.89		**3840**			**3840**	
3960	11.56	16.01	**3960**		**3960**	8.95		**3960**			**3960**	
4080	11.59		**4080**		**4080**	8.96		**4080**			**4080**	
4200	11.61	16.05	**4200**		**4200**	8.97		**4200**			**4200**	
4320	11.62		**4320**		**4320**	8.98		**4320**			**4320**	
Total time pumped(min):				4320		**W/L**	**23.45**		**W/L**	**23.07**		**W/L**
Average yield (l/s):				16.07								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P1848
BBR	PIETER MUNYAI
PRODUCTION BONUS:	AMOS
	CHRISTOPHER
	SIYA
	AYANDA
	ISAAC
EC meter number	

CONSULTANT: GEOSS

DISTRICT: CALVINIA

PROVINCE: NORTHERN CAPE

FARM / VILLAGE NAME : CALVINIA

DATE TESTED: 21/09/2017

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR S31.48297

LONGITUDE: ° ' " ° ' E10.76389

BOREHOLE NO: GOLD COURSE

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: SUBMESIBLE PUMP

BOREHOLE DEPTH: (mbgl) 225.90

COMMENTS: ROD STRIPPED AT THE 4TH STEP SO WE HAD TO REMOVE IT TO FIX IT, SO WE DID OTHER STEPS ON HIGH RATE

SAMPLE INSTRUCTIONS :

Water sample taken	Yes		Test for:	macro	bacterio-logical	DATA CAPTURED BY:	KVN
Date sample taken	25/09/2017		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	08H20						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	**COMMENTS:**			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	NO	BOREHOLE DEPTH AFTER TEST:	M	225.90
VERTICALLY TEST:	NO	NO	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	58.08
CASING DETECTION:	NO	YES	SAND/GRAVEL/SILT PUMPED?	YES/NO	NO
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	NO	DATA REPORTING AND RECORDING	NO	YES
BOREHOLE MARKING	NO	NO	SLUG TEST:	NO	NO
SITE CLEANING & FINISHING	NO	YES	LAYFLAT (M):	M	50
LOGGERS FOR WATERLEVEL MONITORING	NO	NO	LOGGERS FOR pH AND EC:	NO	NO

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____

DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	S31.48297	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	GOLD COURSE		E10.76389	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	CALVINIA
ALT BH NO:	0				

BOREHOLE DEPTH (m)	225.90	DATUM LEVEL ABOVE CASING (m):	0.52	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	36.39	CASING HEIGHT: (magl):	0.03	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	100.00	DIAM PUMP INLET (mm):	210.00	PUMP TYPE:	BP50

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	22/09/2017	TIME:	10H20		DATE:	22/09/2017	TIME:	11H20		DATE:	22/09/201	TIME:	12H20	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	1.47		**1**		**1**	12.79	6.89	**1**		**1**	23.41		**1**	29.42
2	1.81		**2**		**2**	13.46		**2**		**2**	23.62	11.63	**2**	29.24
3	2.20	5.03	**3**		**3**	13.64	7.04	**3**		**3**	24.19		**3**	29.05
5	2.76		**5**		**5**	14.00		**5**		**5**	25.11	12.03	**5**	28.79
7	3.14		**7**		**7**	14.45		**7**		**7**	25.63		**7**	28.59
10	3.53	5.00	**10**		**10**	15.48	7.02	**10**		**10**	26.06		**10**	28.40
15	4.90		**15**		**15**	17.02		**15**		**15**	27.21	12.05	**15**	28.00
20	5.90		**20**		**20**	18.04		**20**		**20**	28.44		**20**	27.60
30	8.29	5.04	**30**		**30**	18.72	7.06	**30**		**30**	30.41		**30**	27.15
40	9.62		**40**		**40**	20.01		**40**		**40**	31.53	12.04	**40**	27.00
50	10.65		**50**		**50**	21.64		**50**		**50**	32.64		**50**	26.75
60	12.00		**60**		**60**	22.37		**60**		**60**	33.07		**60**	25.60
70			**70**		**70**			**70**		**70**			**70**	25.36
80			**80**		**80**			**80**		**80**			**80**	25.10
90			**90**		**90**			**90**		**90**			**90**	25.00
100			**100**		**100**			**100**		**100**			**100**	24.90
110			**110**		**110**			**110**		**110**			**110**	24.75
120			**120**		**120**			**120**		**120**			**120**	24.32
pH			**150**		**pH**			**150**		**pH**			**150**	23.40
TEMP	23.20	°C	**180**		**TEMP**	22.50	°C	**180**		**TEMP**		°C	**180**	23.13
EC	80.00	µS/cm	**210**		**EC**	80.00	µS/cm	**210**		**EC**		µS/cm	**210**	22.53
DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			**240**	22.04
DATE:	21/09/2017	TIME:	21H00		DATE:		TIME:			DATE:		TIME:	**420**	20.30
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	**600**	18.58
													800	16.29
1	13.85		**1**	12.40	**1**			**1**		**1**			**960**	14.86
2	14.02		**2**	12.39	**2**			**2**		**2**			**1140**	12.75
3	14.39		**3**	12.33	**3**			**3**		**3**				
5			**5**	12.25	**5**			**5**		**5**				
7			**7**	12.18	**7**			**7**		**7**				
10			**10**	12.12	**10**			**10**		**10**				
15			**15**	11.95	**15**			**15**		**15**				
20			**20**	11.70	**20**			**20**		**20**				
30			**30**	11.43	**30**			**30**		**30**				
40			**40**	11.27	**40**			**40**		**40**				
50			**50**	11.12	**50**			**50**		**50**				
60			**60**	10.97	**60**			**60**		**60**				
70			**70**	10.76	**70**			**70**		**70**				
80			**80**	10.55	**80**			**80**		**80**				
90			**90**	10.30	**90**			**90**		**90**				
100			**100**	10.12	**100**			**100**		**100**				
110			**110**	9.59	**110**			**110**		**110**				
120			**120**	9.03	**120**			**120**		**120**				
pH			**150**	8.67	**pH**			**150**		**pH**				
TEMP		°C	**180**	8.14	**TEMP**		°C	**180**		**TEMP**		°C		
EC		µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm		
			240					**240**						
			300					**300**						
			360					**360**						

S/W/L:(mbch) 31.13

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	S31.48297	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	GOLD COURSE		E10.76389	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH:	225.90	DATUM LEVEL ABOVE CASING (m):	0.52	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	48.74	CASING HEIGHT: (magl):	0.03	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	100.00	DIAM PUMP INLET(mm):	210	PUMP TYPE:	BP50

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	23/09/2017	TIME:	08H30	DATE:	25/09/2017	TIME:	16H30	TYPE OF PUMP:	BP50

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	0.46		**1**	29.83	**1**			**1**			**1**	
2	0.61		**2**	29.80	**2**			**2**			**2**	
3	0.71	2.87	**3**	29.77	**3**			**3**			**3**	
5	1.00		**5**	29.74	**5**			**5**			**5**	
7	1.25	3.03	**7**	29.72	**7**			**7**			**7**	
10	1.55		**10**	29.69	**10**			**10**			**10**	
15	2.00		**15**	29.63	**15**			**15**			**15**	
20	2.40	3.02	**20**	29.59	**20**			**20**			**20**	
30	3.53		**30**	29.53	**30**			**30**			**30**	
40	4.79		**40**	29.47	**40**			**40**			**40**	
60	5.60	3.00	**60**	29.34	**60**			**60**			**60**	
90	7.05		**90**	29.19	**90**			**90**			**90**	
120	8.70		**120**	29.04	**120**			**120**			**120**	
150	9.97	3.04	**150**	28.92	**150**			**150**			**150**	
180	11.00		**180**	28.85	**180**			**180**			**180**	
210	12.08		**210**	28.71	**210**			**210**			**210**	
240	12.77	3.03	**240**	28.63	**240**			**240**			**240**	
300	14.70		**300**	28.44	**300**			**300**			**300**	
360	15.79		**360**	28.22	**360**			**360**			**360**	
420	17.00	3.05	**420**	28.06	**420**			**420**			**420**	
480	17.81		**480**	27.03	**480**			**480**			**480**	
540	18.72	3.05	**540**		**540**			**540**			**540**	
600	19.67		**600**		**600**			**600**			**600**	
720	20.84	3.03	**720**		**720**			**720**			**720**	
840	21.46		**840**		**840**			**840**			**840**	
960	22.55	3.04	**960**		**960**			**960**			**960**	
1080	23.73		**1080**		**1080**			**1080**			**1080**	
1200	24.19	3.04	**1200**		**1200**			**1200**			**1200**	
1320	25.33		**1320**		**1320**			**1320**			**1320**	
1440	25.91	3.02	**1440**		**1440**			**1440**			**1440**	
1560	26.37		**1560**		**1560**			**1560**			**1560**	
1680	26.83	3.00	**1680**		**1680**			**1680**			**1680**	
1800	27.22		**1800**		**1800**			**1800**			**1800**	
1920	27.74	3.05	**1920**		**1920**			**1920**			**1920**	
2040	28.13		**2040**		**2040**			**2040**			**2040**	
2160	28.62	3.03	**2160**		**2160**			**2160**			**2160**	
2280	28.97		**2280**		**2280**			**2280**			**2280**	
2400	29.48	3.01	**2400**		**2400**			**2400**			**2400**	
2520	29.71		**2520**		**2520**			**2520**			**2520**	
2640	30.04	3.04	**2640**		**2640**			**2640**			**2640**	
2760	30.36		**2760**		**2760**			**2760**			**2760**	
2880	30.67	3.02	**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2880		**W/L**			**W/L**			**W/L**
Average yield (l/s):				3.02								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PROJECT #	P1848
BBR	CHRISTOPHER
PRODUCTION BONUS:	ISAAC
	AYANDA
EC meter number	

CONSULTANT: GEOSS
DISTRICT: HANTAM
PROVINCE: NC
FARM / VILLAGE NAME : WITVAL / CALVINIA
DATE TESTED: 26/09/2017

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE:	° ' "	OR ° '	OR 31.45243
LONGITUDE:	° ' "	° '	19.81140

BOREHOLE NO: WITWAL BH03
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: SUBMERSIBLE
BOREHOLE DEPTH: (mbgl) 193.80

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	AVN
Date sample taken	29/09/2017		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	07H20						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	198.80
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	34.4
CASING DETECTION:	NO	RUST	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	YES	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____
DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	0	PROVINCE:	NC
BOREHOLE NO:	WITWAL BH03			DISTRICT:	HANTAM
ALT BH NO:	0			SITE NAME:	WITVAL / CALVINIA
ALT BH NO:	0				

BOREHOLE DEPTH (m)	193.80	DATUM LEVEL ABOVE CASING (m):	0.50	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	22.90	CASING HEIGHT: (magl):	0.00	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	91.10	DIAM PUMP INLET (mm):	170.00	PUMP TYPE:	BP50

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	26/09/2017	TIME:	16H30		DATE:	26/09/2017	TIME:	17H30		DATE:	26/09/201	TIME:	18H30	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.09		**1**		**1**	0.73		**1**		**1**	3.02		**1**	
2	0.13		**2**		**2**	0.79		**2**		**2**	3.78		**2**	
3	0.16		**3**		**3**	0.86		**3**		**3**	4.06		**3**	
5	0.18	0.68	**5**		**5**	0.95	3.01	**5**		**5**	4.42	10.12	**5**	
7	0.19		**7**		**7**	1.02		**7**		**7**	4.73		**7**	
10	0.21	0.68	**10**		**10**	1.07	3.01	**10**		**10**	4.91	10.10	**10**	
15	0.25		**15**		**15**	1.15		**15**		**15**	5.23		**15**	
20	0.29	0.67	**20**		**20**	1.20	3.03	**20**		**20**	5.45	10.09	**20**	
30	0.34		**30**		**30**	1.32		**30**		**30**	5.82		**30**	
40	0.38	0.69	**40**		**40**	1.39	3.02	**40**		**40**	5.94	10.13	**40**	
50	0.40		**50**		**50**	1.45		**50**		**50**	6.09		**50**	
60	0.42	0.67	**60**		**60**	1.52	3.02	**60**		**60**	6.35	10.11	**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	22.00	°C	**180**		**TEMP**	21.80	°C	**180**		**TEMP**	20.10	°C	**180**	
EC	550.00	µS/cm	**210**		**EC**	543.00	µS/cm	**210**		**EC**	545.00	µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	26/09/2017	TIME:	19H30		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	7.06		**1**	5.24	**1**			**1**		**1**			**1**	
2	7.12		**2**	4.53	**2**			**2**		**2**			**2**	
3	7.44		**3**	4.28	**3**			**3**		**3**			**3**	
5	7.53	12.26	**5**	4.06	**5**			**5**		**5**			**5**	
7	7.62		**7**	3.81	**7**			**7**		**7**			**7**	
10	7.73	12.24	**10**	3.40	**10**			**10**		**10**			**10**	
15	7.89		**15**	3.23	**15**			**15**		**15**			**15**	
20	8.04	12.26	**20**	3.05	**20**			**20**		**20**			**20**	
30	8.29		**30**	2.93	**30**			**30**		**30**			**30**	
40	8.49	12.26	**40**	2.86	**40**			**40**		**40**			**40**	
50	8.71		**50**	2.75	**50**			**50**		**50**			**50**	
60	8.89	12.25	**60**	2.66	**60**			**60**		**60**			**60**	
70			**70**	2.52	**70**			**70**		**70**			**70**	
80			**80**	2.40	**80**			**80**		**80**			**80**	
90			**90**	2.34	**90**			**90**		**90**			**90**	
100			**100**	2.21	**100**			**100**		**100**			**100**	
110			**110**	2.13	**110**			**110**		**110**			**110**	
120			**120**	1.90	**120**			**120**		**120**			**120**	
pH			**150**	1.63	**pH**			**150**		**pH**			**150**	
TEMP	19.10	°C	**180**	1.40	**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	550.00	µS/cm	**210**	1.25	**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240	1.08				**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 22.4

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P1848	MAP REFERENCE:	31.45243	PROVINCE:	NC
BOREHOLE NO:	WITWAL BH03		19.8114	DISTRICT:	HANTAM
ALT BH NO:	0			SITE NAME:	WITVAL / CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH:	193.80	DATUM LEVEL ABOVE CASING (m):	0.50	EXISTING PUMP:	SUBMERSIBLE
WATER LEVEL (mbdl):	23.80	CASING HEIGHT: (magl):	0.00	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	91.10	DIAM PUMP INLET(mm):	170	PUMP TYPE:	BP50

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	27/09/2017	TIME:	07H30	DATE:		TIME:		TYPE OF PUMP:	BP50

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:	**WITWAL BH01**		NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);		51.3	Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	1.98		**1**	16.56	**1**		14.10	**1**			**1**	
2	2.17		**2**	16.40	**2**		14.05	**2**			**2**	
3	2.79		**3**	16.28	**3**		13.96	**3**			**3**	
5	3.32	10.03	**5**	16.02	**5**		13.87	**5**			**5**	
7	3.60		**7**	15.84	**7**		13.74	**7**			**7**	
10	3.93	10.03	**10**	15.61	**10**	0.21	13.61	**10**			**10**	
15	4.30		**15**	15.24	**15**	0.44	13.40	**15**			**15**	
20	4.52	10.02	**20**	15.09	**20**	0.61	13.22	**20**			**20**	
30	4.97		**30**	14.80	**30**	0.94	13.04	**30**			**30**	
40	5.28	10.01	**40**	14.58	**40**	1.26	12.83	**40**			**40**	
60	5.87		**60**	14.26	**60**	1.70	12.50	**60**			**60**	
90	6.36	10.03	**90**	13.92	**90**	2.17	12.27	**90**			**90**	
120	6.82		**120**	13.65	**120**	2.60	11.97	**120**			**120**	
150	7.17	10.05	**150**	13.30	**150**	2.93	11.73	**150**			**150**	
180	7.52		**180**	13.06	**180**	3.31	11.54	**180**			**180**	
210	7.80	10.02	**210**	12.84	**210**	3.54	11.38	**210**			**210**	
240	8.12		**240**	12.72	**240**	3.86	11.21	**240**			**240**	
300	8.59	10.04	**300**	12.34	**300**	4.30	10.97	**300**			**300**	
360	9.02		**360**	12.06	**360**	4.60	10.72	**360**			**360**	
420	9.50	10.01	**420**	11.89	**420**	5.11	10.55	**420**			**420**	
480	9.90		**480**	11.42	**480**	5.50	10.30	**480**			**480**	
540	10.26	10.03	**540**		**540**	5.77		**540**			**540**	
600	10.60		**600**		**600**	6.09		**600**			**600**	
720	11.30	10.04	**720**		**720**	6.70		**720**			**720**	
840	11.85		**840**		**840**	7.27		**840**			**840**	
960	12.30	10.02	**960**		**960**	7.70		**960**			**960**	
1080	12.89		**1080**		**1080**	8.29		**1080**			**1080**	
1200	13.34	10.04	**1200**		**1200**	8.60		**1200**			**1200**	
1320	13.78		**1320**		**1320**	8.98		**1320**			**1320**	
1440	14.35	10.03	**1440**		**1440**	9.62		**1440**			**1440**	
1560	14.86		**1560**		**1560**	10.09		**1560**			**1560**	
1680	15.24	10.01	**1680**		**1680**	10.45		**1680**			**1680**	
1800	15.79		**1800**		**1800**	10.97		**1800**			**1800**	
1920	16.17	10.04	**1920**		**1920**	11.28		**1920**			**1920**	
2040	16.63		**2040**		**2040**	11.70		**2040**			**2040**	
2160	17.00	10.02	**2160**		**2160**	12.13		**2160**			**2160**	
2280	17.46		**2280**		**2280**	12.45		**2280**			**2280**	
2400	17.95	10.03	**2400**		**2400**	12.81		**2400**			**2400**	
2520	18.78		**2520**		**2520**	13.26		**2520**			**2520**	
2640	18.64	10.01	**2640**		**2640**	13.69		**2640**			**2640**	
2760	18.97		**2760**		**2760**	13.85		**2760**			**2760**	
2880	19.30	10.04	**2880**		**2880**	14.16		**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2880		**W/L**	**23.39**		**W/L**			**W/L**
Average yield (l/s):				10.04								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	JOHAN
PRODUCTION BONUS:	
EC meter number	

CONSULTANT: GEOSS
DISTRICT: CALVINIA
PROVINCE: WC
FARM / VILLAGE NAME :
DATE TESTED: 12/05/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS:	hddd °mm 'ss.s "	hddd °mm.mmm '	hddd.ddddd
LATITUDE:	° ' "	OR ° '	OR 31.45530
LONGITUDE:	° ' "	° '	19.77385

BOREHOLE NO: CAL-DV01
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: NEW BOREHOLE
BOREHOLE DEPTH: (mbgl) 151.26

COMMENTS: WE DID TWO CONSTANT DISCHARGE TESTS

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	AVN
Date sample taken			If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken							

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	**COMMENTS:**			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	151.26
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	87.9
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____
DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	0	PROVINCE:	WC
BOREHOLE NO:	CAL-DV01			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				
BOREHOLE DEPTH (m)	151.36	DATUM LEVEL ABOVE CASING (m):	0.71	EXISTING PUMP:	0

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.4553	PROVINCE:	WC
BOREHOLE NO:	CAL-DV01		19.77385	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				
BOREHOLE DEPTH:	151.26	DATUM LEVEL ABOVE CASING (m):	0.71	EXISTING PUMP:	0
WATER LEVEL (mbdl):	88.76	CASING HEIGHT: (magl):	0.15	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	124.30	DIAM PUMP INLET(mm):	221	PUMP TYPE:	WA110-2

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	12/05/2018	TIME:	10H00	DATE:		TIME:		TYPE OF PUMP:	WA110-2

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	1.39		**1**	31.47	**1**			**1**			**1**	
2	1.59		**2**	31.12	**2**			**2**			**2**	
3	1.72	9.10	**3**	30.10	**3**			**3**			**3**	
5	1.96	11.49	**5**	28.97	**5**			**5**			**5**	
7	3.97	13.29	**7**	28.47	**7**			**7**			**7**	
10	4.77	15.06	**10**	27.94	**10**			**10**			**10**	
15	5.97	15.06	**15**	27.30	**15**			**15**			**15**	
20	6.89	15.06	**20**	26.84	**20**			**20**			**20**	
30	8.57	15.05	**30**	25.62	**30**			**30**			**30**	
40	9.72	15.06	**40**	25.27	**40**			**40**			**40**	
60	11.80	15.06	**60**	24.60	**60**			**60**			**60**	
90	14.19	15.07	**90**	23.49	**90**			**90**			**90**	
120	16.76	15.04	**120**	22.43	**120**			**120**			**120**	
150	16.42	15.06	**150**	21.78	**150**			**150**			**150**	
180	20.18	15.00	**180**	21.12	**180**			**180**			**180**	
210	21.78	15.04	**210**	20.80	**210**			**210**			**210**	
240	23.20	15.05	**240**	19.47	**240**			**240**			**240**	
300	24.80	15.06	**300**	18.67	**300**			**300**			**300**	
360	28.03	15.01	**360**	17.10	**360**			**360**			**360**	
420	30.33	15.03	**420**	16.35	**420**			**420**			**420**	
480	32.45	15.05	**480**	15.77	**480**			**480**			**480**	
540	34.81		**540**	14.87	**540**			**540**			**540**	
	34.81	14.54	**600**	14.16	**600**			**600**			**600**	
	34.81	14.08	**720**	13.21	**720**			**720**			**720**	
	34.81	13.99	**840**	11.55	**840**			**840**			**840**	
			960	10.35	**960**			**960**			**960**	
			1080	9.25	**1080**			**1080**			**1080**	
			1200	8.10	**1200**			**1200**			**1200**	
			1320	7.18	**1320**			**1320**			**1320**	
			1440	6.32	**1440**			**1440**			**1440**	
			1560	5.97	**1560**			**1560**			**1560**	
			1680	5.32	**1680**			**1680**			**1680**	
			1800	4.53	**1800**			**1800**			**1800**	
			1920	3.90	**1920**			**1920**			**1920**	
			2040	2.22	**2040**			**2040**			**2040**	
			2160	1.38	**2160**			**2160**			**2160**	
			2280		**2280**			**2280**			**2280**	
			2400		**2400**			**2400**			**2400**	
			2520		**2520**			**2520**			**2520**	
			2640		**2640**			**2640**			**2640**	
			2760		**2760**			**2760**			**2760**	
			2880		**2880**			**2880**			**2880**	
			3000		**3000**			**3000**			**3000**	
			3120		**3120**			**3120**			**3120**	
			3240		**3240**			**3240**			**3240**	
			3360		**3360**			**3360**			**3360**	
			3480		**3480**			**3480**			**3480**	
			3600		**3600**			**3600**			**3600**	
			3720		**3720**			**3720**			**3720**	
			3840		**3840**			**3840**			**3840**	
			3960		**3960**			**3960**			**3960**	
			4080		**4080**			**4080**			**4080**	
			4200		**4200**			**4200**			**4200**	
			4320		**4320**			**4320**			**4320**	
Total time pumped(min):				540		**W/L**			**W/L**			**W/L**
Average yield (l/s):				15.05								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	JOHAN
PRODUCTION BONUS:	ABEL
	ERNEST
	SIMON
	BRIGHT
	HENRY
EC meter number	#51

CONSULTANT: GEOSS
DISTRICT: CALVINIA
PROVINCE: NORTHERN CAPE
FARM / VILLAGE NAME :
DATE TESTED: 19/05/2018

MAP REFERENCE:
CO-ORDINATES:

FORMAT ON GPS: **hddd °mm 'ss.s "** **hddd °mm.mmm '** **hddd.ddddd**

LATITUDE:	° ' "	OR ° '	OR **31.41163**
LONGITUDE:	° ' "	° '	**19.77509**

BOREHOLE NO: **CAL-DV 4**
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: NEW BOREHOLE
BOREHOLE DEPTH: (mbgl) 205.00

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	**Yes**	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	NAOMI
Date sample taken	21/05/2018		If consultant took sample, give name:			DATA CHECKED BY:	AILENE
Time sample taken	08H00						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	**COMMENTS:**			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	205.00
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	14.51
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	30
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____
DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.41163	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-DV 4		19.77509	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				

BOREHOLE DEPTH (m)	205.00	DATUM LEVEL ABOVE CASING (m):	0.56	EXISTING PUMP:	0
WATER LEVEL (mbdl):	10.25	CASING HEIGHT: (magl):	0.34	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	99.15	DIAM PUMP INLET (mm):	117.00	PUMP TYPE:	DW2402

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM 139		DISCHARGE RATE 2			RPM 347		DISCHARGE RATE 3			RPM 529	
DATE:	19/05/2018	TIME:	07H30		DATE:	19/05/2018	TIME:	09H10		DATE:	19/05/2018	TIME:	10H50	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.90		**1**		**1**	9.30		**1**		**1**	21.41	2.70	**1**	
2	1.67	0.96	**2**		**2**	9.78	1.58	**2**		**2**	23.18	2.83	**2**	
3	2.27	1.06	**3**		**3**	10.90	1.90	**3**		**3**	23.86	2.96	**3**	
5	3.40	1.05	**5**		**5**	12.23	1.00	**5**		**5**	25.52	2.98	**5**	
7	3.78	1.06	**7**		**7**	13.06	2.00	**7**		**7**	27.03	3.07	**7**	
10	4.48	1.07	**10**		**10**	13.76	2.02	**10**		**10**	28.74	3.06	**10**	
15	5.39	1.05	**15**		**15**	15.06	2.01	**15**		**15**	29.72	3.03	**15**	
20	5.94	1.06	**20**		**20**	15.76	2.03	**20**		**20**	30.70	3.05	**20**	
30	6.65	1.04	**30**		**30**	17.36	2.02	**30**		**30**	32.23	3.03	**30**	
40	7.24	1.07	**40**		**40**	18.12	2.03	**40**		**40**	33.15	3.02	**40**	
50	7.61	1.05	**50**		**50**	18.71	2.05	**50**		**50**	33.98	3.03	**50**	
60	7.93	1.06	**60**		**60**	19.17	2.04	**60**		**60**	34.58	3.02	**60**	
70	8.22	1.01	**70**		**70**	19.58	2.05	**70**		**70**	35.10	3.05	**70**	
80	8.40	1.04	**80**		**80**	20.10	2.05	**80**		**80**	35.60	3.05	**80**	
90	8.58	1.07	**90**		**90**	20.48	2.03	**90**		**90**	36.30	3.03	**90**	
100	8.72		**100**		**100**	20.87		**100**		**100**	36.74		**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	378.00	µS/cm	**210**		**EC**	405.00	µS/cm	**210**		**EC**	413.00	µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	19/05/2018	TIME:	12H30		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	37.15		**1**	87.94	**1**			**1**		**1**			**1**	
2	37.63		**2**	76.60	**2**			**2**		**2**			**2**	
3	38.03		**3**	62.96	**3**			**3**		**3**			**3**	
5	38.66	4.70	**5**	51.61	**5**			**5**		**5**			**5**	
7	38.98		**7**	33.17	**7**			**7**		**7**			**7**	
10	39.47	5.10	**10**	29.20	**10**			**10**		**10**			**10**	
15	45.55	5.80	**15**	22.69	**15**			**15**		**15**			**15**	
20	65.83	5.82	**20**	20.29	**20**			**20**		**20**			**20**	
30	88.05		**30**	17.46	**30**			**30**		**30**			**30**	
	88.05	4.75	**40**	11.93	**40**			**40**		**40**			**40**	
	88.05	4.30	**50**	10.73	**50**			**50**		**50**			**50**	
	88.05	4.18	**60**	9.53	**60**			**60**		**60**			**60**	
			70	8.39	**70**			**70**		**70**			**70**	
			80	7.75	**80**			**80**		**80**			**80**	
			90	7.29	**90**			**90**		**90**			**90**	
			100	6.74	**100**			**100**		**100**			**100**	
			110	6.44	**110**			**110**		**110**			**110**	
			120	6.20	**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**	4.85	**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240	4.16				**240**					**240**	
			300	3.63				**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch)

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.41163	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-DV 4		19.77509	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				
BOREHOLE DEPTH:	205.00	DATUM LEVEL ABOVE CASING (m):	0.56	EXISTING PUMP:	0
WATER LEVEL (mbdl):	12.11	CASING HEIGHT: (magl):	0.34	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	99.15	DIAM PUMP INLET(mm):	117	PUMP TYPE:	DW2402

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	20/05/2018	TIME:	08H00	DATE:	22/05/2018	TIME:	08H00	TYPE OF PUMP:	DW2402

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	1.28		**1**	52.05	**1**			**1**			**1**	
2	2.78	2.70	**2**	47.91	**2**			**2**			**2**	
3	7.21	2.80	**3**	43.81	**3**			**3**			**3**	
5	10.66		**5**	39.39	**5**			**5**			**5**	
7	12.61	2.80	**7**	36.89	**7**			**7**			**7**	
10	14.29	2.85	**10**	33.90	**10**			**10**			**10**	
15	17.45	2.84	**15**	30.70	**15**			**15**			**15**	
20	19.48	2.82	**20**	28.13	**20**			**20**			**20**	
30	21.17	2.80	**30**	24.33	**30**			**30**			**30**	
40	24.94	2.80	**40**	22.61	**40**			**40**			**40**	
60	25.03	2.81	**60**	19.55	**60**			**60**			**60**	
90	27.07	2.84	**90**	16.30	**90**			**90**			**90**	
120	28.40	2.82	**120**	14.61	**120**			**120**			**120**	
150	30.78	2.81	**150**	13.12	**150**			**150**			**150**	
180	32.17	2.80	**180**	12.02	**180**			**180**			**180**	
210	33.10	2.85	**210**	11.10	**210**			**210**			**210**	
240	33.91	2.83	**240**	10.54	**240**			**240**			**240**	
300	34.97	2.82	**300**	9.45	**300**			**300**			**300**	
360	35.84	2.82	**360**	8.73	**360**			**360**			**360**	
420	36.75	2.83	**420**	8.07	**420**			**420**			**420**	
480	37.85	2.83	**480**	7.47	**480**			**480**			**480**	
540	38.88	2.83	**540**	7.02	**540**			**540**			**540**	
600	39.92	2.84	**600**	6.58	**600**			**600**			**600**	
720	41.68	2.83	**720**	6.12	**720**			**720**			**720**	
840	43.77	2.80	**840**	5.67	**840**			**840**			**840**	
960	46.12	2.82	**960**	5.20	**960**			**960**			**960**	
1080	48.24	2.83	**1080**	4.74	**1080**			**1080**			**1080**	
1200	50.44	2.84	**1200**	4.29	**1200**			**1200**			**1200**	
1320	52.02	2.85	**1320**	3.33	**1320**			**1320**			**1320**	
1440	54.30		**1440**	3.11	**1440**			**1440**			**1440**	
1560			**1560**		**1560**			**1560**			**1560**	
1680			**1680**		**1680**			**1680**			**1680**	
1800			**1800**		**1800**			**1800**			**1800**	
1920			**1920**		**1920**			**1920**			**1920**	
2040			**2040**		**2040**			**2040**			**2040**	
2160			**2160**		**2160**			**2160**			**2160**	
2280			**2280**		**2280**			**2280**			**2280**	
2400			**2400**		**2400**			**2400**			**2400**	
2520			**2520**		**2520**			**2520**			**2520**	
2640			**2640**		**2640**			**2640**			**2640**	
2760			**2760**		**2760**			**2760**			**2760**	
2880			**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				1440		**W/L**			**W/L**			**W/L**
Average yield (l/s):				2.83								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	JOHAN
PRODUCTION BONUS:	ABEL
	ERNEST
	HENRY
	REX
	BRIGHT
EC meter number	#51

CONSULTANT: GEOSS
DISTRICT: CALVINIA
PROVINCE: NORTHERN CAPE
FARM / VILLAGE NAME :
DATE TESTED: 15/05/2018

MAP REFERENCE:
CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR 31.43108
LONGITUDE: ° ' " ° ' 19.78912

BOREHOLE NO: CAL-DV3
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: NEW BOREHOLE
BOREHOLE DEPTH: (mbgl) 205.86

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	NAOMI
Date sample taken	17/05/2018		If consultant took sample, give name:			DATA CHECKED BY:	AILENE
Time sample taken	10H43						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	205.86
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	41.62
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____
DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.43108	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-DV3		19.78912	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				

BOREHOLE DEPTH (m)	205.86	DATUM LEVEL ABOVE CASING (m):	0.74	EXISTING PUMP:	0
WATER LEVEL (mbdl):	41.11	CASING HEIGHT: (magl):	0.20	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	147.15	DIAM PUMP INLET (mm):	117.00	PUMP TYPE:	DW 2402

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	15/05/2018	TIME:	16H00		DATE:	15/05/2018	TIME:	17H40		DATE:	15/05/2018	TIME:	19H20	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	1.73		**1**		**1**	37.59		**1**		**1**	102.40		**1**	101.11
2	2.54		**2**		**2**	37.68	1.25	**2**		**2**	102.53		**2**	97.20
3	3.56		**3**		**3**	37.90	1.84	**3**		**3**	103.12	2.38	**3**	82.40
5	6.94	0.48	**5**		**5**	41.48	1.73	**5**		**5**	104.76		**5**	78.38
7	5.97	0.52	**7**		**7**	45.34	1.85	**7**		**7**	104.76	1.77	**7**	72.11
10	9.41	0.83	**10**		**10**	49.42	1.96	**10**		**10**	104.76	1.61	**10**	66.24
15	15.21	1.01	**15**		**15**	55.84	2.02	**15**		**15**	104.76	1.45	**15**	58.11
20	18.94	1.01	**20**		**20**	59.88	2.01	**20**					**20**	43.70
30	23.46	1.00	**30**		**30**	65.24	2.04	**30**					**30**	37.16
40	27.03	1.03	**40**		**40**	69.44	2.05	**40**					**40**	25.94
50	30.45	1.06	**50**		**50**	76.78	2.05	**50**					**50**	22.01
60	32.50	1.03	**60**		**60**	79.33	2.03	**60**					**60**	18.45
70	34.12	1.00	**70**		**70**	80.96	2.02	**70**					**70**	15.97
80	35.28	1.02	**80**		**80**	89.90	2.00	**80**					**80**	13.27
90	36.48	1.01	**90**		**90**	95.64	2.01	**90**					**90**	11.78
100	37.34		**100**		**100**	101.54		**100**					**100**	10.29
110			**110**		**110**			**110**					**110**	8.98
120			**120**		**120**			**120**					**120**	7.98
pH			**150**		**pH**			**150**		**pH**			**150**	5.67
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	3.96
EC	327.00	µS/cm	**210**		**EC**	335.00	µS/cm	**210**		**EC**		µS/cm	**210**	2.93

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:		TIME:			DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1			**1**		**1**			**1**		**1**			**1**	
2			**2**		**2**			**2**		**2**			**2**	
3			**3**		**3**			**3**		**3**			**3**	
5			**5**		**5**			**5**		**5**			**5**	
7			**7**		**7**			**7**		**7**			**7**	
10			**10**		**10**			**10**		**10**			**10**	
15			**15**		**15**			**15**		**15**			**15**	
20			**20**		**20**			**20**		**20**			**20**	
30			**30**		**30**			**30**		**30**			**30**	
40			**40**		**40**			**40**		**40**			**40**	
50			**50**		**50**			**50**		**50**			**50**	
60			**60**		**60**			**60**		**60**			**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch)

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.43108	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-DV3		19.78912	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				
BOREHOLE DEPTH:	205.86	DATUM LEVEL ABOVE CASING (m):	0.74	EXISTING PUMP:	0
WATER LEVEL (mbdl):	41.41	CASING HEIGHT: (magl):	0.20	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	147.15	DIAM PUMP INLET(mm):	117	PUMP TYPE:	DW 2402

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	16/05/2018	TIME:	11:30	DATE:		TIME:		TYPE OF PUMP:	DW 2402

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	2.34		**1**	45.82	**1**			**1**			**1**	
2	3.98		**2**	41.48	**2**			**2**			**2**	
3	4.78	0.75	**3**	36.33	**3**			**3**			**3**	
5	6.39	0.78	**5**	33.31	**5**			**5**			**5**	
7	8.59	0.78	**7**	30.57	**7**			**7**			**7**	
10	10.22	0.80	**10**	28.11	**10**			**10**			**10**	
15	14.30	0.81	**15**	26.57	**15**			**15**			**15**	
20	16.50	0.82	**20**	23.66	**20**			**20**			**20**	
30	21.10	0.80	**30**	19.76	**30**			**30**			**30**	
40	24.29	0.83	**40**	17.07	**40**			**40**			**40**	
60	26.81	0.81	**60**	12.11	**60**			**60**			**60**	
90	30.88	0.80	**90**	9.18	**90**			**90**			**90**	
120	34.71	0.82	**120**	6.59	**120**			**120**			**120**	
150	36.85	0.80	**150**	5.10	**150**			**150**			**150**	
180	38.21	0.83	**180**	4.08	**180**			**180**			**180**	
210	39.02	0.84	**210**	3.38	**210**			**210**			**210**	
240	41.38	0.82	**240**	2.85	**240**			**240**			**240**	
300	43.48	0.81	**300**	2.15	**300**			**300**			**300**	
360	44.53	0.80	**360**	1.84	**360**			**360**			**360**	
420	44.88	0.80	**420**		**420**			**420**			**420**	
480	45.18	0.81	**480**		**480**			**480**			**480**	
540	45.38	0.83	**540**		**540**			**540**			**540**	
600	45.59	0.82	**600**		**600**			**600**			**600**	
720	45.78	0.80	**720**		**720**			**720**			**720**	
840	46.01	0.81	**840**		**840**			**840**			**840**	
960	46.19	0.83	**960**		**960**			**960**			**960**	
1080	46.45	0.80	**1080**		**1080**			**1080**			**1080**	
1200	46.45	0.84	**1200**		**1200**			**1200**			**1200**	
1320	47.00	0.81	**1320**		**1320**			**1320**			**1320**	
1440	48.55		**1440**		**1440**			**1440**			**1440**	
1560			**1560**		**1560**			**1560**			**1560**	
1680			**1680**		**1680**			**1680**			**1680**	
1800			**1800**		**1800**			**1800**			**1800**	
1920			**1920**		**1920**			**1920**			**1920**	
2040			**2040**		**2040**			**2040**			**2040**	
2160			**2160**		**2160**			**2160**			**2160**	
2280			**2280**		**2280**			**2280**			**2280**	
2400			**2400**		**2400**			**2400**			**2400**	
2520			**2520**		**2520**			**2520**			**2520**	
2640			**2640**		**2640**			**2640**			**2640**	
2760			**2760**		**2760**			**2760**			**2760**	
2880			**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				1440		**W/L**			**W/L**			**W/L**
Average yield (l/s):				0.80								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

Ground water solutions t/a AB Pumps CC

BOREHOLE TEST RECORD

PR0JECT #	P2009
BBR	MICHAEL
PRODUCTION BONUS:	ABEL
	ERNEST
	PHINEAS
	SIMON
	HENRY
EC meter number	51

CONSULTANT: GEOSS - KES MURRAY

DISTRICT: CALVINIA

PROVINCE: NORTHEN CAPE

FARM / VILLAGE NAME : NATURE RESERVE

DATE TESTED: 06/07/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR S 31.43522

LONGITUDE: ° ' " ° ' E 19.78445

BOREHOLE NO: CAL-NAT 5

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: NEW BOREHOLE

BOREHOLE DEPTH: (mbgl) 199.80

COMMENTS: ROD STRIPPED ON THE 1ST DATA SHEET. BOREHOLE BOOMED AT 860 MIN .CONSTANT RATE WAS 6 HOURS.
WE RESTARTED AGAIN FOR 5 HOURS FOR 24HOURS

SAMPLE INSTRUCTIONS :

Water sample taken	**Yes**	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	EM
Date sample taken	07/07/2018		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	10H25						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	**COMMENTS:**			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	199.70
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	30.68
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	NO
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____

DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	0	PROVINCE:	NORTHEN CAPE
BOREHOLE NO:	CAL-NAT 5			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	NATURE RESERVE
ALT BH NO:	0				
BOREHOLE DEPTH (m)	199.80	DATUM LEVEL ABOVE CASING (m):	0.72	EXISTING PUMP:	NEW BOREBOLE
WATER LEVEL (mbdl):	25.32	CASING HEIGHT: (magl):	0.11	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	154.04	DIAM PUMP INLET (mm):	178.00	PUMP TYPE:	DW 4002

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM 154		DISCHARGE RATE 2			RPM 210.5		DISCHARGE RATE 3			RPM 517	
DATE:	04/07/2018	TIME:	08H30		DATE:	04/07/2018	TIME:	09H30		DATE:	04/07/2018	TIME:	10H30	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	2.96		**1**		**1**	16.92		**1**		**1**	23.32		**1**	
2	5.22		**2**		**2**	18.84	1.79	**2**		**2**	24.30	2.86	**2**	
3	8.09		**3**		**3**	19.77	2.22	**3**		**3**	25.23	3.02	**3**	
5	11.60		**5**		**5**	20.94	2.23	**5**		**5**	27.62	3.02	**5**	
7	13.02	1.50	**7**		**7**	21.54	2.23	**7**		**7**	28.87	3.03	**7**	
10	14.12	1.51	**10**		**10**	22.09	2.22	**10**		**10**	29.47	3.02	**10**	
15	14.64	1.50	**15**		**15**	22.31	2.21	**15**		**15**	29.68	3.02	**15**	
20	14.87	1.51	**20**		**20**	22.36	2.21	**20**		**20**	29.80	3.01	**20**	
30	14.99	1.51	**30**		**30**	22.38	2.23	**30**		**30**	29.77	3.03	**30**	
40	15.09	1.50	**40**		**40**	22.41	2.22	**40**		**40**	29.77	3.03	**40**	
50	15.21	1.51	**50**		**50**	22.43	2.22	**50**		**50**	29.77	3.02	**50**	
60	15.23	1.50	**60**		**60**	22.44	2.20	**60**		**60**	30.21		**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	498	µS/cm	**210**		**EC**	508	µS/cm	**210**		**EC**	452	µS/cm	**210**	

DISCHARGE RATE 4			RPM 789		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	04/07/2018	TIME:	11H30		DATE:	04/07/2018	TIME:	12H30		DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	32.57		**1**		**1**	86.73		**1**	58.34	**1**			**1**	
2	39.20	4.46	**2**		**2**	89.33	5.89	**2**	42.30	**2**			**2**	
3	44.68	4.79	**3**		**3**	89.41		**3**	30.61	**3**			**3**	
5	58.25	4.91	**5**		**5**			**5**	13.54	**5**			**5**	
7	63.70	5.05	**7**		**7**			**7**	6.60	**7**			**7**	
10	70.69	5.04	**10**		**10**			**10**	4.29	**10**			**10**	
15	75.65	5.03	**15**		**15**			**15**	3.77	**15**			**15**	
20	78.27	5.02	**20**		**20**			**20**	1.47	**20**			**20**	
30	83.37	5.02	**30**		**30**			**30**	3.27	**30**			**30**	
40	84.27	5.00	**40**		**40**			**40**	3.09	**40**			**40**	
50	84.48	5.03	**50**		**50**			**50**	3.00	**50**			**50**	
60	84.66		**60**		**60**			**60**	2.92	**60**			**60**	
70			**70**		**70**			**70**	2.85	**70**			**70**	
80			**80**		**80**			**80**	2.81	**80**			**80**	
90			**90**		**90**			**90**	2.79	**90**			**90**	
100			**100**		**100**			**100**	2.76	**100**			**100**	
110			**110**		**110**			**110**	2.74	**110**			**110**	
120			**120**		**120**			**120**	2.72	**120**			**120**	
pH			**150**		**pH**			**150**	2.69	**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**	2.66	**TEMP**		°C	**180**	
EC	483	µS/cm	**210**		**EC**		µS/cm	**210**	2.56	**EC**		µS/cm	**210**	
			240					**240**	2.53				**240**	
			300					**243**	2.49				**300**	
			360					**244**					**360**	

S/W/L:(mbch) 24.6

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	S 31.43522	PROVINCE:	NORTHEN CAPE
BOREHOLE NO:	CAL-NAT 5		E 19.78445	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	NATURE RESERVE
ALT BH NO:	0				
BOREHOLE DEPTH:	199.80	DATUM LEVEL ABOVE CASING (m):	0.72	EXISTING PUMP:	NEW BOREBOLE
WATER LEVEL (mbdl):	30.03	CASING HEIGHT: (magl):	0.11	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	154.04	DIAM PUMP INLET(mm):	178	PUMP TYPE:	DW 4002

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	05/07/2108	TIME:	08H00	DATE:	06/07/2108	TIME:		TYPE OF PUMP:	DW 4002

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	4.95		**1**	64.08	**1**			**1**			**1**	
2	13.97		**2**	49.01	**2**			**2**			**2**	
3	23.29	4.91	**3**	34.45	**3**			**3**			**3**	
5	40.64	4.95	**5**	15.33	**5**			**5**			**5**	
7	49.59		**7**	7.51	**7**			**7**			**7**	
10	57.27	5.03	**10**	6.02	**10**			**10**			**10**	
15	64.82	5.05	**15**	5.45	**15**			**15**			**15**	
20	70.63	5.03	**20**	5.16	**20**			**20**			**20**	
30	72.89	5.02	**30**	4.86	**30**			**30**			**30**	
40	73.85	5.01	**40**	4.63	**40**			**40**			**40**	
60	77.03	5.03	**60**	4.39	**60**			**60**			**60**	
90	77.54	5.02	**90**	4.05	**90**			**90**			**90**	
120	77.76	5.01	**120**	3.84	**120**			**120**			**120**	
150	78.03	5.01	**150**	3.65	**150**			**150**			**150**	
180	78.14	5.00	**180**	3.48	**180**			**180**			**180**	
210	78.40	5.03	**210**	3.35	**210**			**210**			**210**	
240	78.84	5.02	**240**	3.20	**240**			**240**			**240**	
300	79.25	5.02	**300**	3.02	**300**			**300**			**300**	
360	79.27	5.00	**360**	2.77	**360**			**360**			**360**	
420	79.46	5.00	**420**	2.58	**420**			**420**			**420**	
480	80.08	5.03	**480**	2.43	**480**			**480**			**480**	
540	80.33	5.02	**540**	2.27	**540**			**540**			**540**	
600	80.52	5.03	**600**	2.10	**600**			**600**			**600**	
720	80.94	5.05	**720**	1.81	**720**			**720**			**720**	
840	81.04	5.02	**840**		**840**			**840**			**840**	
960	81.11	5.03	**960**		**960**			**960**			**960**	
1080	81.36	5.01	**1080**		**1080**			**1080**			**1080**	
1200	81.63	5.02	**1200**		**1200**			**1200**			**1200**	
1320	82.12	5.01	**1320**		**1320**			**1320**			**1320**	
1440	82.12	5.00	**1440**		**1440**			**1440**			**1440**	
			1560		**1560**			**1560**			**1560**	
			1680		**1680**			**1680**			**1680**	
			1800		**1800**			**1800**			**1800**	
			1920		**1920**			**1920**			**1920**	
			2040		**2040**			**2040**			**2040**	
			2160		**2160**			**2160**			**2160**	
			2280		**2280**			**2280**			**2280**	
			2400		**2400**			**2400**			**2400**	
			2520		**2520**			**2520**			**2520**	
			2640		**2640**			**2640**			**2640**	
			2760		**2760**			**2760**			**2760**	
			2880		**2880**			**2880**			**2880**	
			3000		**3000**			**3000**			**3000**	
			3120		**3120**			**3120**			**3120**	
			3240		**3240**			**3240**			**3240**	
			3360		**3360**			**3360**			**3360**	
			3480		**3480**			**3480**			**3480**	
			3600		**3600**			**3600**			**3600**	
			3720		**3720**			**3720**			**3720**	
			3840		**3840**			**3840**			**3840**	
			3960		**3960**			**3960**			**3960**	
			4080		**4080**			**4080**			**4080**	
			4200		**4200**			**4200**			**4200**	
			4320		**4320**			**4320**			**4320**	
Total time pumped(min):				860		**W/L**			**W/L**			**W/L**
Average yield (l/s):				6.03								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

Ground water solutions t/a AB Pumps CC

BOREHOLE TEST RECORD

PR0JECT #	P2009
BBR	MICHAEL
PRODUCTION BONUS:	ABEL
	ERNEST
	PHINIAS/SIMON
	SIMON
	HENRY
EC meter number	51

CONSULTANT: GEOSS- KES MURRAY

DISTRICT: CALVINIA

PROVINCE: NORTHERN CAPE

FARM / VILLAGE NAME : NATURE RESERVE CALVINIA

DATE TESTED: 08/07/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR S 31.45129

LONGITUDE: ° ' " ° ' E 19.77058

BOREHOLE NO: CAL-NAT-6

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: NEW BOREHOLE

BOREHOLE DEPTH: (mbgl) 200M

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	ELZAAN
Date sample taken	10/07/2018		If consultant took sample, give name:			DATA CHECKED BY:	
Time sample taken	06H25						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	200.00
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	12.57
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	50
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ SIGNATURE: _____

DESIGNATION: _____ DATE: _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	0	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-NAT-6			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	NATURE RESERVE CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH (m)	200M	DATUM LEVEL ABOVE CASING (m):	0.69	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):	11.75	CASING HEIGHT: (magl):	0.13	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	100.04	DIAM PUMP INLET (mm):	178.00	PUMP TYPE:	DW 4002

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM 99.1		DISCHARGE RATE 2			RPM 174.9		DISCHARGE RATE 3			RPM 308	
DATE:	08/07/2018	TIME:	15H00		DATE:	0/07/2018	TIME:	16H00		DATE:	08/07/201	TIME:	17H00	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.70		**1**		**1**	1.51	1.69	**1**		**1**	3.66	3.02	**1**	
2	0.72	1.00	**2**		**2**	1.81	1.81	**2**		**2**	4.72		**2**	
3	0.74	1.03	**3**		**3**	2.01	2.07	**3**		**3**	5.22	3.21	**3**	
5	0.76	1.05	**5**		**5**	2.27	2.05	**5**		**5**	5.68	3.55	**5**	
7	0.77	1.04	**7**		**7**	2.34	2.04	**7**		**7**	5.79	4.02	**7**	
10	0.80	1.05	**10**		**10**	2.37	2.03	**10**		**10**	6.63	4.03	**10**	
15	0.81	1.05	**15**		**15**	2.41	2.03	**15**		**15**	6.89	4.02	**15**	
20	0.83	1.04	**20**		**20**	2.43	2.02	**20**		**20**	6.92	4.00	**20**	
30	0.85	1.04	**30**		**30**	2.47	2.01	**30**		**30**	6.96	4.00	**30**	
40	0.86	1.04	**40**		**40**	2.49	2.04	**40**		**40**	7.03	4.02	**40**	
50	0.87	1.03	**50**		**50**	2.52	2.03	**50**		**50**	7.09	4.01	**50**	
60	0.88	1.02	**60**		**60**	2.53	2.03	**60**		**60**	7.20		**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	291	µS/cm	**210**		**EC**	393	µS/cm	**210**		**EC**	397	µS/cm	**210**	

DISCHARGE RATE 4			RPM 678		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	08/07/2018	TIME:	18H00		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	8.85		**1**	75.48	**1**			**1**		**1**			**1**	
2	11.98	5.30	**2**	59.72	**2**			**2**		**2**			**2**	
3	20.43	6.18	**3**	43.97	**3**			**3**		**3**			**3**	
5	43.31	7.53	**5**	15.36	**5**			**5**		**5**			**5**	
7	87.53		**7**	0.71	**7**			**7**		**7**			**7**	
8	87.53	3.60	**10**	0.60	**10**			**10**		**10**			**10**	
9	87.53	3.43	**15**	0.49	**15**			**15**		**15**			**15**	
10	87.53	3.40	**20**	0.45	**20**			**20**		**20**			**20**	
30			**30**	0.38	**30**			**30**		**30**			**30**	
40			**40**	0.35	**40**			**40**		**40**			**40**	
50			**50**	0.33	**50**			**50**		**50**			**50**	
60			**60**	0.31	**60**			**60**		**60**			**60**	
70			**70**	0.28	**70**			**70**		**70**			**70**	
80			**80**	0.27	**80**			**80**		**80**			**80**	
90			**90**	0.26	**90**			**90**		**90**			**90**	
100			**100**	0.25	**100**			**100**		**100**			**100**	
110			**110**	0.24	**110**			**110**		**110**			**110**	
120			**120**	0.23	**120**			**120**		**120**			**120**	
pH			**150**	0.20	**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**	0.19	**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**187**	0.19	**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 11.1

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	S 31.45129	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-NAT-6		E 19.77058	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	NATURE RESERVE CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH:	200M	DATUM LEVEL ABOVE CASING (m):	0.69	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):	11.80	CASING HEIGHT: (magl):	0.13	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	100.04	DIAM PUMP INLET(mm):	178	PUMP TYPE:	DW 4002

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	09/07/2018	TIME:	08H00	DATE:	01/07/2018	TIME:	11H30	TYPE OF PUMP:	DW 4002

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	2.60		**1**	79.72	**1**			**1**			**1**	
2	4.46		**2**	74.32	**2**			**2**			**2**	
3	5.03	2.89	**3**	53.30	**3**			**3**			**3**	
5	5.20		**5**	30.18	**5**			**5**			**5**	
7	5.21	3.52	**7**	4.66	**7**			**7**			**7**	
10	5.26	3.55	**10**	1.98	**10**			**10**			**10**	
15	5.36	3.52	**15**	1.85	**15**			**15**			**15**	
20	5.41	3.51	**20**	1.82	**20**			**20**			**20**	
30	5.47	3.52	**30**	1.76	**30**			**30**			**30**	
40	5.54	3.52	**40**	1.73	**40**			**40**			**40**	
60	5.62	3.51	**60**	1.69	**60**			**60**			**60**	
90	5.71	3.53	**90**	1.62	**90**			**90**			**90**	
120	5.80	3.52	**120**	1.59	**120**			**120**			**120**	
150	5.85	3.50	**150**	1.54	**150**			**150**			**150**	
180	5.87	3.53	**180**	1.49	**180**			**180**			**180**	
210	5.94	3.52	**210**		**210**			**210**			**210**	
240	5.98	3.53	**240**		**240**			**240**			**240**	
300	6.09	3.52	**300**		**300**			**300**			**300**	
360	6.16	3.53	**360**		**360**			**360**			**360**	
420	6.28	3.52	**420**		**420**			**420**			**420**	
480	6.34	3.51	**480**		**480**			**480**			**480**	
540	6.43	3.53	**540**		**540**			**540**			**540**	
600	6.44	3.53	**600**		**600**			**600**			**600**	
720	6.56	3.52	**720**		**720**			**720**			**720**	
840	6.66	3.51	**840**		**840**			**840**			**840**	
960	6.77	3.53	**960**		**960**			**960**			**960**	
1080	6.87	3.52	**1080**		**1080**			**1080**			**1080**	
1200	6.98	3.51	**1200**		**1200**			**1200**			**1200**	
1320	7.41	3.53	**1320**		**1320**			**1320**			**1320**	
1440	8.01	3.52	**1440**		**1440**			**1440**			**1440**	
1470	87.07	4.32	**1560**		**1560**			**1560**			**1560**	
1471	87.07	4.11	**1680**		**1680**			**1680**			**1680**	
1472	87.07	3.80	**1800**		**1800**			**1800**			**1800**	
1473	87.07	3.51	**1920**		**1920**			**1920**			**1920**	
2040			**2040**		**2040**			**2040**			**2040**	
2160			**2160**		**2160**			**2160**			**2160**	
2280			**2280**		**2280**			**2280**			**2280**	
2400			**2400**		**2400**			**2400**			**2400**	
2520			**2520**		**2520**			**2520**			**2520**	
2640			**2640**		**2640**			**2640**			**2640**	
2760			**2760**		**2760**			**2760**			**2760**	
2880			**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				1470		**W/L**			**W/L**			**W/L**
Average yield (l/s):				3.52								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	MICHAEL
PRODUCTION BONUS:	ABEL
	ERNEST
	PHINEAS
	SIMON
EC meter number	51

CONSULTANT: GEOSS

DISTRICT: CALVINIA

PROVINCE: NORTHERN CAPE

FARM / VILLAGE NAME :

DATE TESTED: 21/08/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE:	° ' "	OR ° '	OR S 31.40048
LONGITUDE:	° ' "	° '	E 19.55587

BOREHOLE NO: CAL-PHASE 3.4A

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: NEW BOREHOLE

BOREHOLE DEPTH: (mbgl) 77.20

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	ELZAAN
Date sample taken	24/08/2018		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	07H50						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	77.20
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	22.1
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____

DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	0	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-PHASE 3.4A			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				

BOREHOLE DEPTH (m)	77.20	DATUM LEVEL ABOVE CASING (m):	0.40	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):	20.16	CASING HEIGHT: (magl):	0.38	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	70.25	DIAM PUMP INLET (mm):	310.00	PUMP TYPE:	GW 9602

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM 531		DISCHARGE RATE 2			RPM 1138		DISCHARGE RATE 3			RPM 1719	
DATE:	21/08/2018	TIME:	12H20		DATE:	21/08/2018	TIME:	40H00		DATE:	21/08/2018	TIME:	15H40	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.09		**1**		**1**	0.52		**1**		**1**	1.48		**1**	
2	0.13		**2**		**2**	0.56	11.25	**2**		**2**	1.52		**2**	
3	0.17	5.08	**3**		**3**	0.63	13.25	**3**		**3**	1.64	24.97	**3**	
5	0.20	5.10	**5**		**5**	0.75	15.10	**5**		**5**	1.75	20.05	**5**	
7	0.21	5.07	**7**		**7**	0.80	15.07	**7**		**7**	1.77	25.07	**7**	
10	0.22	5.10	**10**		**10**	0.84	15.05	**10**		**10**	1.84	25.05	**10**	
15	0.25	5.05	**15**		**15**	0.89	15.08	**15**		**15**	1.86	25.03	**15**	
20	0.26	5.09	**20**		**20**	0.93	15.10	**20**		**20**	1.91	25.00	**20**	
30	0.29	5.10	**30**		**30**	1.01	15.10	**30**		**30**	2.06	25.05	**30**	
40	0.32	5.08	**40**		**40**	1.05	15.11	**40**		**40**	2.17	25.07	**40**	
50	0.34	5.08	**50**		**50**	1.11	15.09	**50**		**50**	2.24	25.03	**50**	
60	0.37	5.04	**60**		**60**	1.17	15.10	**60**		**60**	2.34	25.05	**60**	
70	0.38	5.06	**70**		**70**	1.23	15.10	**70**		**70**	2.41	25.02	**70**	
80	0.40	5.08	**80**		**80**	1.26	15.08	**80**		**80**	2.49	25.04	**80**	
90	0.41	5.09	**90**		**90**	1.30	15.10	**90**		**90**	2.56	25.06	**90**	
100	0.42		**100**		**100**	1.35		**100**		**100**	2.65		**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	1519	µS/cm	**210**		**EC**	1569	µS/cm	**210**		**EC**	1531	µS/cm	**210**	

DISCHARGE RATE 4			RPM 2127		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	21/08/2018	TIME:	17H20		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	5.00		**1**	3.12	**1**			**1**		**1**			**1**	
2	2.75		**2**	2.76	**2**			**2**		**2**			**2**	
3	2.78	29.44	**3**	2.61	**3**			**3**		**3**			**3**	
5	2.89	29.91	**5**	2.41	**5**			**5**		**5**			**5**	
7	2.90	30.15	**7**	2.27	**7**			**7**		**7**			**7**	
10	2.92	30.11	**10**	2.21	**10**			**10**		**10**			**10**	
15	2.98	30.15	**15**	2.10	**15**			**15**		**15**			**15**	
20	3.02	30.12	**20**	2.01	**20**			**20**		**20**			**20**	
30	3.11	30.10	**30**	1.86	**30**			**30**		**30**			**30**	
40	3.19	30.16	**40**	1.74	**40**			**40**		**40**			**40**	
50	3.27	30.11	**50**	1.62	**50**			**50**		**50**			**50**	
60	3.34	30.12	**60**	1.57	**60**			**60**		**60**			**60**	
70	3.41	30.10	**70**	1.51	**70**			**70**		**70**			**70**	
80	3.47	30.13	**80**	1.45	**80**			**80**		**80**			**80**	
90	3.53	30.11	**90**	1.36	**90**			**90**		**90**			**90**	
100	3.59		**100**	1.25	**100**			**100**		**100**			**100**	
110			**110**	1.19	**110**			**110**		**110**			**110**	
120			**120**	1.14	**120**			**120**		**120**			**120**	
pH			**150**	1.10	**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**	1.07	**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	1505	µS/cm	**210**	1.05	**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240	1.02				**240**					**240**	
			300	0.98				**300**					**300**	
			360	0.94										
			400	0.89				**360**					**360**	

S/W/L:(mbch) 19.76

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	S 31.40048	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-PHASE 3.4A		E 19.55587	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				
BOREHOLE DEPTH:	77.20	DATUM LEVEL ABOVE CASING (m):	0.40	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):	20.40	CASING HEIGHT: (magl):	0.38	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	70.25	DIAM PUMP INLET(mm):	310	PUMP TYPE:	GW 9602

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	22/08/2018	TIME:	08H00	DATE:	25/08/2018	TIME:	08H00	TYPE OF PUMP:	GW 9602

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	0.21		**1**	6.68	**1**			**1**			**1**	
2	0.34	13.56	**2**	6.40	**2**			**2**			**2**	
3	0.44	17.74	**3**	6.27	**3**			**3**			**3**	
5	0.58	21.30	**5**	6.16	**5**			**5**			**5**	
7	0.81	25.61	**7**	6.09	**7**			**7**			**7**	
10	1.18	28.09	**10**	6.02	**10**			**10**			**10**	
15	1.31	28.11	**15**	5.89	**15**			**15**			**15**	
20	1.42	28.17	**20**	5.81	**20**			**20**			**20**	
30	1.59	28.13	**30**	5.65	**30**			**30**			**30**	
40	1.77	28.10	**40**	5.53	**40**			**40**			**40**	
60	2.00	28.12	**60**	5.28	**60**			**60**			**60**	
90	2.31	28.11	**90**	5.03	**90**			**90**			**90**	
120	2.53	28.00	**120**	4.79	**120**			**120**			**120**	
150	2.75	28.09	**150**	4.57	**150**			**150**			**150**	
180	2.94	28.07	**180**	4.37	**180**			**180**			**180**	
210	3.22	28.05	**210**	4.20	**210**			**210**			**210**	
240	3.38	28.09	**240**	4.09	**240**			**240**			**240**	
300	3.66	28.10	**300**	3.74	**300**			**300**			**300**	
360	3.90	28.12	**360**	3.50	**360**			**360**			**360**	
420	4.10	28.10	**420**	3.28	**420**			**420**			**420**	
480	4.30	28.08	**480**	3.09	**480**			**480**			**480**	
540	4.66	28.11	**540**	2.95	**540**			**540**			**540**	
600	4.68	28.07	**600**	2.77	**600**			**600**			**600**	
720	4.87	28.17	**720**	2.57	**720**			**720**			**720**	
840	5.12	28.11	**840**	2.37	**840**			**840**			**840**	
960	5.34	28.14	**960**	2.27	**960**			**960**			**960**	
1080	5.50	28.11	**1080**	2.19	**1080**			**1080**			**1080**	
1200	5.66	28.11	**1200**	2.14	**1200**			**1200**			**1200**	
1320	5.80	28.09	**1320**	2.09	**1320**			**1320**			**1320**	
1440	5.95	28.10	**1440**	2.04	**1440**			**1440**			**1440**	
1560	6.08	28.06	**1560**		**1560**			**1560**			**1560**	
1680	6.18	28.11	**1680**		**1680**			**1680**			**1680**	
1800	6.27	28.13	**1800**		**1800**			**1800**			**1800**	
1920	6.37	28.09	**1920**		**1920**			**1920**			**1920**	
2040	6.45	28.05	**2040**		**2040**			**2040**			**2040**	
2160	6.57	28.09	**2160**		**2160**			**2160**			**2160**	
2280	6.68	28.12	**2280**		**2280**			**2280**			**2280**	
2400	6.74	28.09	**2400**		**2400**			**2400**			**2400**	
2520	6.85	28.11	**2520**		**2520**			**2520**			**2520**	
2640	6.91	28.13	**2640**		**2640**			**2640**			**2640**	
2760	6.99	28.10	**2760**		**2760**			**2760**			**2760**	
2880	7.08		**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2880		**W/L**			**W/L**			**W/L**
Average yield (l/s):				28.11								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	MICHAEL
PRODUCTION BONUS:	ABEL
	ERNEST
	PHINEAS
	SIMON
EC meter number	51

CONSULTANT: GEOSS

DISTRICT: CALVINIA

PROVINCE: NORTHERN CAPE

FARM / VILLAGE NAME :

DATE TESTED: 26/08/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE:	° ' "	OR ° '	OR S 31.35771
LONGITUDE:	° ' "	° '	E 19.69145

BOREHOLE NO: CAL -PHASE 3-6

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: NEW BOREHOLE

BOREHOLE DEPTH: (mbgl) 111.42

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	EM
Date sample taken	29/08/2018		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	01H20						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	111.40
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	75.17
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____

DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	0	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL -PHASE 3-6			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	S 31.35771	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL -PHASE 3-6		E 19.69145	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	0
ALT BH NO:	0				
BOREHOLE DEPTH:	111.42	DATUM LEVEL ABOVE CASING (m):	0.54	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):	39.17	CASING HEIGHT: (magl):	0.21	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	96.85	DIAM PUMP INLET(mm):	226	PUMP TYPE:	WA 110-2

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	27/08/2018	TIME:	13H30	DATE:	30/08/2018	TIME:	01H30	TYPE OF PUMP:	WA 110-2

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	0.15		**1**	43.07	**1**			**1**			**1**	
2	0.27		**2**	42.95	**2**			**2**			**2**	
3	0.40	11.65	**3**	42.86	**3**			**3**			**3**	
5	0.70	11.96	**5**	42.70	**5**			**5**			**5**	
7	1.68		**7**	42.55	**7**			**7**			**7**	
10	2.26	12.15	**10**	42.36	**10**			**10**			**10**	
15	3.36	12.07	**15**	42.10	**15**			**15**			**15**	
20	4.28	12.09	**20**	41.99	**20**			**20**			**20**	
30	6.21	12.10	**30**	41.63	**30**			**30**			**30**	
40	8.36	12.07	**40**	41.38	**40**			**40**			**40**	
60	11.34	12.11	**60**	41.04	**60**			**60**			**60**	
90	14.94	12.09	**90**	40.72	**90**			**90**			**90**	
120	17.74	12.15	**120**	40.56	**120**			**120**			**120**	
150	19.90	12.13	**150**	40.44	**150**			**150**			**150**	
180	21.67	12.03	**180**	40.32	**180**			**180**			**180**	
210	23.19	12.05	**210**	40.22	**210**			**210**			**210**	
240	24.79	12.09	**240**	40.15	**240**			**240**			**240**	
300	26.68	12.06	**300**	40.03	**300**			**300**			**300**	
360	28.34	12.04	**360**	39.91	**360**			**360**			**360**	
420	29.77	12.02	**420**	39.79	**420**			**420**			**420**	
480	30.84	12.06	**480**	39.66	**480**			**480**			**480**	
540	31.77	12.10	**540**	39.55	**540**			**540**			**540**	
600	32.57	12.07	**600**	39.42	**600**			**600**			**600**	
720	33.87	12.04	**720**	39.17	**720**			**720**			**720**	
840	35.15	12.36	**840**	38.93	**840**			**840**			**840**	
960	36.33	12.10	**960**	38.67	**960**			**960**			**960**	
1080	37.35	12.13	**1080**	38.44	**1080**			**1080**			**1080**	
1200	38.43	12.11	**1200**	38.22	**1200**			**1200**			**1200**	
1320	39.25	12.09	**1320**	38.09	**1320**			**1320**			**1320**	
1440	39.97	12.12	**1440**	37.85	**1440**			**1440**			**1440**	
1560	40.60	12.10	**1560**		**1560**			**1560**			**1560**	
1680	41.16	12.07	**1680**		**1680**			**1680**			**1680**	
1800	41.67	12.07	**1800**		**1800**			**1800**			**1800**	
1920	42.16	12.06	**1920**		**1920**			**1920**			**1920**	
2040	42.68	12.09	**2040**		**2040**			**2040**			**2040**	
2160	43.21		**2160**		**2160**			**2160**			**2160**	
2280			**2280**		**2280**			**2280**			**2280**	
2400			**2400**		**2400**			**2400**			**2400**	
2520			**2520**		**2520**			**2520**			**2520**	
2640			**2640**		**2640**			**2640**			**2640**	
2760			**2760**		**2760**			**2760**			**2760**	
2880			**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2160		**W/L**			**W/L**			**W/L**
Average yield (l/s):				12.07								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	PIETER MUNYAI
PRODUCTION BONUS:	NXAMILE
	KOLLEN
EC meter number	

CONSULTANT: BVI

DISTRICT: CALVINIA

PROVINCE: NORTHERN CAPE

FARM / VILLAGE NAME : KREITZBERG

DATE TESTED: 14/08/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: **hddd ° mm ' ss.s "** **hddd ° mm.mmm '** **hddd.ddddd**

LATITUDE:	° ' "	OR ° '	OR **S 31.63272**
LONGITUDE:	° ' "	° '	**E 19.75683**

BOREHOLE NO: **CAL-PHASE 3.9**

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: NEW BOREHOLE

BOREHOLE DEPTH: (mbgl) 62.15

COMMENTS: WE OLNY DID STEP , WE WERE INSTRUCTED TO PULL THE PIPES OUT

SAMPLE INSTRUCTIONS :

Water sample taken	**Yes**	No	Test for:	**macro**	**bacterio-logical**	DATA CAPTURED BY:	ELZAAN
Date sample taken	14/08/2018		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	15H50						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:	5.00	l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:	8.00	l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:	10.00	l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:	MAX	l/s	**COMMENTS:**			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	**UNIT**	**QTY**		**UNIT**	**QTY**
STRAIGHTNESS TEST:	**NO**	0	BOREHOLE DEPTH AFTER TEST:	**M**	62.15
VERTICALLY TEST:	**NO**	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	**M**	19.53
CASING DETECTION:	**NO**	1	SAND/GRAVEL/SILT PUMPED?	**YES/NO**	**0**
SUPPLIED NEW STEEL BOREHOLE COVER:	**NO**	0	DATA REPORTING AND RECORDING	**NO**	1
BOREHOLE MARKING	**NO**	0	SLUG TEST:	**NO**	0
SITE CLEANING & FINISHING	**NO**	1	LAYFLAT (M):	**M**	50
LOGGERS FOR WATERLEVEL MONITORING	**NO**	0	LOGGERS FOR pH AND EC:	**NO**	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____

DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	0	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-PHASE 3.9			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	KREITZBERG
ALT BH NO:	0				

BOREHOLE DEPTH (m)	62.15	DATUM LEVEL ABOVE CASING (m):	0.42	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):	19.19	CASING HEIGHT: (magl):	0.36	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	58.00	DIAM PUMP INLET (mm):	170.00	PUMP TYPE:	BP 50

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM 557		DISCHARGE RATE 2			RPM 960		DISCHARGE RATE 3			RPM 1223	
DATE: 14/08/2018		TIME: 07H30			DATE: 14/08/2018		TIME: 08H30			DATE: 14/08/2018		TIME: 09H30		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.10		**1**		**1**	0.42		**1**		**1**	0.99	10.46	**1**	
2	0.10		**2**		**2**	0.44	8.24	**2**		**2**	1.00		**2**	
3	0.11		**3**		**3**	0.47		**3**		**3**	1.03	11.27	**3**	
5	0.11	3.79	**5**		**5**	0.50	8.21	**5**		**5**	1.07		**5**	
7	0.12	4.21	**7**		**7**	0.55		**7**		**7**	1.10	11.28	**7**	
10	0.12		**10**		**10**	0.62	8.23	**10**		**10**	1.15		**10**	
15	0.13	4.20	**15**		**15**	0.65		**15**		**15**	1.21		**15**	
20	0.18		**20**		**20**	0.68		**20**		**20**	1.27	11.26	**20**	
30	0.24	4.21	**30**		**30**	0.77	8.25	**30**		**30**	1.36		**30**	
40	0.26		**40**		**40**	0.85		**40**		**40**	1.43		**40**	
50	0.32	4.22	**50**		**50**	0.90	8.23	**50**		**50**	1.49	11.28	**50**	
60	0.36		**60**		**60**	0.95		**60**		**60**	1.55		**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP	14.30	°C	**180**		**TEMP**	15.60	°C	**180**		**TEMP**	20.90	°C	**180**	
EC	502	µS/cm	**210**		**EC**	522	µS/cm	**210**		**EC**	534	µS/cm	**210**	

DISCHARGE RATE 4			RPM 1405		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE: 14/08/2018		TIME: 10H30			DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	1.65		**1**	1.96	**1**			**1**		**1**			**1**	
2	1.66	13.87	**2**	1.88	**2**			**2**		**2**			**2**	
3	1.67		**3**	1.81	**3**			**3**		**3**			**3**	
5	1.68	14.05	**5**	1.72	**5**			**5**		**5**			**5**	
7	1.73		**7**	1.60	**7**			**7**		**7**			**7**	
10	1.76	14.01	**10**	1.53	**10**			**10**		**10**			**10**	
15	1.80		**15**	1.42	**15**			**15**		**15**			**15**	
20	1.84	14.03	**20**	1.37	**20**			**20**		**20**			**20**	
30	1.95		**30**	1.26	**30**			**30**		**30**			**30**	
40	2.03		**40**	1.17	**40**			**40**		**40**			**40**	
50	2.11	14.04	**50**	1.09	**50**			**50**		**50**			**50**	
60	2.17		**60**	1.05	**60**			**60**		**60**			**60**	
70			**70**	1.00	**70**			**70**		**70**			**70**	
80			**80**	0.97	**80**			**80**		**80**			**80**	
90			**90**	0.94	**90**			**90**		**90**			**90**	
100			**100**	0.90	**100**			**100**		**100**			**100**	
110			**110**	0.88	**110**			**110**		**110**			**110**	
120			**120**	0.87	**120**			**120**		**120**			**120**	
pH			**150**	0.82	**pH**			**150**		**pH**			**150**	
TEMP	20.10	°C	**180**	0.79	**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	518	µS/cm	**210**	0.76	**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 18.77

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	S 31.63272	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-PHASE 3.9		E 19.75683	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	KREITZBERG
ALT BH NO:	0				
BOREHOLE DEPTH:	62.15	DATUM LEVEL ABOVE CASING (m):	0.42	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):		CASING HEIGHT: (magl):	0.36	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	58.00	DIAM PUMP INLET(mm):	170	PUMP TYPE:	BP 50

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:		TIME:		DATE:		TIME:		TYPE OF PUMP:	BP 50

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	0.21		**1**	6.68	**1**			**1**			**1**	
2	0.34		**2**	6.40	**2**			**2**			**2**	
3	0.44		**3**	6.27	**3**			**3**			**3**	
5	0.58		**5**	6.16	**5**			**5**			**5**	
7	0.81		**7**	6.09	**7**			**7**			**7**	
10	1.18		**10**	6.02	**10**			**10**			**10**	
15	1.31		**15**	5.89	**15**			**15**			**15**	
20	1.42		**20**	5.81	**20**			**20**			**20**	
30	1.59		**30**	5.65	**30**			**30**			**30**	
40	1.77		**40**	5.53	**40**			**40**			**40**	
60	2.00		**60**	5.28	**60**			**60**			**60**	
90	2.31		**90**	5.03	**90**			**90**			**90**	
120	2.53		**120**	4.79	**120**			**120**			**120**	
150	2.75		**150**	4.57	**150**			**150**			**150**	
180	2.94		**180**	4.37	**180**			**180**			**180**	
210	3.22		**210**	4.20	**210**			**210**			**210**	
240	3.38		**240**	4.09	**240**			**240**			**240**	
300	3.66		**300**	3.74	**300**			**300**			**300**	
360	3.90		**360**	3.50	**360**			**360**			**360**	
420	4.10		**420**	3.28	**420**			**420**			**420**	
480	4.30		**480**	3.09	**480**			**480**			**480**	
540	4.66		**540**	2.95	**540**			**540**			**540**	
600	4.68		**600**	2.77	**600**			**600**			**600**	
720	4.87		**720**	2.57	**720**			**720**			**720**	
840	5.12		**840**	2.37	**840**			**840**			**840**	
960	5.34		**960**	2.27	**960**			**960**			**960**	
1080	5.50		**1080**	2.19	**1080**			**1080**			**1080**	
1200	5.66		**1200**	2.14	**1200**			**1200**			**1200**	
1320	5.80		**1320**	2.09	**1320**			**1320**			**1320**	
1440	5.95		**1440**	2.04	**1440**			**1440**			**1440**	
1560	6.08		**1560**		**1560**			**1560**			**1560**	
1680	6.18		**1680**		**1680**			**1680**			**1680**	
1800	6.27		**1800**		**1800**			**1800**			**1800**	
1920	6.37		**1920**		**1920**			**1920**			**1920**	
2040	6.45		**2040**		**2040**			**2040**			**2040**	
2160	6.57		**2160**		**2160**			**2160**			**2160**	
2280	6.68		**2280**		**2280**			**2280**			**2280**	
2400	6.74		**2400**		**2400**			**2400**			**2400**	
2520	6.85		**2520**		**2520**			**2520**			**2520**	
2640	6.91		**2640**		**2640**			**2640**			**2640**	
2760	6.99		**2760**		**2760**			**2760**			**2760**	
2880	7.08		**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):						**W/L**			**W/L**			**W/L**
Average yield (l/s):												

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	JOHAN
PRODUCTION BONUS:	ABEL
	ERNEST
	SIMON
	BRIGHT
	HENRY
EC meter number	#51

CONSULTANT: GEOSS
DISTRICT: HANTAM
PROVINCE: NORTHERN CAPE
FARM / VILLAGE NAME : KRUITBURG CALVINIA
DATE TESTED: 25/05/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR 31.65036
LONGITUDE: ° ' " ° ' 19.80109

BOREHOLE NO: CAL-S2-4
TRANSMISSIVITY VALUE:
TYPE INSTALLATION: NEW BOREHOLE
BOREHOLE DEPTH: (mbgl) 185.96

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	NAOMI
Date sample taken	27/05/2018		If consultant took sample, give name:			DATA CHECKED BY:	AILENE
Time sample taken	07H45						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	185.96
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	16.46
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	1	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ SIGNATURE: _____
DESIGNATION: _____ DATE: _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.65036	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-S2-4		19.80109	DISTRICT:	HANTAM
ALT BH NO:	0			SITE NAME:	KRUITBURG CALVINIA
ALT BH NO:	0				

BOREHOLE DEPTH (m)	185.96	DATUM LEVEL ABOVE CASING (m):	0.65	EXISTING PUMP:	0
WATER LEVEL (mbdl):	6.29	CASING HEIGHT: (magl):	0.18	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	154.09	DIAM PUMP INLET (mm):	117.00	PUMP TYPE:	DW 4002

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	25/05/2018	TIME:	13H40		DATE:	25/05/201	TIME:	15H20		DATE:	25/05/201	TIME:	17H00	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	1.16		**1**		**1**	7.22	2.32	**1**		**1**	13.12		**1**	
2	1.54		**2**		**2**	7.39	2.58	**2**		**2**	13.37		**2**	
3	1.68		**3**		**3**	7.78	2.81	**3**		**3**	15.32	4.21	**3**	
5	1.88	1.31	**5**		**5**	8.39	3.07	**5**		**5**	16.21	4.41	**5**	
7	1.94	1.50	**7**		**7**	8.88	3.06	**7**		**7**	16.61	4.53	**7**	
10	2.10	2.03	**10**		**10**	9.21	3.07	**10**		**10**	16.96	4.52	**10**	
15	3.16	2.03	**15**		**15**	9.83	3.07	**15**		**15**	17.46	4.50	**15**	
20	3.66	2.02	**20**		**20**	10.20	3.05	**20**		**20**	17.77	4.50	**20**	
30	4.39	2.02	**30**		**30**	10.77	3.05	**30**		**30**	18.37	4.50	**30**	
40	4.97	2.01	**40**		**40**	11.17	3.05	**40**		**40**	18.80	4.50	**40**	
50	5.26	2.02	**50**		**50**	11.37	3.04	**50**		**50**	19.15	4.54	**50**	
60	5.64	2.01	**60**		**60**	11.64	3.04	**60**		**60**	20.25	4.53	**60**	
70	5.95	2.00	**70**		**70**	12.01	3.04	**70**		**70**	20.73	4.33	**70**	
80	6.22	2.00	**80**		**80**	12.33	3.06	**80**		**80**	21.17	4.52	**80**	
90	6.61	2.01	**90**		**90**	12.73	3.05	**90**		**90**	21.62	4.52	**90**	
100	6.89		**100**		**100**	13.02		**100**		**100**	22.01		**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	486.00	µS/cm	**210**		**EC**	480.00	µS/cm	**210**		**EC**	524.00	µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	25/05/2018	TIME:	18H40		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	22.52	6.58	**1**	70.22	**1**			**1**		**1**			**1**	
2	20.23		**2**	40.11	**2**			**2**		**2**			**2**	
3	28.86		**3**	28.98	**3**			**3**		**3**			**3**	
5	33.37	6.61	**5**	25.12	**5**			**5**		**5**			**5**	
7	37.50	6.60	**7**	22.91	**7**			**7**		**7**			**7**	
10	43.11	6.62	**10**	21.54	**10**			**10**		**10**			**10**	
15	49.11	6.61	**15**	19.82	**15**			**15**		**15**			**15**	
20	53.21	6.68	**20**	18.92	**20**			**20**		**20**			**20**	
30	59.24	6.86	**30**	17.29	**30**			**30**		**30**			**30**	
40	62.22	6.84	**40**	16.16	**40**			**40**		**40**			**40**	
50	64.25	6.85	**50**	14.22	**50**			**50**		**50**			**50**	
60	67.76	6.83	**60**	13.16	**60**			**60**		**60**			**60**	
70	68.66	6.84	**70**	13.15	**70**			**70**		**70**			**70**	
80	70.71	6.84	**80**	12.57	**80**			**80**		**80**			**80**	
90	71.48	6.80	**90**	11.80	**90**			**90**		**90**			**90**	
100	72.55		**100**	11.20	**100**			**100**		**100**			**100**	
110			**110**	10.40	**110**			**110**		**110**			**110**	
120			**120**	10.02	**120**			**120**		**120**			**120**	
pH			**150**	9.12	**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**	8.15	**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**	7.50	**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240	6.82				**240**					**240**	
			300	6.01				**300**					**300**	
			360	5.36										
			400	4.20				**360**					**360**	

S/W/L:(mbch) 6.08

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.65036	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-S2-4		19.80109	DISTRICT:	HANTAM
ALT BH NO:	0			SITE NAME:	KRUITBURG CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH:	185.96	DATUM LEVEL ABOVE CASING (m):	0.65	EXISTING PUMP:	0
WATER LEVEL (mbdl):	9.18	CASING HEIGHT: (magl):	0.18	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	154.09	DIAM PUMP INLET(mm):	117	PUMP TYPE:	DW 4002

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**							
DATE:	26/05/2018	TIME:	08H00	DATE:		TIME:		TYPE OF PUMP:			DW 4002
				OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
				NR:	**CAL S2-3**		NR:			NR:	
DISCHARGE BOREHOLE				Distance(m);	900		Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	1.55		**1**	27.78	**1**			**1**			**1**	
2	3.32		**2**	26.35	**2**			**2**			**2**	
3	4.21	2.20	**3**	25.35	**3**			**3**			**3**	
5	5.39	4.02	**5**	24.50	**5**	0.03	15.50	**5**			**5**	
7	5.72		**7**	23.84	**7**			**7**			**7**	
10	7.28	4.04	**10**	23.00	**10**	0.08	15.42	**10**			**10**	
15	8.56	4.09	**15**	22.47	**15**	0.18	15.21	**15**			**15**	
20	9.37	4.09	**20**	21.01	**20**	0.31	15.00	**20**			**20**	
30	11.72	4.07	**30**	20.81	**30**	0.60	14.78	**30**			**30**	
40	12.52	4.05	**40**	20.01	**40**	0.88	14.61	**40**			**40**	
60	13.87	4.05	**60**	18.72	**60**	1.39	14.33	**60**			**60**	
90	15.32	4.05	**90**	17.18	**90**	2.11	13.87	**90**			**90**	
120	16.79	4.04	**120**	16.12	**120**	2.73	13.35	**120**			**120**	
150	17.85	4.04	**150**	15.17	**150**	3.33	12.83	**150**			**150**	
180	18.87	4.08	**180**	14.13	**180**	3.87	12.38	**180**			**180**	
210	19.32	4.08	**210**	13.54	**210**	4.43	11.92	**210**			**210**	
240	20.24	4.06	**240**	12.70	**240**	4.84	11.55	**240**			**240**	
300	21.89	4.06	**300**	11.58	**300**	5.85	10.76	**300**			**300**	
360	23.75	4.08	**360**	10.80	**360**	6.59	9.83	**360**			**360**	
420	24.81	4.05	**420**	9.25	**420**	7.32	9.47	**420**			**420**	
480	25.81	4.09	**480**	9.21	**480**	7.97	9.05	**480**			**480**	
540	26.63	4.09	**540**	8.57	**540**	8.48	8.49	**540**			**540**	
600	28.17	4.09	**600**	7.80	**600**	9.18	7.93	**600**			**600**	
720	29.60	4.07	**720**		**720**	10.33		**720**			**720**	
840	30.59	4.03	**840**		**840**	11.05		**840**			**840**	
960	31.77	4.03	**960**		**960**	11.59		**960**			**960**	
1080	32.47	4.04	**1080**		**1080**	12.20		**1080**			**1080**	
1200	33.58	4.02	**1200**		**1200**	13.65		**1200**			**1200**	
1320	34.11		**1320**		**1320**	14.53		**1320**			**1320**	
1440	34.86		**1440**		**1440**	15.55		**1440**			**1440**	
1560			**1560**		**1560**			**1560**			**1560**	
1680			**1680**		**1680**			**1680**			**1680**	
1800			**1800**		**1800**			**1800**			**1800**	
1920			**1920**		**1920**			**1920**			**1920**	
2040			**2040**		**2040**			**2040**			**2040**	
2160			**2160**		**2160**			**2160**			**2160**	
2280			**2280**		**2280**			**2280**			**2280**	
2400			**2400**		**2400**			**2400**			**2400**	
2520			**2520**		**2520**			**2520**			**2520**	
2640			**2640**		**2640**			**2640**			**2640**	
2760			**2760**		**2760**			**2760**			**2760**	
2880			**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				1440		**W/L**	**14.93**		**W/L**			**W/L**
Average yield (l/s):				4.03								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

Ground water solutions t/a AB Pumps CC

BOREHOLE TEST RECORD

PR0JECT #	P2009
BBR	MICHAEL
PRODUCTION BONUS:	ABEL
	ERNST/PHINEAS
	SIMON
	HENRY
EC meter number	#31

CONSULTANT: GEOSS

DISTRICT: CALVINIA

PROVINCE: NORTHERN CAPE

FARM / VILLAGE NAME : CALVINIA

DATE TESTED: 28/06/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE:	° ' "	OR ° '	OR 31.61755
LONGITUDE:	° ' "	° '	19.74473

BOREHOLE NO: CAL-S2-10

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: NEW BOREHOLE

BOREHOLE DEPTH: (mbgl) 151.16

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	NAOMI
Date sample taken	01/07/2018		If consultant took sample, give name:			DATA CHECKED BY:	AILENE
Time sample taken	09H10						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	151.15
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	20.55
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____

DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.61755	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-S2-10		19.74473	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	CALVINIA
ALT BH NO:	0				

BOREHOLE DEPTH (m)	151.16	DATUM LEVEL ABOVE CASING (m):	0.54	EXISTING PUMP:	0
WATER LEVEL (mbdl):	19.44	CASING HEIGHT: (magl):	0.22	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	100.15	DIAM PUMP INLET (mm):	178.00	PUMP TYPE:	WA-110-2

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM 98.8		DISCHARGE RATE 2			RPM 190		DISCHARGE RATE 3			RPM 459	
DATE:	28/06/2018	TIME:	12H00		DATE:	28/06/2018	TIME:	13H00		DATE:	28/06/2018	TIME:	14H00	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.18		**1**		**1**	0.48		**1**		**1**	0.94		**1**	
2	0.20		**2**		**2**	0.57	4.14	**2**		**2**	0.96		**2**	
3	0.21	2.33	**3**		**3**	0.66	4.69	**3**		**3**	0.98	5.78	**3**	
5	0.23	2.30	**5**		**5**	0.73	4.95	**5**		**5**	1.03	6.81	**5**	
7	0.24	2.31	**7**		**7**	0.77	5.04	**7**		**7**	1.05	7.99	**7**	
10	0.25	2.37	**10**		**10**	0.79	5.07	**10**		**10**	2.03	8.51	**10**	19.50
15	0.25	2.36	**15**		**15**	0.81	5.10	**15**		**15**	2.98	12.31	**15**	
20	0.25	2.35	**20**		**20**	0.85	5.10	**20**		**20**	3.42	12.22	**20**	
30	0.27	2.36	**30**		**30**	0.87	5.07	**30**		**30**	3.73	12.28	**30**	
40	0.27	2.36	**40**		**40**	0.88	5.05	**40**		**40**	3.73	12.25	**40**	
50	0.28	2.35	**50**		**50**	0.90	5.07	**50**		**50**	3.82	12.24	**50**	
60	0.29	2.35	**60**		**60**	0.91	5.07	**60**		**60**	3.93		**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	810.00	µS/cm	**210**		**EC**	778.00	µS/cm	**210**		**EC**	812.00	µS/cm	**210**	

DISCHARGE RATE 4			RPM 706.8		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	28/06/2018	TIME:	15H00		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	3.95		**1**	2.72	**1**			**1**		**1**			**1**	
2	3.99	13.81	**2**	1.55	**2**			**2**		**2**			**2**	
3	4.42	14.56	**3**	1.24	**3**			**3**		**3**			**3**	
5	4.67	15.72	**5**	1.05	**5**			**5**		**5**			**5**	
7	6.41	17.54	**7**	0.93	**7**			**7**		**7**			**7**	
10	7.66	18.50	**10**	0.82	**10**			**10**		**10**			**10**	
15	9.11	18.96	**15**	0.76	**15**			**15**		**15**			**15**	
20	9.51	19.20	**20**	0.68	**20**			**20**		**20**			**20**	
30	9.94	19.06	**30**	0.60	**30**			**30**		**30**			**30**	
40	10.08	19.04	**40**	0.55	**40**			**40**		**40**			**40**	
50	10.56	19.07	**50**	0.51	**50**			**50**		**50**			**50**	
60	10.64	19.11	**60**	0.49	**60**			**60**		**60**			**60**	
70	10.83	19.12	**70**	0.44	**70**			**70**		**70**			**70**	
80	10.94	19.10	**80**	0.41	**80**			**80**		**80**			**80**	
90	11.03	19.04	**90**	0.39	**90**			**90**		**90**			**90**	
100	11.09	19.03	**100**	0.37	**100**			**100**		**100**			**100**	
110	11.17	19.00	**110**	0.36	**110**			**110**		**110**			**110**	
120	11.28	19.02	**120**	0.35	**120**			**120**		**120**			**120**	
pH			**150**	0.31	**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**	0.29	**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**	0.27	**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240	0.25				**240**					**240**	
			300	0.21				**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 18.96

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.61755	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-S2-10		19.74473	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH:	151.16	DATUM LEVEL ABOVE CASING (m):	0.54	EXISTING PUMP:	0
WATER LEVEL (mbdl):	19.59	CASING HEIGHT: (magl):	0.22	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	100.15	DIAM PUMP INLET(mm):	178	PUMP TYPE:	WA-110-2

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	29/06/2018	TIME:	09H20	DATE:		TIME:		TYPE OF PUMP:	WA-110-2

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	4.72		**1**	4.79	**1**			**1**			**1**	
2	5.40	16.47	**2**	4.35	**2**			**2**			**2**	
3	6.61	19.78	**3**	4.24	**3**			**3**			**3**	
5	8.59	20.05	**5**	4.09	**5**			**5**			**5**	
7	9.26	20.00	**7**	3.98	**7**			**7**			**7**	
10	9.87	20.10	**10**	3.88	**10**			**10**			**10**	
15	10.37	20.15	**15**	3.76	**15**			**15**			**15**	
20	10.64	20.24	**20**	3.68	**20**			**20**			**20**	
30	11.08	20.15	**30**	3.55	**30**			**30**			**30**	
40	11.36	20.10	**40**	3.43	**40**			**40**			**40**	
60	11.66	20.08	**60**	3.30	**60**			**60**			**60**	
90	11.98	20.20	**90**	3.13	**90**			**90**			**90**	
120	12.32	20.13	**120**	3.04	**120**			**120**			**120**	
150	12.61	20.12	**150**	2.90	**150**			**150**			**150**	
180	12.83	20.10	**180**	2.79	**180**			**180**			**180**	
210	12.96	20.09	**210**	2.70	**210**			**210**			**210**	
240	13.12	20.15	**240**	2.64	**240**			**240**			**240**	
300	13.43	20.13	**300**	2.52	**300**			**300**			**300**	
360	13.66	20.15	**360**	2.43	**360**			**360**			**360**	
420	13.90	20.13	**420**	2.35	**420**			**420**			**420**	
480	14.11	20.10	**480**	2.31	**480**			**480**			**480**	
540	14.21	20.15	**540**	2.26	**540**			**540**			**540**	
600	14.50	20.11	**600**	2.18	**600**			**600**			**600**	
720	14.89	20.13	**720**	2.11	**720**			**720**			**720**	
840	15.17	20.16	**840**	2.06	**840**			**840**			**840**	
960	15.46	20.10	**960**	2.02	**960**			**960**			**960**	
1080	15.73	20.01	**1080**	1.98	**1080**			**1080**			**1080**	
1200	15.94	20.05	**1200**	1.93	**1200**			**1200**			**1200**	
1320	16.23	20.01	**1320**	1.88	**1320**			**1320**			**1320**	
1440	16.57	20.05	**1440**	1.85	**1440**			**1440**			**1440**	
1560	16.71	20.07	**1560**	1.82	**1560**			**1560**			**1560**	
1680	16.96	20.09	**1680**	1.80	**1680**			**1680**			**1680**	
1800	17.07	20.10	**1800**	1.75	**1800**			**1800**			**1800**	
1920	17.69	20.08	**1920**	1.71	**1920**			**1920**			**1920**	
2040	17.88	20.05	**2040**	1.67	**2040**			**2040**			**2040**	
2160	18.12	20.04	**2160**	1.65	**2160**			**2160**			**2160**	
2280	18.35	20.02	**2280**	1.61	**2280**			**2280**			**2280**	
2400	18.41	20.15	**2400**	1.58	**2400**			**2400**			**2400**	
2520	18.54	20.12	**2520**	1.55	**2520**			**2520**			**2520**	
2640	18.73	20.10	**2640**	1.53	**2640**			**2640**			**2640**	
2760	18.94	20.09	**2760**	1.51	**2760**			**2760**			**2760**	
2880	18.95	20.07	**2880**	1.48	**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2880		**W/L**			**W/L**			**W/L**
Average yield (l/s):				20.09								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	MICHAEL
PRODUCTION BONUS:	ABEL
	PHINEAS
	ERNEST
	SIMON
EC meter number	51

CONSULTANT: GEOSS

DISTRICT: CALVINIA

PROVINCE: NORTHERN CAPE

FARM / VILLAGE NAME : SPITZKOP

DATE TESTED: 16/08/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE: ° ' " OR ° ' OR S 31.37297

LONGITUDE: ° ' " ° ' E 19.97083

BOREHOLE NO: REDRILL - 39602

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: NEW BOREHOLE

BOREHOLE DEPTH: (mbgl) 151.00

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	ELZAAN
Date sample taken	19/082018		If consultant took sample, give name:			DATA CHECKED BY:	AVN
Time sample taken	15H55						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	151.00
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	8.53
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	100
LOGGERS FOR WATERLEVEL MONITORING	NO	0	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ SIGNATURE: _____

DESIGNATION: _____ DATE: _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	0	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	REDRILL - 39602			DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	SPITZKOP
ALT BH NO:	0				

BOREHOLE DEPTH (m)	151.00	DATUM LEVEL ABOVE CASING (m):	0.40	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):	8.15	CASING HEIGHT: (magl):	0.34	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	79.25	DIAM PUMP INLET (mm):	310.00	PUMP TYPE:	GW 9602

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM 224.5		DISCHARGE RATE 2			RPM 653		DISCHARGE RATE 3			RPM	
DATE: 16/08/2018		TIME: 13H30			DATE: 16/08/2018		TIME: 15H10			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	1.57		**1**		**1**	12.13		**1**	24.61	**1**			**1**	
2	1.65		**2**		**2**	13.51	7.50	**2**	20.59	**2**			**2**	
3	1.93	3.72	**3**		**3**	14.79	8.10	**3**	15.24	**3**			**3**	
5	2.28	4.50	**5**		**5**	16.66	10.24	**5**	10.88	**5**			**5**	
7	2.56		**7**		**7**	23.53	11.43	**7**	8.90	**7**			**7**	
10	3.75	4.90	**10**		**10**	33.27	13.17	**10**	7.73	**10**			**10**	
15	5.50	5.01	**15**		**15**	48.31	14.50	**15**	6.71	**15**			**15**	
20	6.34	5.00	**20**		**20**	69.91	15.10	**20**	4.96	**20**			**20**	
30	7.46	5.08	**30**			69.91	13.11	**30**	3.98	**30**			**30**	
40	8.52	5.09	**40**			69.91	12.00	**40**	3.06	**40**			**40**	
50	9.16	5.06	**50**			69.91	11.64	**50**	2.63	**50**			**50**	
60	9.67	5.06	**60**					**60**	2.11	**60**			**60**	
70	10.06	5.09	**70**					**70**	1.87	**70**			**70**	
80	10.58	5.08	**80**					**80**	1.23	**80**			**80**	
90	10.91	5.07	**90**					**90**	0.77	**90**			**90**	
100	11.08	5.09	**100**					**100**	0.51	**100**			**100**	
110			**110**					**110**	0.37	**110**			**110**	
120			**120**					**120**	0.26	**120**			**120**	
pH			**150**		**pH**			**150**	0.19	**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**	0.18	**TEMP**		°C	**180**	
EC	1181	µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:		TIME:			DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1			**1**		**1**			**1**		**1**			**1**	
2			**2**		**2**			**2**		**2**			**2**	
3			**3**		**3**			**3**		**3**			**3**	
5			**5**		**5**			**5**		**5**			**5**	
7			**7**		**7**			**7**		**7**			**7**	
10			**10**		**10**			**10**		**10**			**10**	
15			**15**		**15**			**15**		**15**			**15**	
20			**20**		**20**			**20**		**20**			**20**	
30			**30**		**30**			**30**		**30**			**30**	
40			**40**		**40**			**40**		**40**			**40**	
50			**50**		**50**			**50**		**50**			**50**	
60			**60**		**60**			**60**		**60**			**60**	
70			**70**		**70**			**70**		**70**			**70**	
80			**80**		**80**			**80**		**80**			**80**	
90			**90**		**90**			**90**		**90**			**90**	
100			**100**		**100**			**100**		**100**			**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**		**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240					**240**					**240**	
			300					**300**					**300**	
			360					**360**					**360**	

S/W/L:(mbch) 7.75

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	S 31.37297	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	REDRILL - 39602		E 19.97083	DISTRICT:	CALVINIA
ALT BH NO:	0			SITE NAME:	SPITZKOP
ALT BH NO:	0				
BOREHOLE DEPTH:	151.00	DATUM LEVEL ABOVE CASING (m):	0.40	EXISTING PUMP:	NEW BOREHOLE
WATER LEVEL (mbdl):	8.79	CASING HEIGHT: (magl):	0.34	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	79.25	DIAM PUMP INLET(mm):	310	PUMP TYPE:	GW 9602

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	17/08/2018	TIME:	16H00	DATE:		TIME:		TYPE OF PUMP:	GW 9602

					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:			NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);			Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	2.74		**1**	17.24	**1**			**1**			**1**	
2	5.22	5.35	**2**	15.67	**2**			**2**			**2**	
3	5.85	6.51	**3**	15.24	**3**			**3**			**3**	
5	9.03	7.08	**5**	13.72	**5**			**5**			**5**	
7	10.42	7.07	**7**	13.29	**7**			**7**			**7**	
10	11.01	7.09	**10**	12.50	**10**			**10**			**10**	
15	12.71	7.08	**15**	11.08	**15**			**15**			**15**	
20	14.21	7.09	**20**	9.73	**20**			**20**			**20**	
30	15.68	7.06	**30**	7.79	**30**			**30**			**30**	
40	17.40	7.07	**40**	5.98	**40**			**40**			**40**	
60	18.90	7.10	**60**	4.22	**60**			**60**			**60**	
90	20.55	7.10	**90**	2.52	**90**			**90**			**90**	
120	21.47	7.08	**120**	1.70	**120**			**120**			**120**	
150	21.98	7.09	**150**	1.27	**150**			**150**			**150**	
180	22.36	7.10	**180**		**180**			**180**			**180**	
210	23.10	7.07	**210**		**210**			**210**			**210**	
240	23.39	7.04	**240**		**240**			**240**			**240**	
300	23.75	7.04	**300**		**300**			**300**			**300**	
360	23.89	7.01	**360**		**360**			**360**			**360**	
420	24.06	7.03	**420**		**420**			**420**			**420**	
480	24.98	7.06	**480**		**480**			**480**			**480**	
540	25.38	7.01	**540**		**540**			**540**			**540**	
600	25.72	7.09	**600**		**600**			**600**			**600**	
720	26.18	7.04	**720**		**720**			**720**			**720**	
840	26.83	7.06	**840**		**840**			**840**			**840**	
960	27.04	7.10	**960**		**960**			**960**			**960**	
1080	27.04	7.08	**1080**		**1080**			**1080**			**1080**	
1200	27.04	7.10	**1200**		**1200**			**1200**			**1200**	
1320	27.22	7.06	**1320**		**1320**			**1320**			**1320**	
1440	27.34	7.09	**1440**		**1440**			**1440**			**1440**	
1560	27.49	7.10	**1560**		**1560**			**1560**			**1560**	
1680	27.61	7.08	**1680**		**1680**			**1680**			**1680**	
1800	27.68	7.09	**1800**		**1800**			**1800**			**1800**	
1920	27.75	7.07	**1920**		**1920**			**1920**			**1920**	
2040	27.81	7.08	**2040**		**2040**			**2040**			**2040**	
2160	27.89	7.05	**2160**		**2160**			**2160**			**2160**	
2280	27.97	7.09	**2280**		**2280**			**2280**			**2280**	
2400	28.02	7.10	**2400**		**2400**			**2400**			**2400**	
2520	28.16	7.08	**2520**		**2520**			**2520**			**2520**	
2640	28.19	7.10	**2640**		**2640**			**2640**			**2640**	
2760	28.21	7.07	**2760**		**2760**			**2760**			**2760**	
2880	28.22		**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				2880		**W/L**			**W/L**			**W/L**
Average yield (l/s):				7.10								

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Telephone: 043-732 1211
Fax no: 043-732 1422
Fax to e-mail: 0866 717 732
E mail: office@abpumps.co.za

Abbreviations	
EC	Electrical conductivity
mbgl	Meters below ground level
mbch	Meters below casing height
mbdl	Meters below datum level
magl	Meters above ground level
L/S	Litres per second
RPM	Rates per minute
S/W/L	Static water level
µS/cm	Microsiemens per centimeter

BOREHOLE TEST RECORD

Ground water solutions t/a AB Pumps CC

PR0JECT #	P2009
BBR	JOHAN
PRODUCTION BONUS:	ABEL
	ERNEST
	PHINEAS
	SIMON
	HENRY
EC meter number	

CONSULTANT: GEOSS

DISTRICT:

PROVINCE: NORTHERN CAPE

FARM / VILLAGE NAME : KRUITBERG CALVINIA

DATE TESTED: 22/05/2018

MAP REFERENCE:

CO-ORDINATES:

FORMAT ON GPS: hddd °mm 'ss.s " hddd °mm.mmm ' hddd.ddddd

LATITUDE:	° ' "	OR ° '	OR 31.65122
LONGITUDE:	° ' "	° '	19.80162

BOREHOLE NO: CAL-S2-3

TRANSMISSIVITY VALUE:

TYPE INSTALLATION: NEW BOREHOLE

BOREHOLE DEPTH: (mbgl) 121M

COMMENTS:

SAMPLE INSTRUCTIONS :

Water sample taken	Yes	No	Test for:	macro	bacterio-logical	DATA CAPTURED BY:	NAOMI
Date sample taken	24/05/2018		If consultant took sample, give name:			DATA CHECKED BY:	AILENE
Time sample taken	08H48						

CONSULTANT GUIDELINES

BOREHOLE DEPTH:		m	STEP 1:		l/s	WATER STRIKE 1:			m
BLOW YIELD:		m	STEP 2:		l/s	WATER STRIKE 2:			m
STATIC WATER LEVEL:		m	STEP 3:		l/s	WATER STRIKE 3:			m
PUMP INSTALLATION DEPTH:		m	STEP 4:		l/s	COMMENTS:			
RECOVERY:			STEP 5:		l/s				
AFTER STEPS:		h	STEP 6:		l/s	TELEPHONE NUMBERS PHONE : (NAME & TEL)			
AFTER CONSTANT:		h	STEP DURATION:		min				

DESCRIPTION:	UNIT	QTY		UNIT	QTY
STRAIGHTNESS TEST:	NO	0	BOREHOLE DEPTH AFTER TEST:	M	120.98
VERTICALLY TEST:	NO	0	BOREHOLE WATER LEVEL AFTER TEST: (mbch)	M	14.81
CASING DETECTION:	NO	1	SAND/GRAVEL/SILT PUMPED?	YES/NO	0
SUPPLIED NEW STEEL BOREHOLE COVER:	NO	0	DATA REPORTING AND RECORDING	NO	1
BOREHOLE MARKING	NO	0	SLUG TEST:	NO	0
SITE CLEANING & FINISHING	NO	1	LAYFLAT (M):	M	30
LOGGERS FOR WATERLEVEL MONITORING	NO	1	LOGGERS FOR pH AND EC:	NO	0

It is hereby acknowledged that upon leaving the site, all existing equipment is in an acceptable condition.

NAME: _____ **SIGNATURE:** _____

DESIGNATION: _____ **DATE:** _____

FORM 5 E

STEPPED DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.65122	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-S2-3		19.80162	DISTRICT:	0
ALT BH NO:	ABEL			SITE NAME:	KRUITBERG CALVINIA
ALT BH NO:	0				

BOREHOLE DEPTH (m)	121M	DATUM LEVEL ABOVE CASING (m):	0.75	EXISTING PUMP:	0
WATER LEVEL (mbdl):	6.92	CASING HEIGHT: (magl):	0.10	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	39.15	DIAM PUMP INLET (mm):	117.00	PUMP TYPE:	GW2402

STEPPED DISCHARGE TEST & RECOVERY

DISCHARGE RATE 1			RPM		DISCHARGE RATE 2			RPM		DISCHARGE RATE 3			RPM	
DATE:	22/05/2018	TIME:	15H00		DATE:	22/05/2018	TIME:	16H40		DATE:	23/05/2018	TIME:	18H20	
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	0.58		**1**		**1**	3.83	1.30	**1**		**1**	8.12	2.40	**1**	
2	0.80	0.72	**2**		**2**	3.97	1.60	**2**		**2**	8.63	2.71	**2**	
3	0.93	0.86	**3**		**3**	4.34	1.74	**3**		**3**	8.98	2.82	**3**	
5	1.09	0.92	**5**		**5**	4.92	1.94	**5**		**5**	9.64	3.08	**5**	
7	1.28	1.01	**7**		**7**	5.25	1.98	**7**		**7**	10.24	3.05	**7**	
10	1.63	1.01	**10**		**10**	5.74	2.02	**10**		**10**	10.64	3.07	**10**	
15	1.94	1.00	**15**		**15**	6.06	2.04	**15**		**15**	11.13	3.06	**15**	
20	2.16	1.01	**20**		**20**	6.35	2.02	**20**		**20**	11.42	3.05	**20**	
30	2.46	1.02	**30**		**30**	6.68	2.01	**30**		**30**	12.01	3.08	**30**	
40	2.70	1.03	**40**		**40**	6.93	2.02	**40**		**40**	12.40	3.05	**40**	
50	2.89	1.02	**50**		**50**	7.17	2.01	**50**		**50**	12.82	3.05	**50**	
60	3.05	1.02	**60**		**60**	7.42	2.00	**60**		**60**	13.03	3.04	**60**	
70	3.19	1.00	**70**		**70**	7.48	2.01	**70**		**70**	13.31	3.03	**70**	
80	3.33	1.02	**80**		**80**	7.68	2.01	**80**		**80**	13.64	3.04	**80**	
90	3.48	1.01	**90**		**90**	7.91	2.01	**90**		**90**	13.84	3.05	**90**	
100	3.54		**100**		**100**	8.04		**100**		**100**	14.03		**100**	
110			**110**		**110**			**110**		**110**			**110**	
120			**120**		**120**			**120**		**120**			**120**	
pH			**150**		**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**		**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC	469.00	µS/cm	**210**		**EC**	498.00	µS/cm	**210**		**EC**	491.00	µS/cm	**210**	

DISCHARGE RATE 4			RPM		DISCHARGE RATE 5			RPM		DISCHARGE RATE 6			RPM	
DATE:	22/05/2018	TIME:	20H00		DATE:		TIME:			DATE:		TIME:		
TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)	TIME (MIN)	DRAW DOWN (M)	YIELD (L/S)	TIME (MIN)	RECOVERY (M)
1	14.88	3.85	**1**	30.79	**1**			**1**		**1**			**1**	
2	16.44	4.22	**2**	22.70	**2**			**2**		**2**			**2**	
3	17.66		**3**	15.68	**3**			**3**		**3**			**3**	
5	20.08	4.50	**5**	12.10	**5**			**5**		**5**			**5**	
7	22.20		**7**	10.72	**7**			**7**		**7**			**7**	
10	25.37	4.70	**10**	9.48	**10**			**10**		**10**			**10**	
15	30.65	4.76	**15**	8.63	**15**			**15**		**15**			**15**	
20	31.48		**20**	7.98	**20**			**20**		**20**			**20**	
		4.51	**30**	7.06	**30**			**30**		**30**			**30**	
		4.44	**40**	6.36	**40**			**40**		**40**			**40**	
		4.42	**50**	5.93	**50**			**50**		**50**			**50**	
			60	5.55	**60**			**60**		**60**			**60**	
			70	5.39	**70**			**70**		**70**			**70**	
			80	5.12	**80**			**80**		**80**			**80**	
			90	4.90	**90**			**90**		**90**			**90**	
			100	4.91	**100**			**100**		**100**			**100**	
			110	4.52	**110**			**110**		**110**			**110**	
			120	4.13	**120**			**120**		**120**			**120**	
pH			**150**	3.73	**pH**			**150**		**pH**			**150**	
TEMP		°C	**180**	3.35	**TEMP**		°C	**180**		**TEMP**		°C	**180**	
EC		µS/cm	**210**	3.07	**EC**		µS/cm	**210**		**EC**		µS/cm	**210**	
			240	2.69				**240**					**240**	
			300	2.48				**300**					**300**	
			360	2.27				**360**					**360**	

S/W/L:(mbch) 6.14

FORM 5 F

CONSTANT DISCHARGE TEST & RECOVERY

BOREHOLE TEST RECORD SHEET

PROJ NO :	P2009	MAP REFERENCE:	31.65122	PROVINCE:	NORTHERN CAPE
BOREHOLE NO:	CAL-S2-3		19.80162	DISTRICT:	0
ALT BH NO:	ABEL			SITE NAME:	KRUITBERG CALVINIA
ALT BH NO:	0				
BOREHOLE DEPTH:	121M	DATUM LEVEL ABOVE CASING (m):	0.75	EXISTING PUMP:	0
WATER LEVEL (mbdl):	8.92	CASING HEIGHT: (magl):	0.10	CONTRACTOR:	AB PUMPS
DEPTH OF PUMP (m):	39.15	DIAM PUMP INLET(mm):	117	PUMP TYPE:	GW2402

CONSTANT DISCHARGE TEST & RECOVERY

TEST STARTED				**TEST COMPLETED**					
DATE:	23/05/2018	TIME:	08H50	DATE:	25/05/2018	TIME:	08H42	TYPE OF PUMP:	GW2402

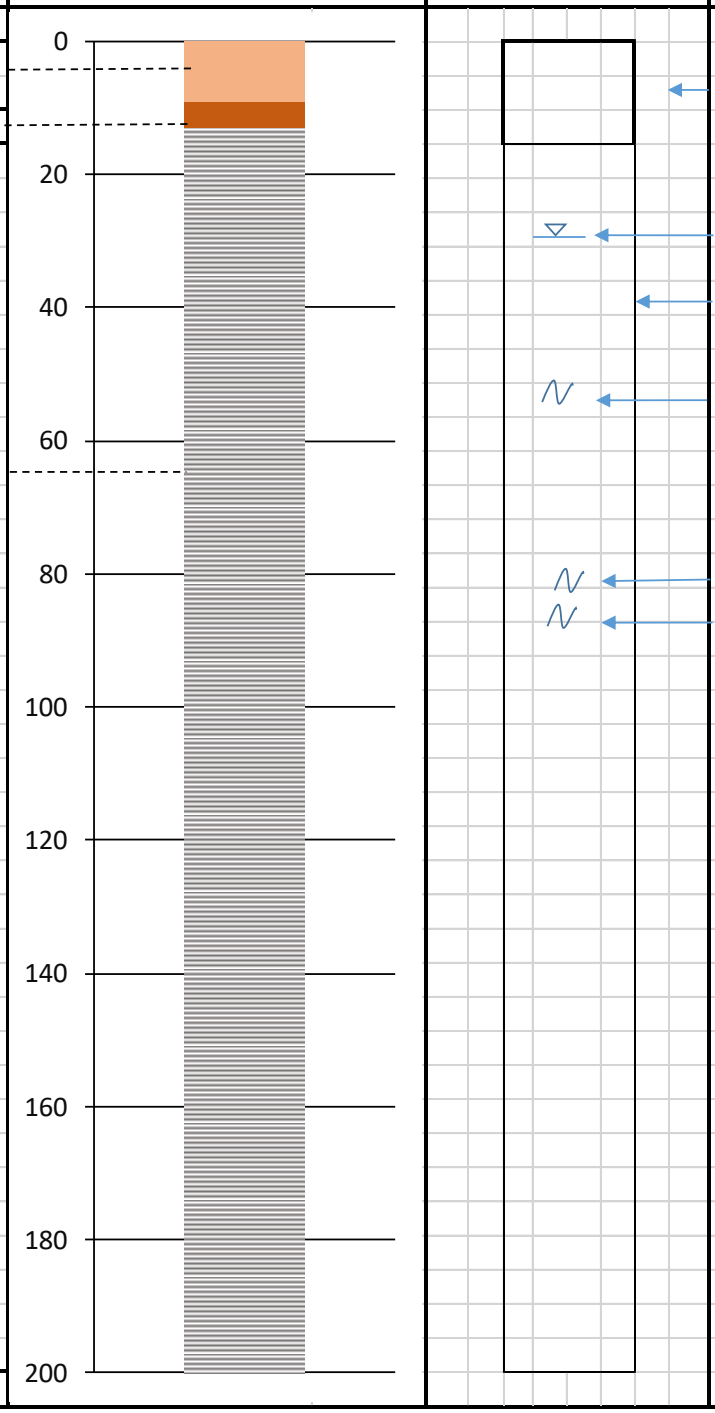
					OBSERVATION HOLE 1			OBSERVATION HOLE 2			OBSERVATION HOLE 3	
					NR:	**CAL S2-4**		NR:			NR:	
DISCHARGE BOREHOLE					Distance(m);		900	Distance(m);			Distance(m);	
TIME	DRAW	YIELD	TIME	RECOVERY	TIME:	Drawdown	Recovery	TIME:	Drawdown	Recovery	TIME:	Drawdown
(MIN)	DOWN (M)	(L/S)	MIN	(M)	(min)	m	(m)	(min)	(m)		(min)	(m)
1	1.39	2.08	**1**	20.66	**1**			**1**			**1**	
2	2.09	2.49	**2**	19.02	**2**			**2**			**2**	
3	2.96	2.43	**3**	17.97	**3**			**3**			**3**	
5	4.85	2.82	**5**	16.70	**5**	0.06		**5**			**5**	
7	5.61	2.86	**7**	16.32	**7**		13.08	**7**			**7**	
10	6.61	2.88	**10**	15.34	**10**	0.01	13.04	**10**			**10**	
15	7.41	2.85	**15**	14.94	**15**	0.24	12.96	**15**			**15**	
20	8.70	2.81	**20**	14.67	**20**	0.39	12.85	**20**			**20**	
30	8.88	2.82	**30**	13.64	**30**	0.68	12.69	**30**			**30**	
40	9.57	2.80	**40**	13.22	**40**	0.98	12.48	**40**			**40**	
60	10.57	2.82	**60**	12.68	**60**	1.54	12.10	**60**			**60**	
90	11.46	2.80	**90**	12.02	**90**	2.30	11.63	**90**			**90**	
120	12.27	2.80	**120**	11.53	**120**	2.99	11.25	**120**			**120**	
150	12.88	2.81	**150**	11.17	**150**	3.63	10.84	**150**			**150**	
180	13.39	2.83	**180**	10.76	**180**	4.20	10.52	**180**			**180**	
210	13.90	2.81	**210**	10.39	**210**	4.68	10.19	**210**			**210**	
240	14.26	2.80	**240**	10.17	**240**	5.15	9.97	**240**			**240**	
300	15.01	2.81	**300**	9.70	**300**	6.01	9.47	**300**			**300**	
360	15.70	2.80	**360**	9.27	**360**	6.72	9.04	**360**			**360**	
420	16.32	2.82	**420**	8.94	**420**	7.36	8.68	**420**			**420**	
480	16.88	2.82	**480**	8.58	**480**	7.94	8.35	**480**			**480**	
540	17.39	2.81	**540**	8.28	**540**	8.44	8.05	**540**			**540**	
600	17.83	2.80	**600**	7.98	**600**	8.92	7.76	**600**			**600**	
720	18.96	2.82	**720**	7.42	**720**	9.73	7.24	**720**			**720**	
840	19.78	2.82	**840**	7.28	**840**	10.43	6.36	**840**			**840**	
960	20.68	2.81	**960**	7.05	**960**	11.04	6.14	**960**			**960**	
1080	21.06	2.81	**1080**	6.87	**1080**	11.62	5.86	**1080**			**1080**	
1200	21.98	2.80	**1200**	6.32	**1200**	12.10	5.41	**1200**			**1200**	
1320	22.87	2.81	**1320**	5.14	**1320**	12.57	5.08	**1320**			**1320**	
1440	23.97	2.82	**1440**	4.87	**1440**	13.14	4.82	**1440**			**1440**	
1560			**1560**		**1560**			**1560**			**1560**	
1680			**1680**		**1680**			**1680**			**1680**	
1800			**1800**		**1800**			**1800**			**1800**	
1920			**1920**		**1920**			**1920**			**1920**	
2040			**2040**		**2040**			**2040**			**2040**	
2160			**2160**		**2160**			**2160**			**2160**	
2280			**2280**		**2280**			**2280**			**2280**	
2400			**2400**		**2400**			**2400**			**2400**	
2520			**2520**		**2520**			**2520**			**2520**	
2640			**2640**		**2640**			**2640**			**2640**	
2760			**2760**		**2760**			**2760**			**2760**	
2880			**2880**		**2880**			**2880**			**2880**	
3000			**3000**		**3000**			**3000**			**3000**	
3120			**3120**		**3120**			**3120**			**3120**	
3240			**3240**		**3240**			**3240**			**3240**	
3360			**3360**		**3360**			**3360**			**3360**	
3480			**3480**		**3480**			**3480**			**3480**	
3600			**3600**		**3600**			**3600**			**3600**	
3720			**3720**		**3720**			**3720**			**3720**	
3840			**3840**		**3840**			**3840**			**3840**	
3960			**3960**		**3960**			**3960**			**3960**	
4080			**4080**		**4080**			**4080**			**4080**	
4200			**4200**		**4200**			**4200**			**4200**	
4320			**4320**		**4320**			**4320**			**4320**	
Total time pumped(min):				1440		**W/L**	**1.7**		**W/L**			**W/L**
Average yield (l/s):				2.18								

18. APPENDIX E: – BOREHOLE LOGS – H & A DRILLING

Log of Borehole No.: Cal_DV4

Location:	Calvinia	**Latitude:**	-31.411618
Date:	30/4/2018	**Longitude:**	19.775263
Client:	BVI Engineering	**Ground Elevation:**	1117 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Clay (0 - 9)	0		6.5" Steel casing
Dolerite (9 - 13)			
	20		Water level (35m)
	40		6.5" Open Hole
			Water strike (49m)
	60		
Shale (13 - 207)			
	80		Water strike (82m)
			Water strike (85m)
	100		
	120		
	140		
	160		
	180		
	200		

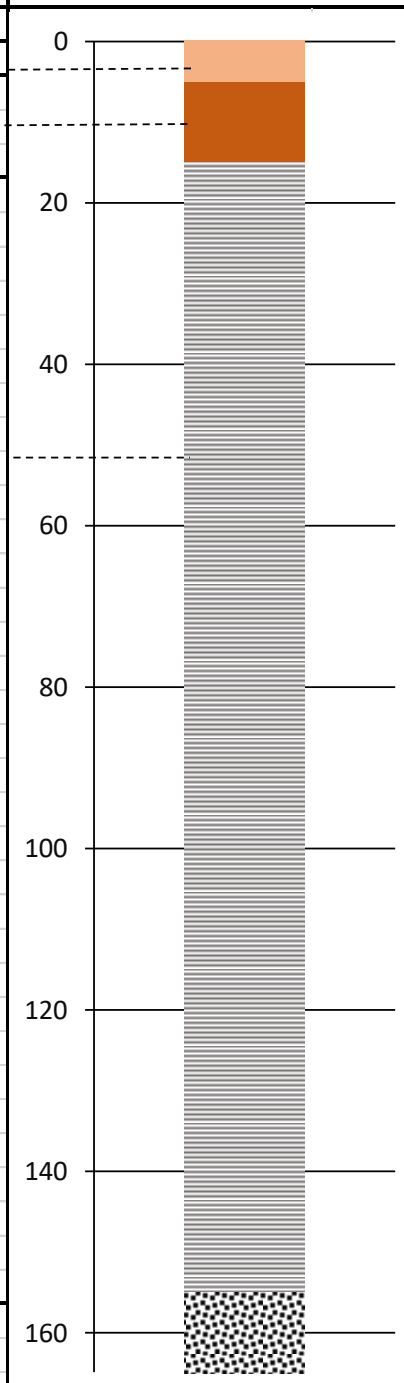


Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 3 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_DV1

Location:	Calvinia	**Latitude:**	-31.455414
Date:	30/4/2018	**Longitude:**	19.773937
Client:	BVI Engineering	**Ground Elevation:**	1009 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Clay (0 - 5)	0		
Dolerite (5 - 10)			8" Steel casing (0 - 6)
	20		
			8" Open Hole (6 - 165)
	40		
Shale (10 - 140)			
	60		
	80		
	100		
	120		
	140		Water strike (144 m)
			Water strike (155m)
	160		
Baked shaleShale (10 - 140)			

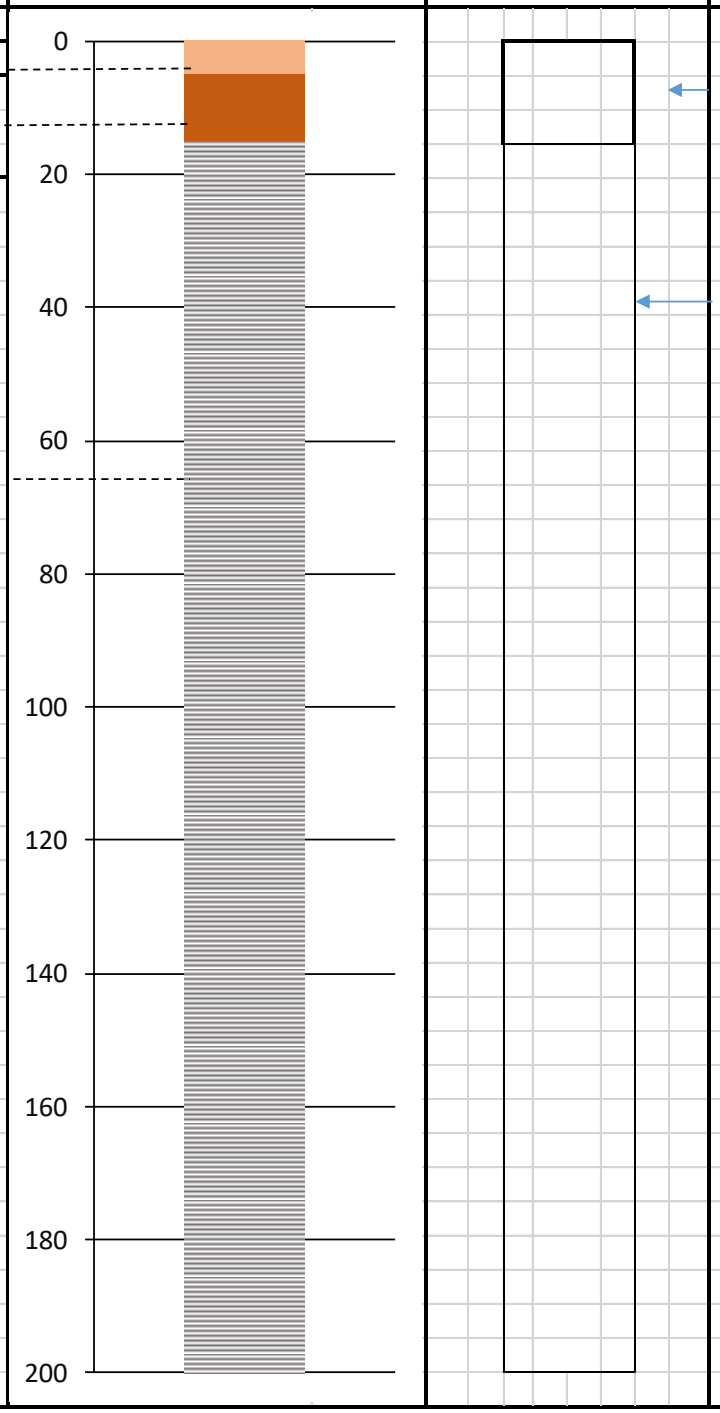


Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 25 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_DV2

Location:	Calvinia	**Latitude:**	-31.429912
Date:	30/4/2018	**Longitude:**	19.785117
Client:	BVI Engineering	**Ground Elevation:**	1058 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Clay (0 - 5)	0		
Dolerite (5 - 10)			6.5" Steel casing (0 - 6)
	20		
	40		6.5" Open Hole (6 - 200)
	60		
Shale (10 - 200)			
	80		
	100		
	120		
	140		
	160		
	180		
	200		



Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 0.1 L/s
Logged By:	Charles Peek		

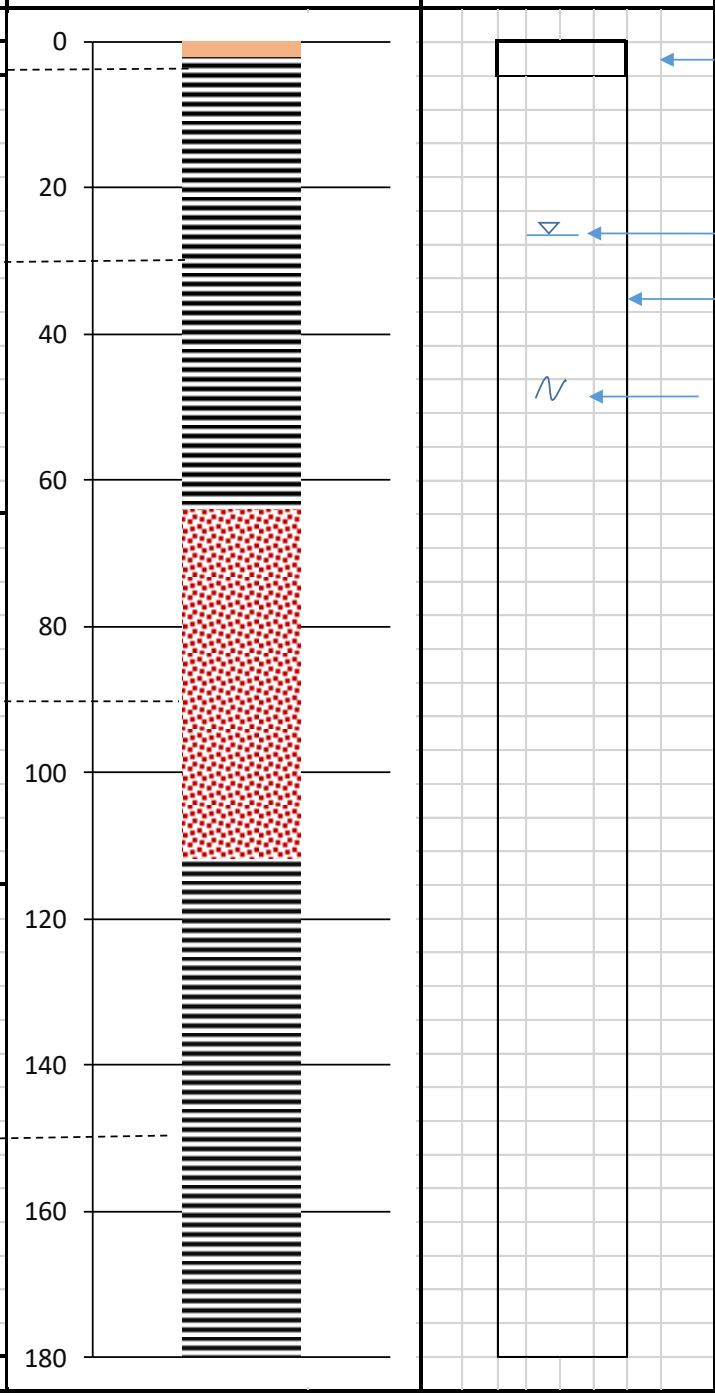
Log of Borehole No.: Cal_DV3

Location:	Calvinia	**Latitude:**	-31.430694
Date:	30/4/2018	**Longitude:**	19.7883

Log of Borehole No.: Cal_S1_KB

Location:	Calvinia	**Latitude:**	-31.636869
Date:	30/4/2018	**Longitude:**	19.758089
Client:	BVI Engineering	**Ground Elevation:**	1081 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Clay (0 - 2)	0		6.5" Steel casing (0 - 6)
	20	Water level (35m)	
Shale (2 - 62)			6.5" Open Hole (6 - 180)
	40	Water strike (48m)	
	60		
	80		
Dolerite (62 - 110)			
	100		
	120		
	140		
Shale (110 - 180)			
	160		
	180		

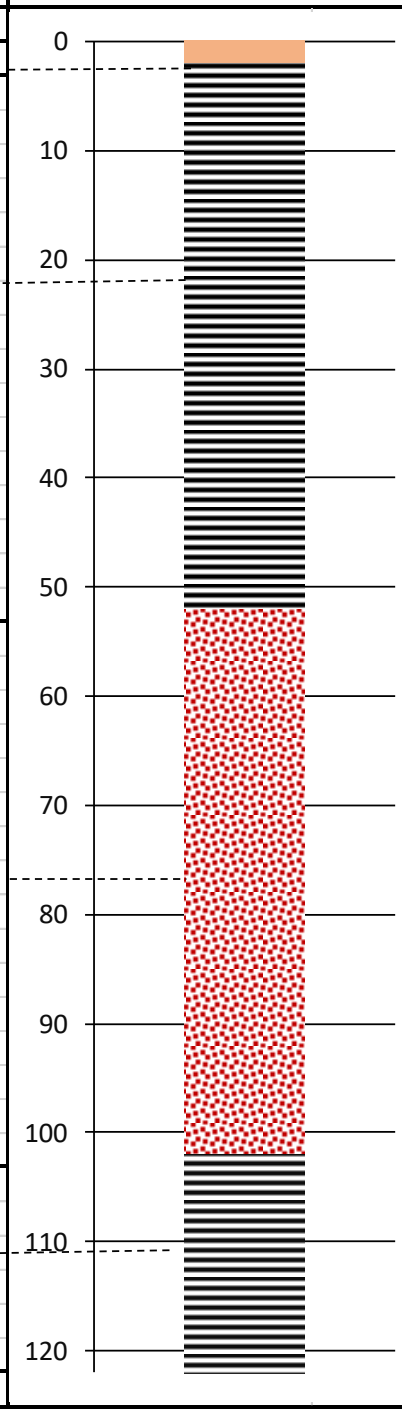


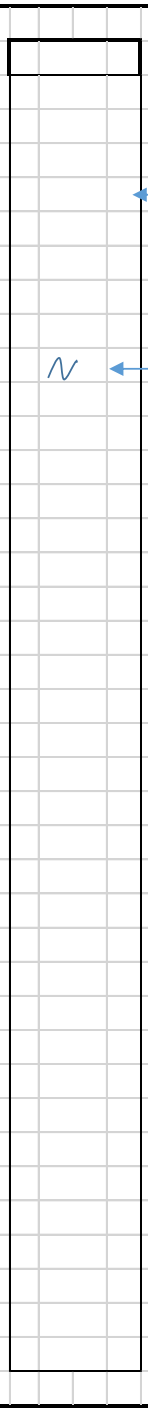
Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 1.25 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S2_3B

Location:	Calvinia	**Latitude:**	-31.650182
Date:	30/5/2018	**Longitude:**	19.802443
Client:	BVI Engineering	**Ground Elevation:**	1160 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Clay (0 - 2)	0		6.5" Steel casing (0 - 4)
	10		6.5" Open Hole (4 - 122)
Shale (2 - 52)	20		
	30		Water strike (33m)
	40		
	50		
	60		
	70		
Dolerite (52 - 102)	80		
	90		
	100		
Shale (102 - 122)	110		
	120		



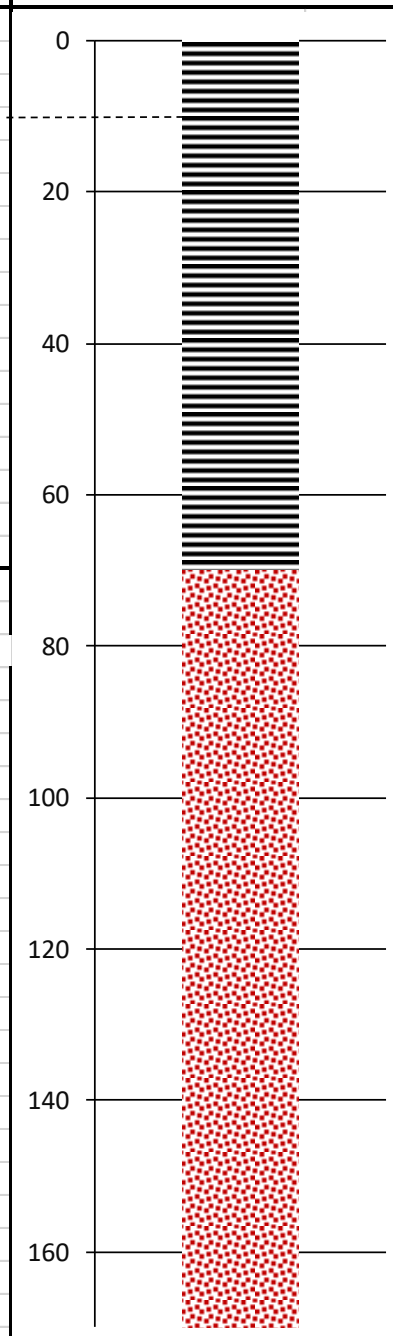


Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 0.2 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Nat5

Location:	Calvinia	**Latitude:**	-31.435236
Date:	30/5/2018	**Longitude:**	19.784485
Client:	BVI Engineering	**Ground Elevation:**	1036m

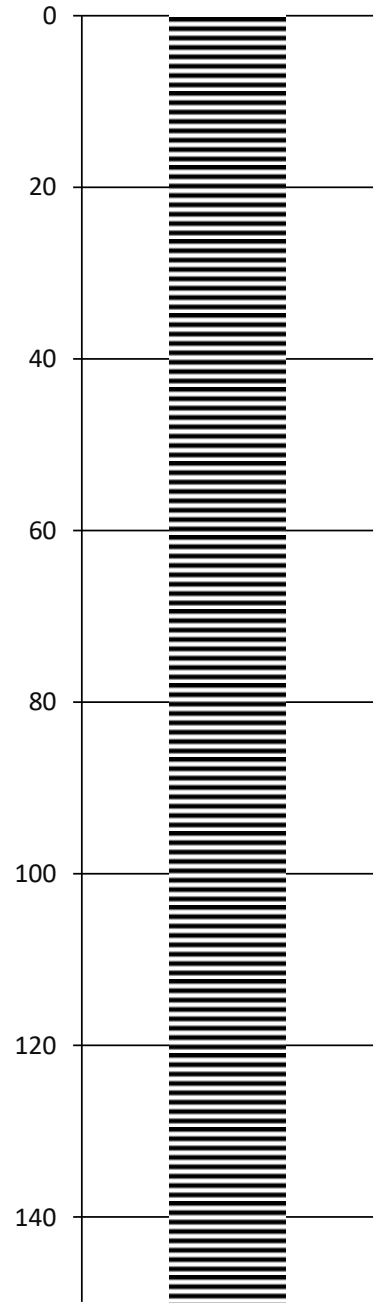
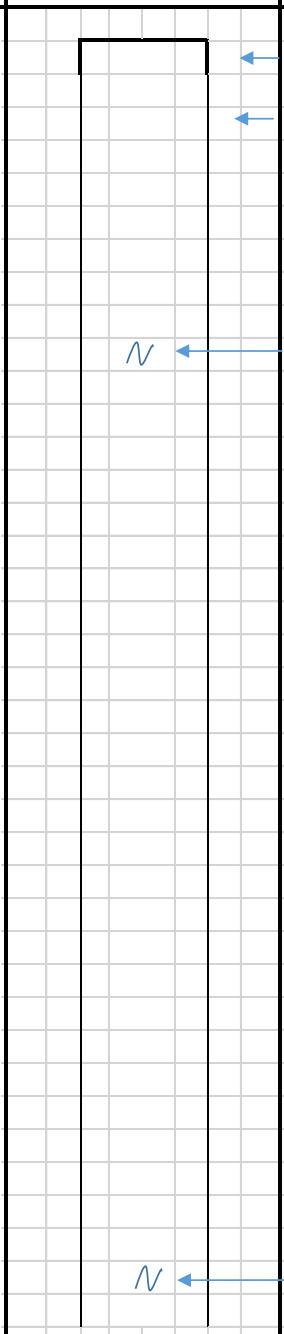
Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 70)	0, 20, 40, 60		6.5" Steel casing (0 - 6)
			6.5" Open Hole (6 - 170)
Dolerite (70 - 168)	80, 100, 120, 140, 160		
			Water strike (168m)



Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 5 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_3

Location:	Calvinia	**Latitude:**	-31.398477
Date:	30/5/2018	**Longitude:**	19.553632
Client:	BVI Engineering	**Ground Elevation:**	905m

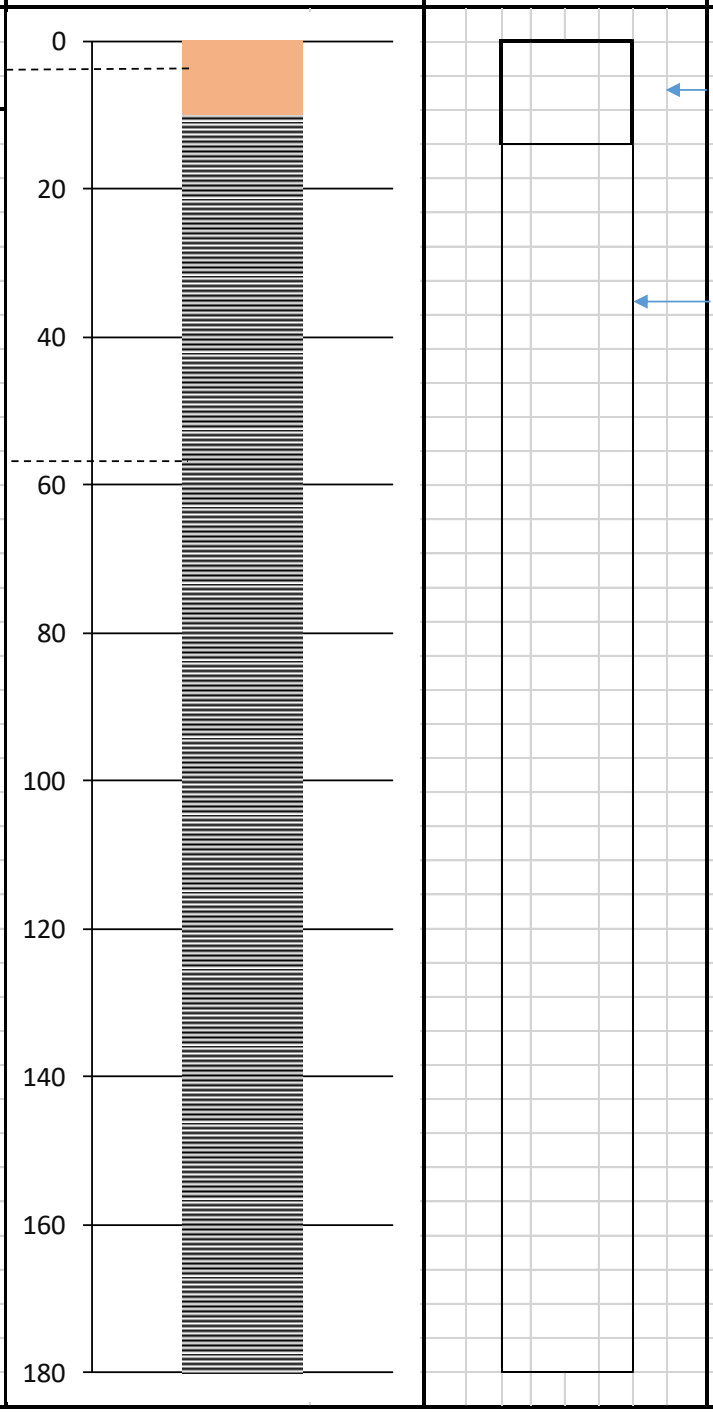
Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 150)			6.5" Steel casing (0 - 6) 6.5" Open Hole (6 - 150) Water strike (37m) Water strike (143m)

Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 1 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S1-1

Location:	Calvinia	**Latitude:**	-31.643388
Date:	30/4/2018	**Longitude:**	19.883707
Client:	BVI Engineering	**Ground Elevation:**	1191 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Clay/sand (0 - 10)	0		
			6.5" Steel casing (0 - 6)
	20		
			6.5" Open Hole (6 - 180)
	40		
Shale (10 - 180)	60		
	80		
	100		
	120		
	140		
	160		
	180		

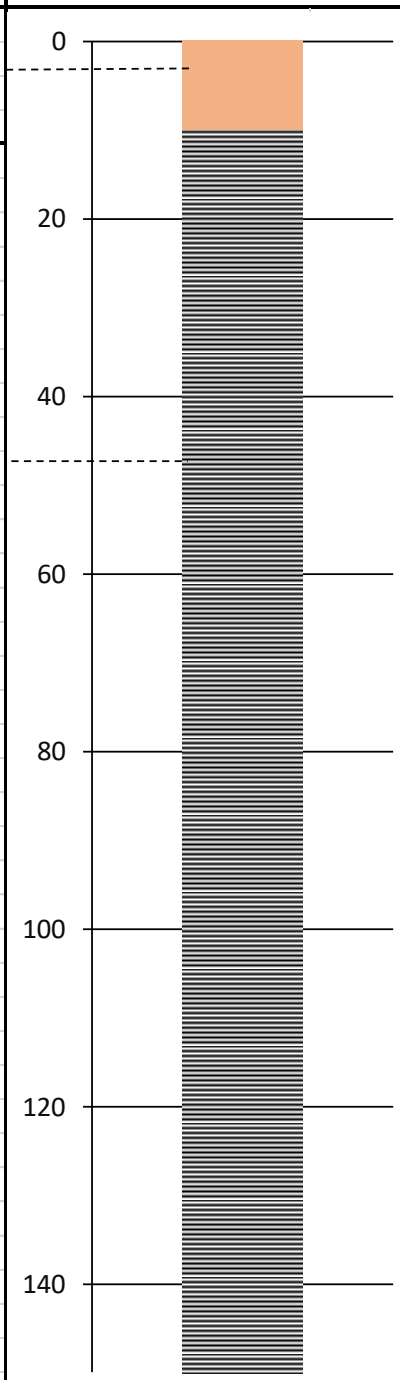


Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 0.1 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S1-2

Location:	Calvinia	**Latitude:**	-31.61826
Date:	30/4/2018	**Longitude:**	19.893412
Client:	BVI Engineering	**Ground Elevation:**	1136 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Clay/sand (0 - 10)	0		6.5" Steel casing (0 - 6)
	20		6.5" Open Hole (6 - 152)
	40		
Shale (10 - 152)			
	60		
	80		
	100		
	120		
	140		

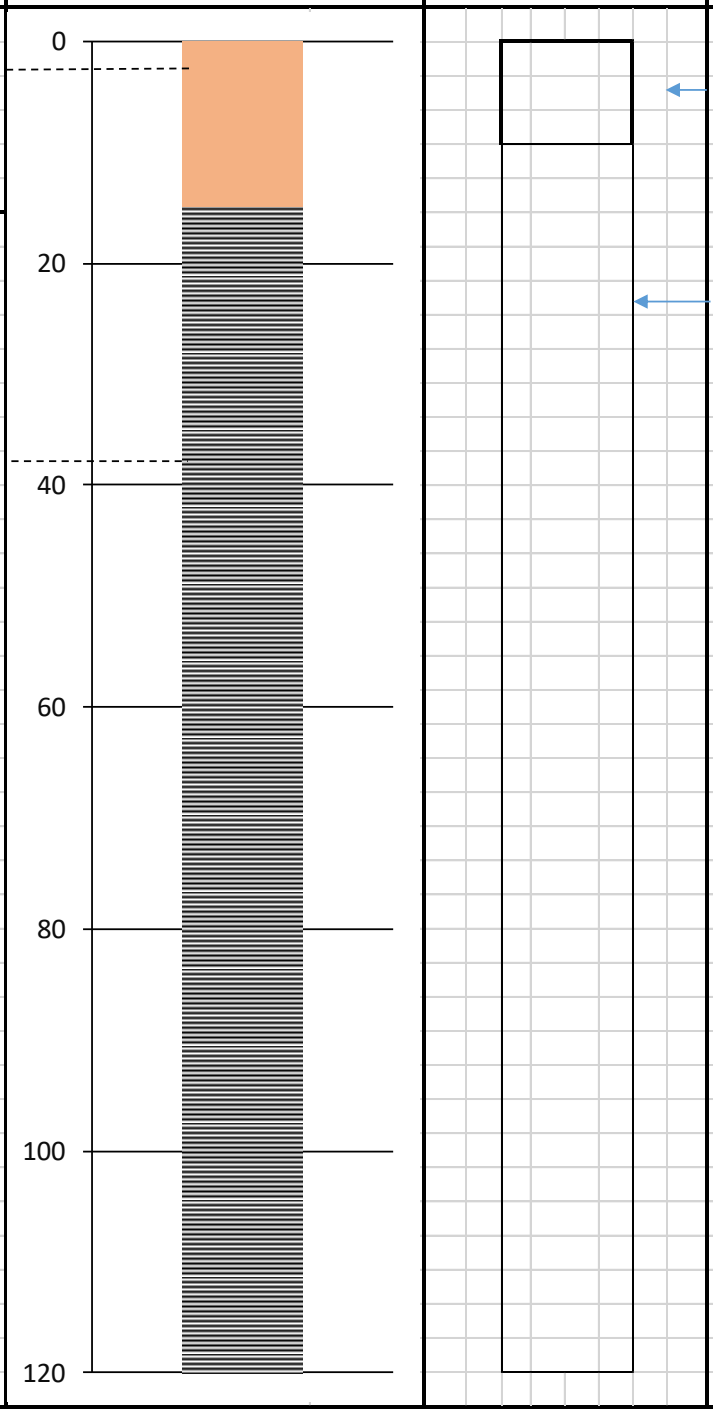


Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 0.1 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S1-3

Location:	Calvinia	**Latitude:**	-31.618808
Date:	30/4/2018	**Longitude:**	19.893628
Client:	BVI Engineering	**Ground Elevation:**	1136 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Clay/sand (0 - 15)	0		6.5" Steel casing (0 - 6)
	20		6.5" Open Hole (6 - 120)
Shale (15 - 120)	40		
	60		
	80		
	100		
	120		

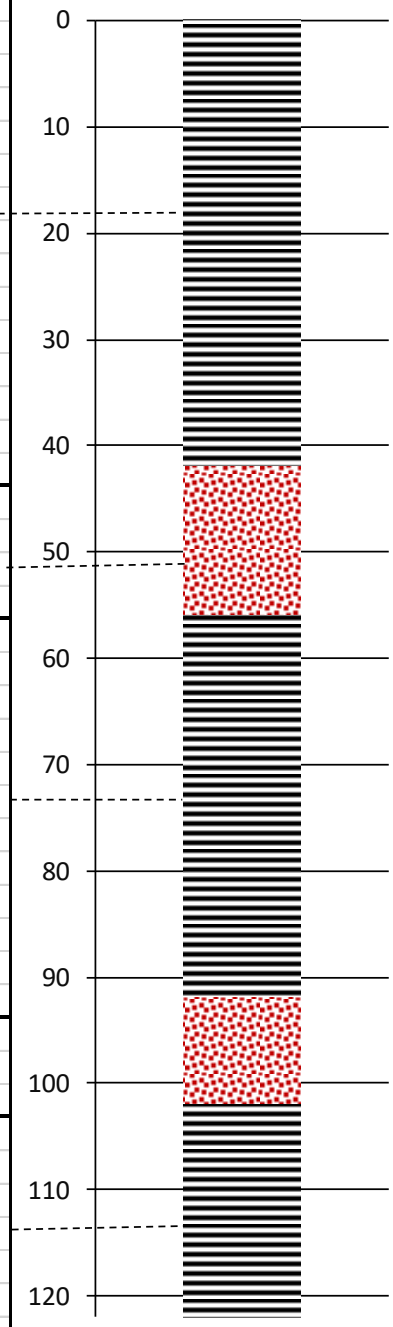


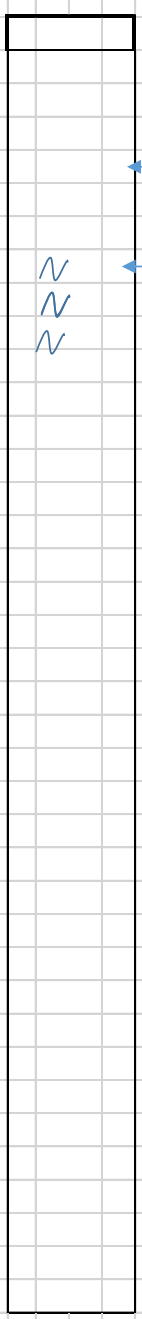
Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 0.1 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S2_3

Location:	Calvinia	**Latitude:**	-31.651334
Date:	30/5/2018	**Longitude:**	19.801571
Client:	BVI Engineering	**Ground Elevation:**	1161 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 42)	0, 10, 20, 30, 40		6.5" Steel casing (0 - 4) 6.5" Open Hole (4 - 122) Water strike (23m) Water strike (27m) Water strike (31m)
Dolerite (42 - 56)	50		
Shale (56 - 92)	60, 70, 80, 90		
Dolerite (92 - 102)	100		
Shale (102 - 122)	110, 120		



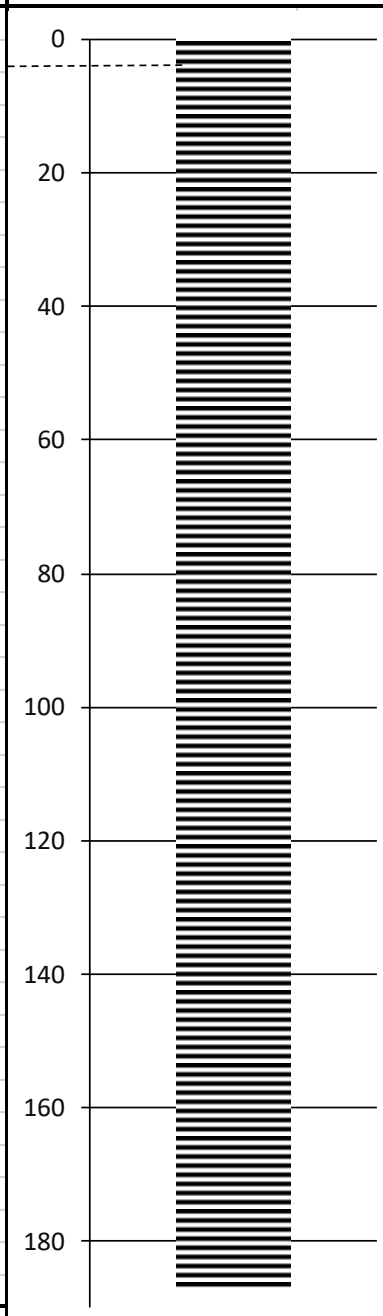


Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 2.78 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S2_4

Location:	Calvinia	**Latitude:**	-31.650359
Date:	30/4/2018	**Longitude:**	19.801047
Client:	BVI Engineering	**Ground Elevation:**	1154 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
	0		6.5" Steel casing (0 - 4.5)
	20		
	40		6.5" Open Hole (4.5 - 187)
	60		
	80		
Shale (0 - 187)			
	100		
	120		
	140		Water strike (146m)
			Water strike (155m)
	160		
			Water strike (168m)
	180		

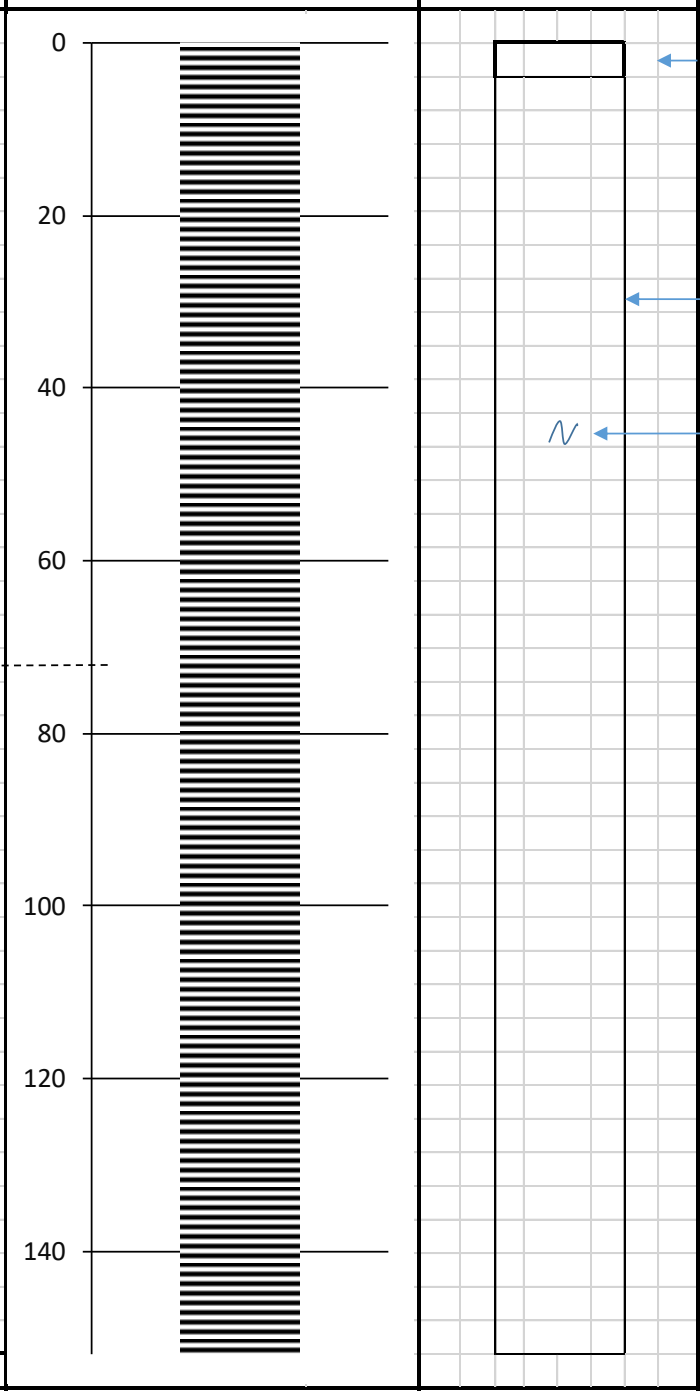


Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 3.8 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S2_7

Location:	Calvinia	**Latitude:**	-31.650782
Date:	30/5/2018	**Longitude:**	19.76698
Client:	BVI Engineering	**Ground Elevation:**	1124 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
	0		6.5" Steel casing (0 - 6)
	20		
			6.5" Open Hole (6 - 152)
	40		
			Water strike (47m)
	60		
Shale (0 - 152)			
	80		
	100		
	120		
	140		



Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 0.1 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S2_8

Location:	Calvinia	**Latitude:**	-31.64988
Date:	30/5/2018	**Longitude:**	19.77017
Client:	BVI Engineering	**Ground Elevation:**	1124 m

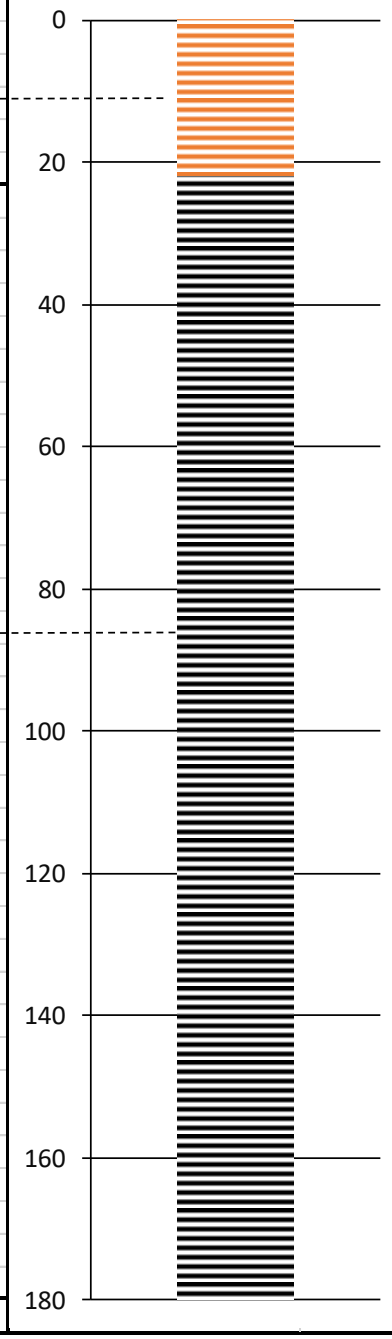
Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
	0		6.5" Steel casing (0 - 9)
			6.5" Open Hole (9 - 202)
	20		Water strike (19m)
			Water strike (24m)
			Water strike (30m)
			Water strike (37m)
	40		
			Water strike (42m)
			Water strike (47m)
	60		
Dolerite (0 - 152)			
	80		
	100		Water strike (102m)
	120		
	140		

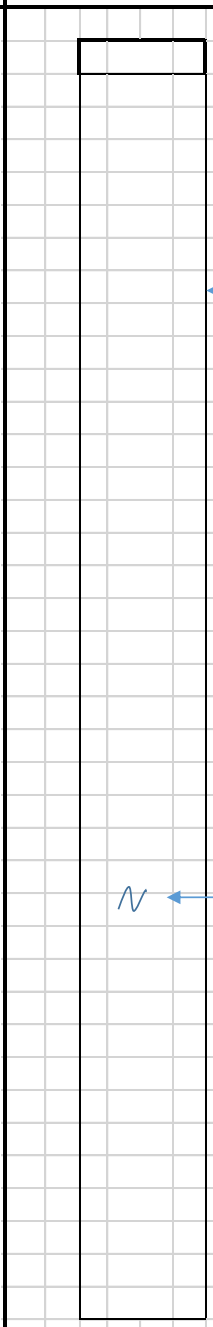
Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 1.5 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S2_9

Location:	Calvinia	**Latitude:**	-31.65136
Date:	30/5/2018	**Longitude:**	19.7831
Client:	BVI Engineering	**Ground Elevation:**	1136 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Weathered shale (0 - 22)	0, 20		6.5" Steel casing (0 - 6)
	40		6.5" Open Hole (6 - 180)
	60, 80		
Shale (22 - 180)	100, 120		Water strike (121m)
	140, 160, 180		





Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 0.3 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S1_KB_B

Location:	Calvinia	**Latitude:**	-31.64276
Date:	30/5/2018	**Longitude:**	19.75856
Client:	BVI Engineering	**Ground Elevation:**	1081 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
	0		6.5" Steel casing (0 - 6)
	20		
			6.5" Open Hole (6 - 150)
			Water strike (43m)
	40		
	60		
Shale (0 - 150)			
	80		
	100		
	120		
	140		

Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 0.3 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_S1_KB_B2

Location:	Calvinia	**Latitude:**	-31.64276
Date:	30/5/2018	**Longitude:**	19.75856
Client:	BVI Engineering	**Ground Elevation:**	1081 m

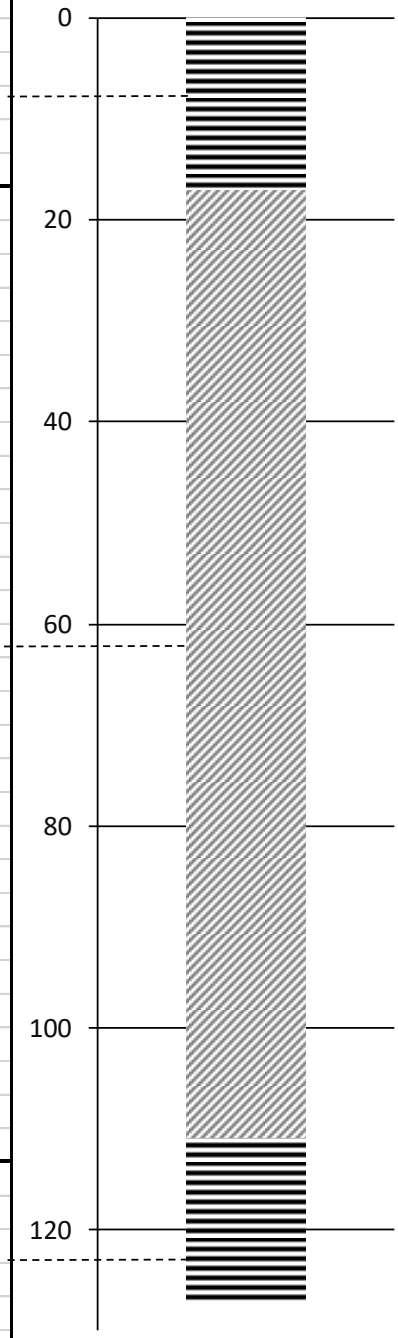
Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
	0		6.5" Steel casing (0 - 6)
			6.5" Open Hole (6 - 80)
	20		
Shale (0 - 80)			
	40		
	60		
	80		

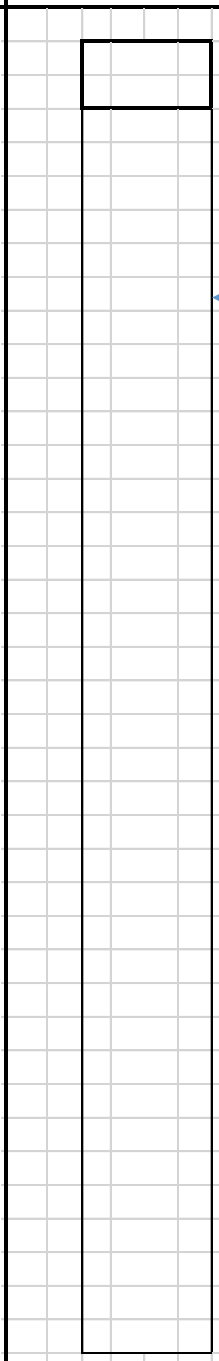
Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - To low to measure
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_5

Location:	Calvinia	**Latitude:**	-31.396265
Date:	28/09/2018	**Longitude:**	19.55079
Client:	BVI Engineering	**Ground Elevation:**	901 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 17)	0		6.5" Steel casing (0 - 6)
	20		6.5" Open Hole (6 - 127)
	40		
Baked Shale (17 - 111)	60		
	80		
	100		
Shale (111- 127)	120		



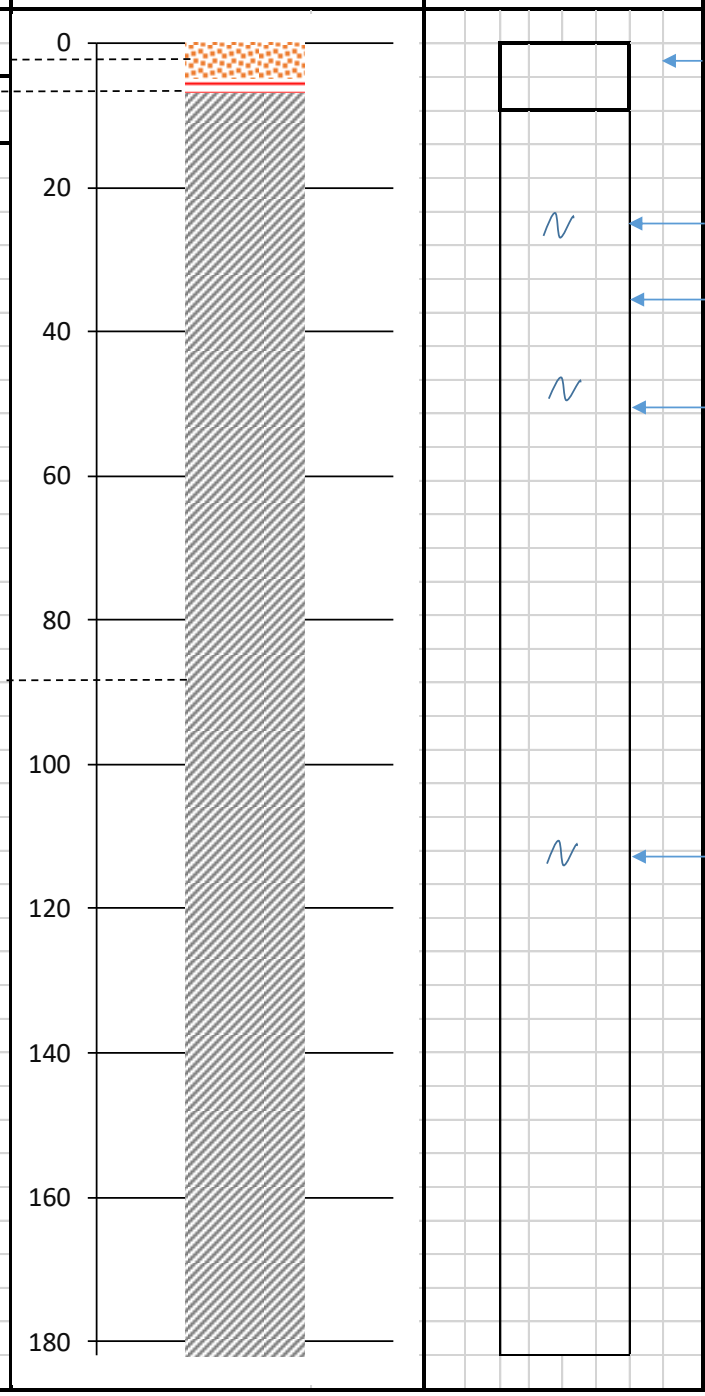


Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 0.1 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_12

Location:	Calvinia	**Latitude:**	-31.626433
Date:	28/09/2018	**Longitude:**	19.776246
Client:	BVI Engineering	**Ground Elevation:**	1089 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Sand (0 - 5)	0		6.5" Steel casing (0 - 6)
Baked Dolerite (5 - 7)			
	20		water strike 32 m
			6.5" Open Hole (6 - 182)
	40		water strike 52 m
	60		
	80		
Baked Shale (7- 182)			
	100		
			water strike 115 m
	120		
	140		
	160		
	180		

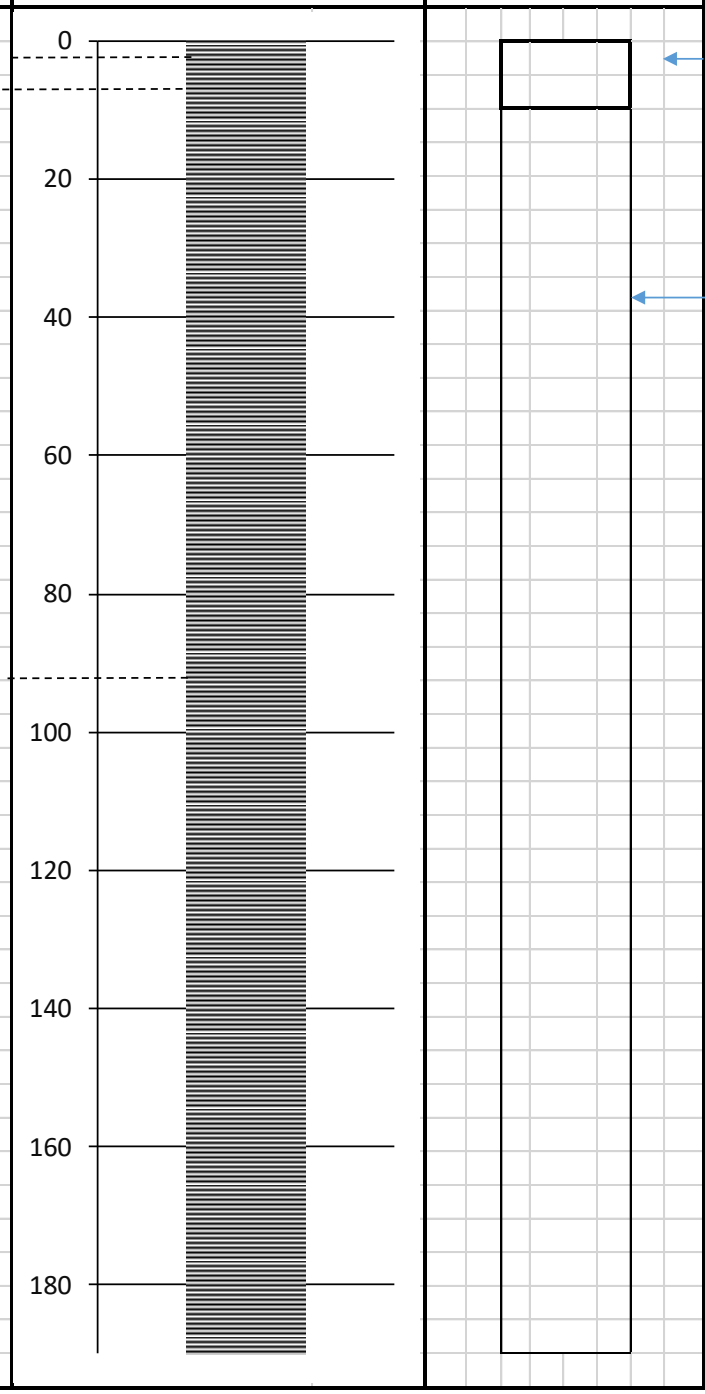


Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 2 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_13

Location:	Calvinia	**Latitude:**	-31.641369
Date:	28/09/2018	**Longitude:**	19.76428
Client:	BVI Engineering	**Ground Elevation:**	1095 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
	0		6.5" Steel casing (0 - 6)
	20		
	40		6.5" Open Hole (6 - 182)
	60		
	80		
Shale (0- 192)			
	100		
	120		
	140		
	160		
	180		

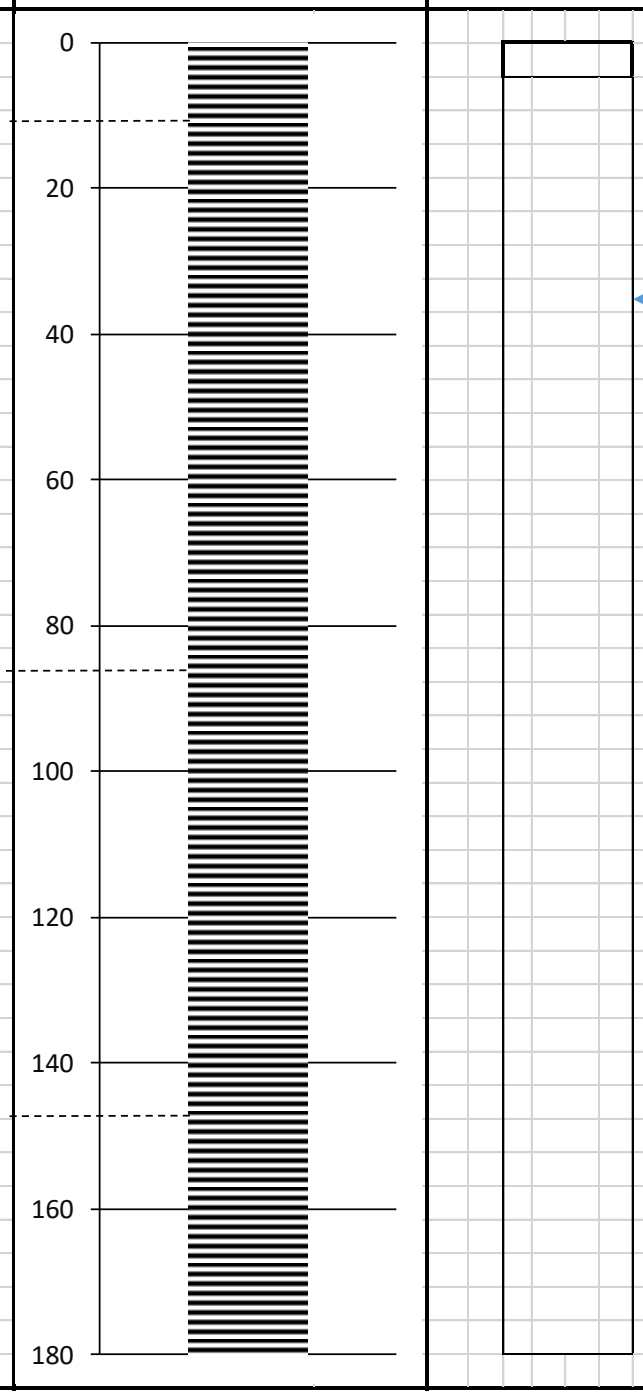


Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield - 0.1 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_8Alt

Location:	Calvinia	**Latitude:**	-31.63271
Date:	30/5/2018	**Longitude:**	19.748168
Client:	BVI Engineering	**Ground Elevation:**	1136 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 182)	0, 20, 40, 60, 80, 100, 120, 140, 160, 180		6.5" Steel casing (0 - 6) 6.5" Open Hole (6 - 182)



Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 0.1 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_9

Location:	Calvinia	**Latitude:**	-31.632714
Date:	30/5/2018	**Longitude:**	19.756781
Client:	BVI Engineering	**Ground Elevation:**	1136 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 31)	0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110		8" Steel casing (0 - 6)
			8" Open Hole (6 - 100)
			Water strike (27 - 30m)
			Water strike (52m)
Dolerite (31 - 100)			Water strike (59m)
			Water strike (88m)
			6.5" Open Hole (100 - 117)
Shale (100 - 117)			

Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 25 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_vlok1

Location:	Calvinia	**Latitude:**	-31.382153
Date:	30/5/2018	**Longitude:**	19.956044
Client:	BVI Engineering	**Ground Elevation:**	1092 m

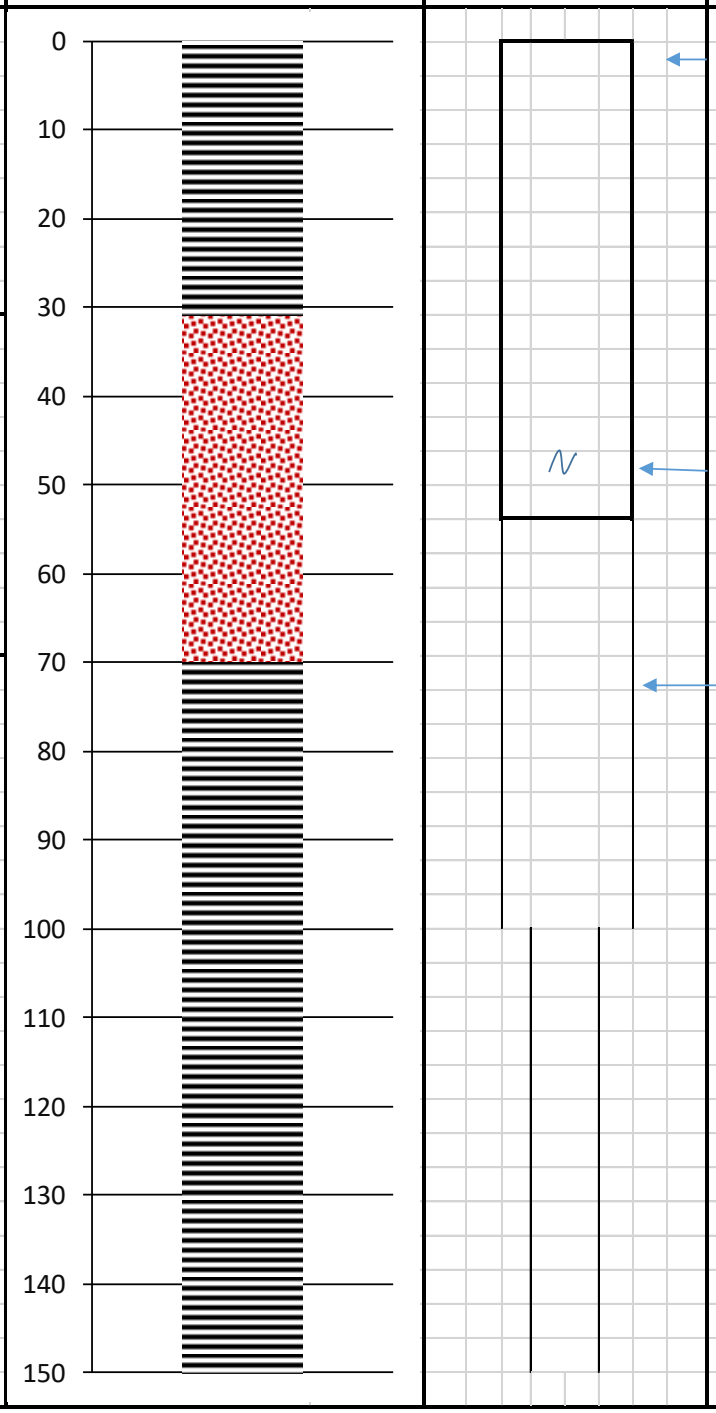
Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 70)	0, 10, 20, 30, 40, 50, 60, 70	6.5" Steel casing (0 - 18); 6.5" Open Hole (18 - 207)	
Dolerite (70 - 96)	80, 90		
Shale (56 - 92)	100, 110, 120, 130	water strike (106 m)	
Dolerite (136 - 197)	140, 150, 160, 170, 180, 190		
Shale (197 - 207)	200		

Drilled By:	H&A Drilling	**Remarks:**	Blow Yield -0.3 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: ReDrill39602

Location:	Calvinia	**Latitude:**	-31.372864
Date:	30/5/2018	**Longitude:**	19.970834
Client:	BVI Engineering	**Ground Elevation:**	1092 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 31)	0, 10, 20, 30		8" Steel casing (0 - 54)
Dolerite (31 - 70)	40, 50, 60, 70		Water strike (47 -50 m)
			8" Open Hole (54 - 100)
Shale (70- 150)	80, 90, 100, 110, 120, 130, 140, 150		6.5" Open Hole (100 - 150)

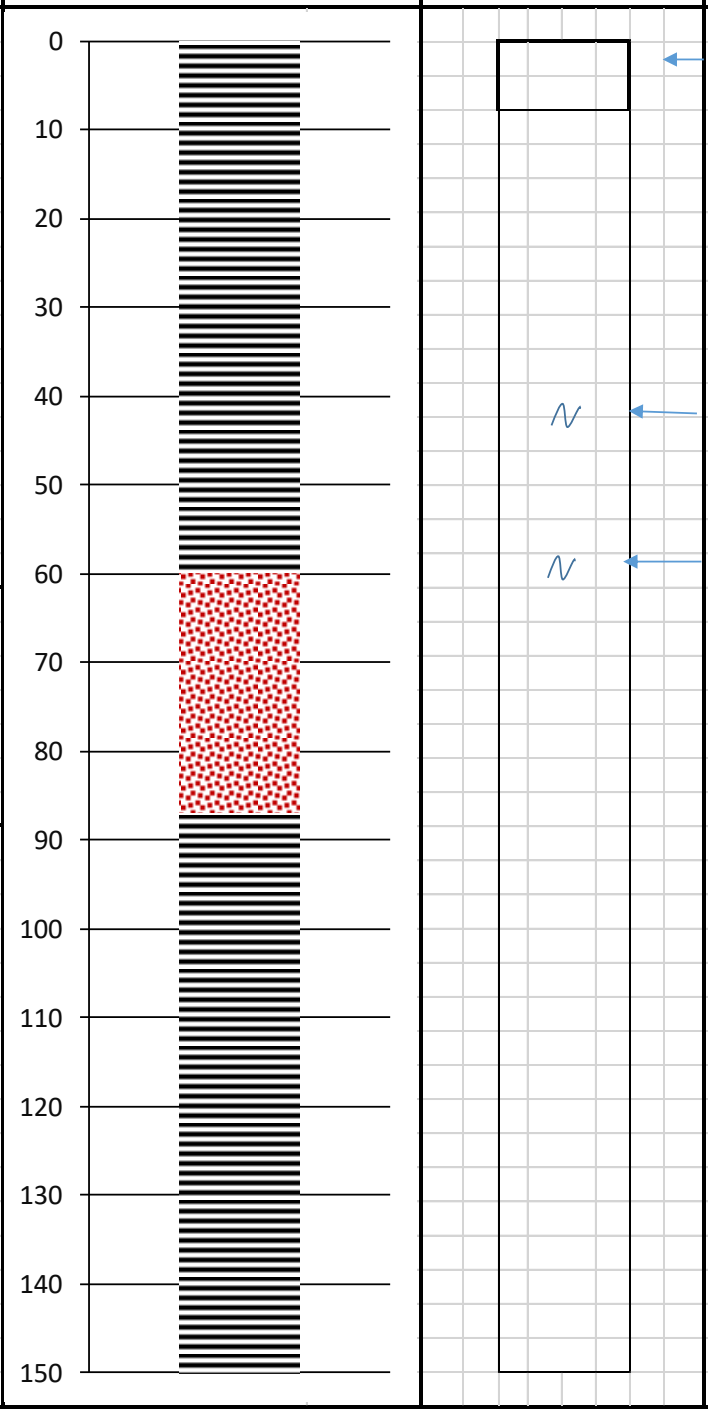


Drilled By:	H&A Drilling	**Remarks:**	
Drill Method:	Air percussion		Blow Yield -> 25 L/s
Logged By:	Charles Peek		

Log of Borehole No.: Cal_vlok2

Location:	Calvinia	**Latitude:**	-31.401289
Date:	30/5/2018	**Longitude:**	20.007778
Client:	BVI Engineering	**Ground Elevation:**	1092 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 60)	0, 10, 20, 30, 40, 50, 60		6.5" Steel casing (0 - 6) 6.5" Open Hole (6 - 152) Water strike (39 m) Water strike (59 m)
Dolerite (60 - 87)	60, 70, 80, 90		
Shale (87- 152)	90, 100, 110, 120, 130, 140, 150		

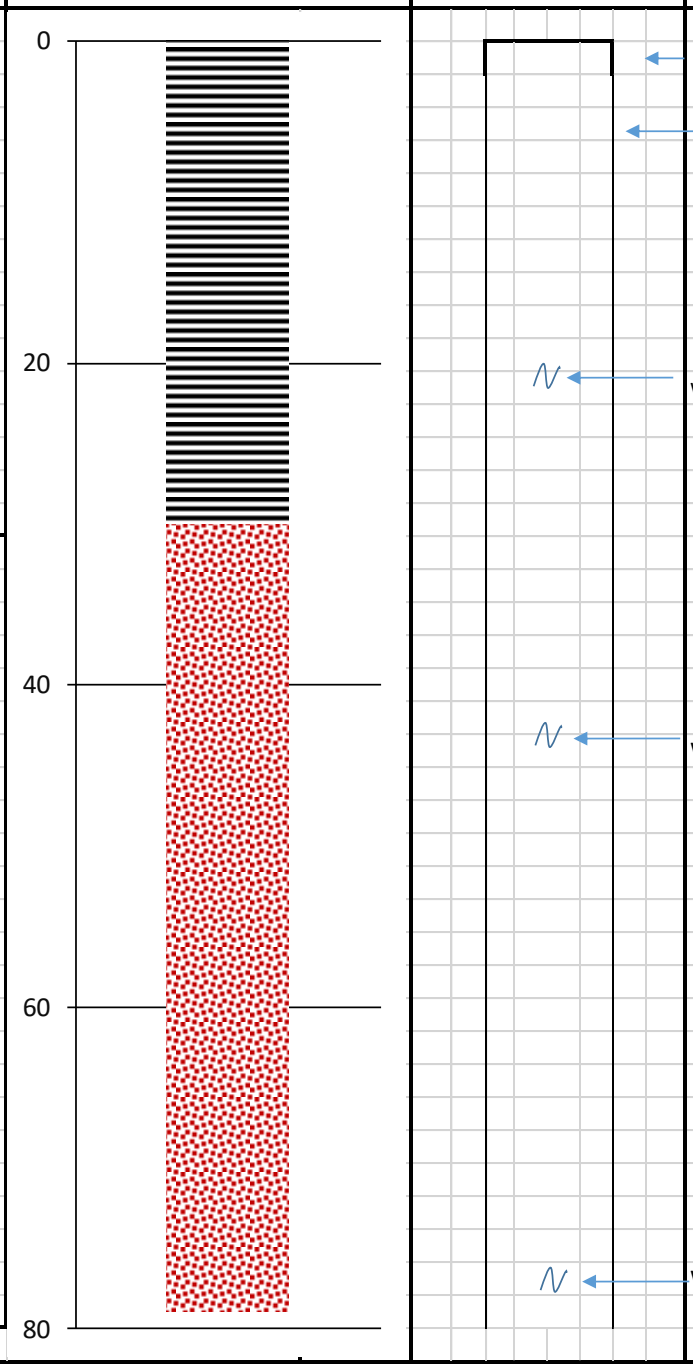


Drilled By:	H&A Drilling	**Remarks:**	Blow Yield -0.1 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_4A

Location:	Calvinia	**Latitude:**	-31.435236
Date:	30/5/2018	**Longitude:**	19.556679
Client:	BVI Engineering	**Ground Elevation:**	902 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 30)	0		8" Steel casing (0 - 6)
			8" Open Hole (6 - 79)
	20		Water strike (22m)
	40		Water strike (43m)
Dolerite (30 - 79)	60		
	80		Water strike (79m)

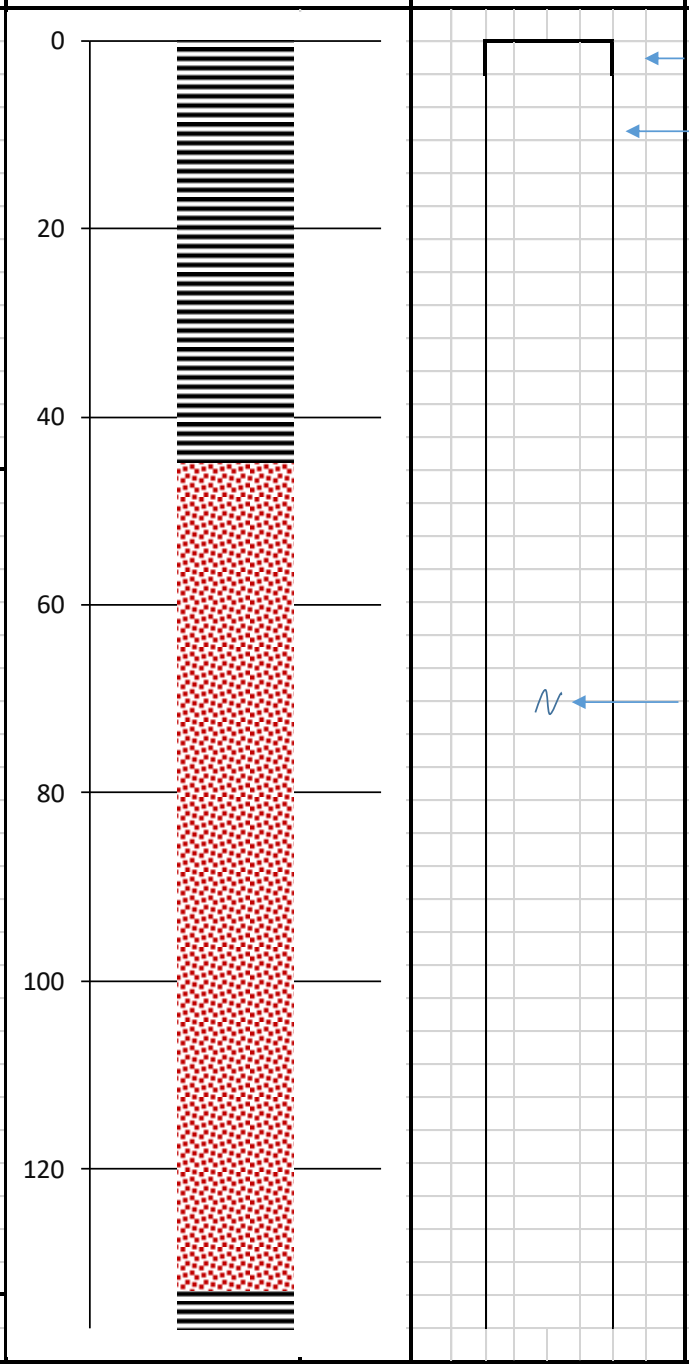


Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - >30 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_7

Location:	Calvinia	**Latitude:**	-31.435236
Date:	30/5/2018	**Longitude:**	19.667129
Client:	BVI Engineering	**Ground Elevation:**	956 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 45)	0, 20, 40	6.5" Steel casing (0 - 6)	6.5" Open Hole (6 - 137)
Dolerite (45 - 133)	60, 80, 100, 120	Water strike (70m)	
Shale (133 - 137)			

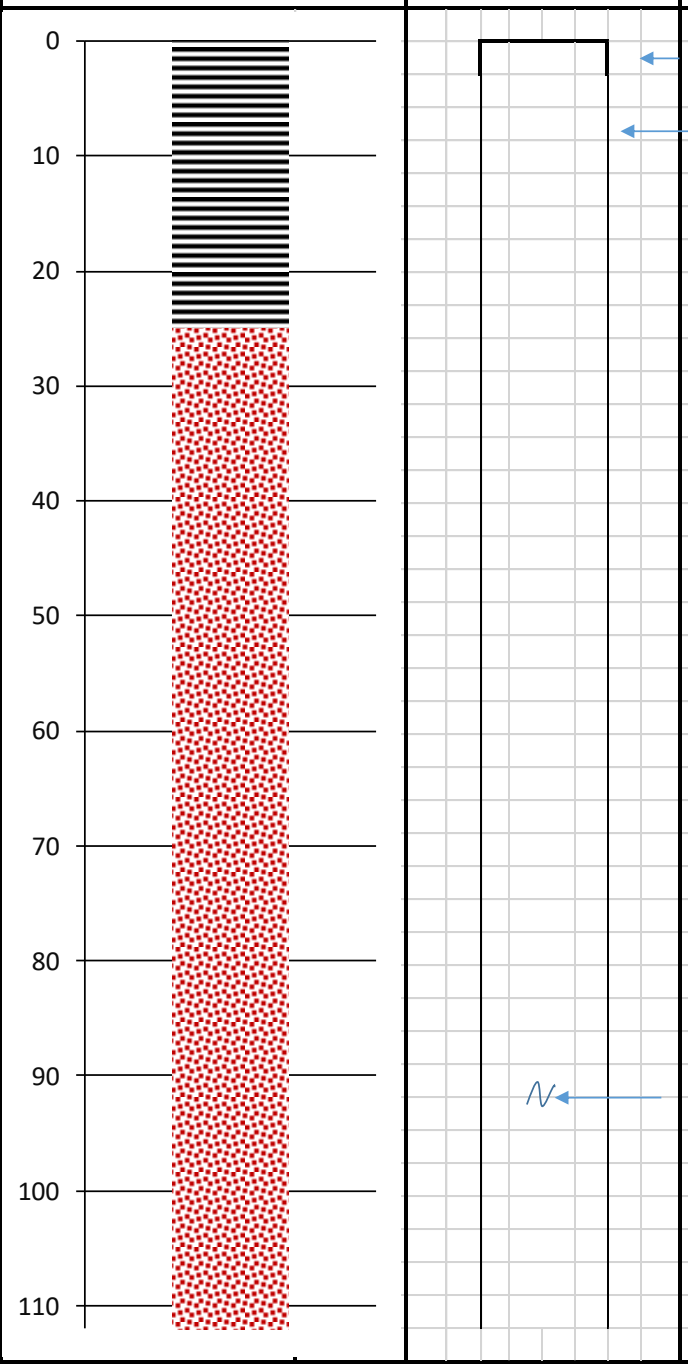


Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - 0.1 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

Log of Borehole No.: Cal_Phase3_6

Location:	Calvinia	**Latitude:**	-31.357725
Date:	30/5/2018	**Longitude:**	19.6915
Client:	BVI Engineering	**Ground Elevation:**	906 m

Lithological Description	Lithology Symbol & Depth (m)	Borehole Construction	Description & water strike
Shale (0 - 25)	0, 10, 20		6.5" Steel casing (0 - 6) 6.5" Open Hole (6 - 112)
Dolerite (25 - 112)	30, 40, 50, 60, 70, 80, 90, 100, 110		Water strike (92m)



Drilled By:	H&A Drilling	**Remarks:**	Blow Yield - >25 L/s
Drill Method:	Air percussion		
Logged By:	Charles Peek		

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