GROUNDWATER RESOURCE INFORMATION PROJECT
EASTERN CAPE PROVINCE

GROUNDWATER INFORMATION SOURCE REFERENCE SHEET

SOURCE REF NR:	SR453 2.2 (2865)	Own Archive		Copy attached	
		Sourced		Copy at source	

A: SOURCE DESCRIPTION

District Municipality:	Amatole		Chris Hani		O.R Tambo	
	Ukhahlamba		Cacadu	X	Alfred Nzo	
Local Municipality:	**Ikwezi**					
Institution where Information is held:	**SRK Consulting**					
Branch of Institution:	**East London**					
Contact details: Contact person:	**Eunice Goossens**					
Contact Tel:	**(043) 748 6292**					
Contact Email:	egoossens@srk.co.za					

B: TYPE OF INFORMATION

Information format:	Hard copy	X	Data Summary		Electronic Report	
	Specify Other:					
Report / Info Title:	**Eastern Cape Province Jansenville Hydrogeological Investigation**					
Report Nr:	**378515/1**		Date:	**Aug-08**		
Author Details:	Eunice Goossens					
Author's Qualification:	Hydrogeologist	X	Govt Dept		Project Manager	
	Engineer		Technician		Other	
	Specify Other:					
Captured by:	**Dané von Berg** Date:		Signed: DVB			

C: GEOHYDROLOGICAL CATEGORIZATION

Project Type	Source development	X	Feasibility Study		Sanitation Study:	
	Specify Other:					

Reference Co-ordinate:	Latitude	Longitude
	-32.93336	24.70151

	Yes	No	Complete	Incomplete
Lithological & Construction Logs	X			
Hydrocensus Data	X			
Pump Testing Data	X			
Chemical Water Analysis Data	X			
Geohydrological Data	X			
Spring Data		X		
Remote Sensing Data	X			
Map Data	X			

Comments:

Reviewed by: Signed:

Republic of South Africa

Department: Water Affairs and Forestry

Directorate: Water Resource Management

EASTERN CAPE PROVINCE
JANSENVILLE
HYDROGEOLOGICAL INVESTIGATION

HYDROGEOLOGICAL REPORT

AUGUST 2008

Prepared by

SRK Consulting (South Africa) Pty Ltd

SRK Consulting
Engineers and Scientists

EASTERN CAPE PROVINCE
CACADU DISTRICT MUNICIPALITY
JANSENVILLE
HYDROGEOLOGICAL INVESTIGATION

GEOHYDROLOGICAL REPORT

HYDROGEOLOGICAL INVESTIGATION IN JANSENVILLE
BASED ON TENDER W8783

August 2008

Report nr: 378515/1

Prepared By:

SRK Consulting (South Africa) Pty Ltd
PO Box 15739
Beacon Bay
5241

For:

Directorate: Water Resource Management
Department of Water Affairs and Forestry
PO Box 7019
East London
5205

EASTERN CAPE PROVINCE
CACADU DISTRICT MUNICIPALITY
JANSENVILLE
HYDROGEOLOGICAL INVESTIGATION

GEOHYDROLOGICAL REPORT

HYDROGEOLOGICAL INVESTIGATION IN JANSENVILLE
BASED ON TENDER W8783

Aug 2008

Approved for SRK Consulting (South Africa) Pty Ltd

.....	.....
G. Nel Project Manager Principal Hydrogeologist	E. Goossens Project Review

Approved for the Department of Water Affairs and Forestry by:

.....	.....
I. Viljoen Assistant Director	H. Goossens Control Technician

EXCECUTIVE SUMMARY

The town of Jansenville is dependant on groundwater for their main water supply and is experiencing an increasing demand on their current production boreholes. The boreholes are pumped far above the recommended pumping rates, not water treatment is done and there is no groundwater monitoring or management.

SRK Consulting was commissioned by the Department of Water Affairs and Forestry (DWAF) to conduct a further groundwater study to determine the existing use and groundwater potential of areas within the municipal boundaries. A hydrocensus within the municipal boundaries revealed 78 existing boreholes. Eleven new exploration boreholes were drilled with airlift yields ranging between 0.1 and 3.5 l/s. The majority of the water strikes were encountered within 50 m with the exception of two boreholes which had further water strikes at 69 m and 109 m. The geohydrological study concluded that the groundwater potential within the areas covered by the municipal boundaries is low and that future exploration work should be conducted in areas adjacent to Jansenville and where prominent faults and folding occurs. Groundwater monitoring and management is crucial to protect the current groundwater supplies.

Dry riverbed of the Brakrivier, a subsidiary of the Sondagsrivier.

Table of Contents

List of Tables

List of Figures

1 Introduction

SRK Consulting was appointed by the Department of Water Affairs and Forestry (DWAF) to conduct a geohydrological investigation in the vicinity of the town of Jansenville, Eastern Cape Province. The investigation was to include the drilling and yield testing of exploration boreholes to determine the remaining groundwater potential of the aquifer/s underlying the town. The area of investigation was however limited to within the municipal boundaries.

As part of the geohydrological assessment, the current use of groundwater in the town was to be established (hydrocensus) in order to estimate the volumes of groundwater currently being abstracted from the aquifer/s underlying the town.

The investigation was conducted as follows:

Phase 1: Project initiation and liaison

- Meetings were arranged with the municipality of Jansenville to inform them of the investigation and to get their cooperation in terms of the collation of groundwater information and access to private properties within the municipal boundaries.
- A meeting was also held with the local farming community to inform them of the investigation and to try and get their approval should exploration drilling be needed within their private properties.

Phase 2: Borehole survey (Hydrocensus)

- A desk study was conducted to gather available groundwater information on the town and its surrounding areas.
- All municipal and private boreholes that fall within the municipal boundaries of Jansenville were visited and information was gathered.

Phase 3: Geohydrological Investigation

- Geophysical investigation
- Drilling and pump testing of exploration boreholes.
- Final report

This report details the findings of the **hydrocensus** and Geohydrological investigation.

2 Background

2.1 Location and demography

Jansenville is situated approximately 150 km north-west of Port Elizabeth and falls within the Cacadu District Municipality.

The average annual rainfall for the area is given as between 250 to 300 mm/year. The general altitude for the study area ranges from 450 mamsl (metres above mean sea level) at the town to 700 mamsl just north of the town. The town is situated along the banks of the Sundays River and extends across the river towards the Brakrivier.

Refer to Figure 1 below for the locality map.

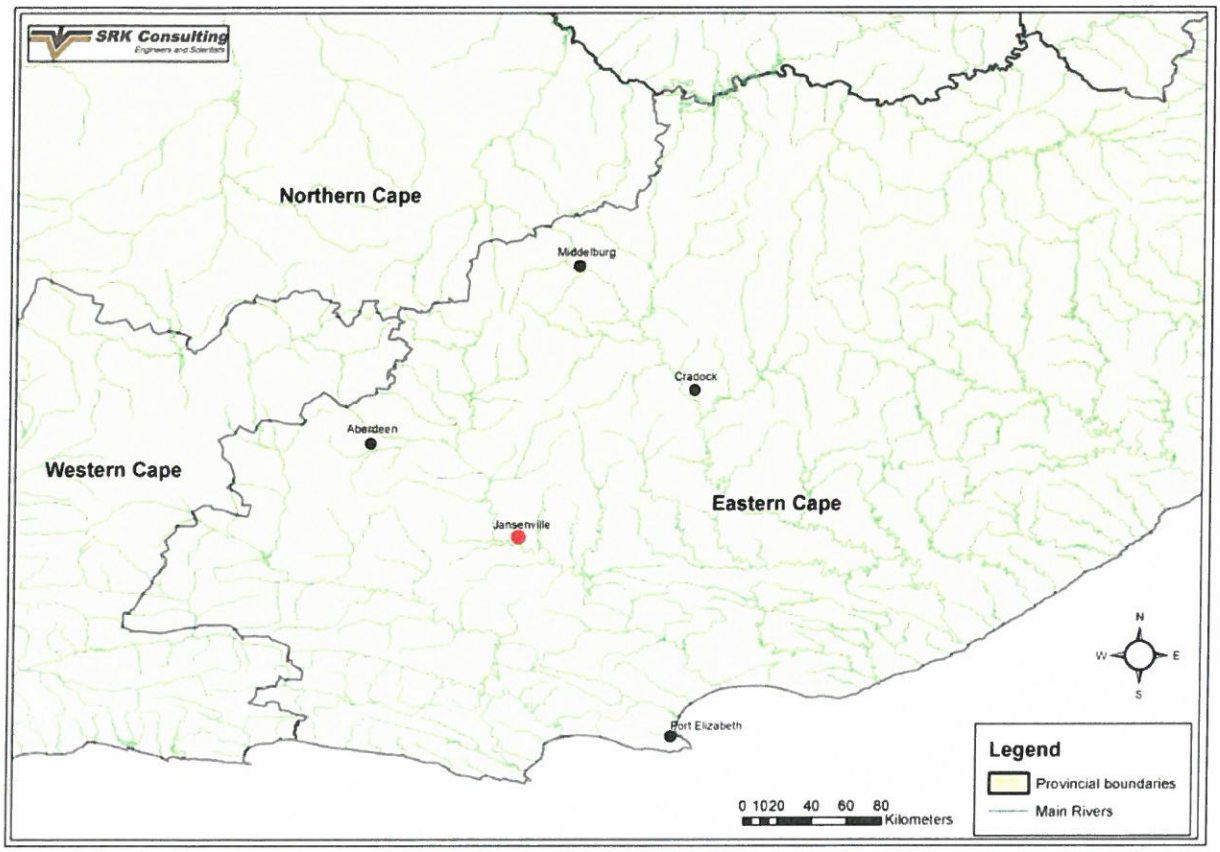


Figure 1: Locality Map – Jansenville

2.2 Jansenville current water supply - status quo.

Jansenville relies only on groundwater for their water supply sources. Four boreholes located in Jansenville, Kruitwater Farm and Eiland Farm (see **Figure 2**) are currently being utilised.

- At the time of investigation (2008), a total of **2938 kl/day** was being abstracted from the four production boreholes. All four boreholes were pumped continuously (24 hrs/day) at **yields ranging from 8 l/s to 10 l/s**. The yield data was provided by the municipality and could not be measured. Abstraction from boreholes EC/N24/042 was taken the same as 047 as the abstraction was unknown.
- No treatment of the water is currently taking place and the water has a distinct **foul smell** (rotten egg smell).
- People are making progressively use of rainwater harvesting to supplement the water supply.
- Based on the 2001 census (SA Statistics), Jansenville is home to approximately **3992 people**, which puts the water demand at **239 kl/day if RDP design criteria** of 60 l/capita/day are used. Based on the calculated current abstraction rate, the per capita use is **currently 735 l/capita/day**.

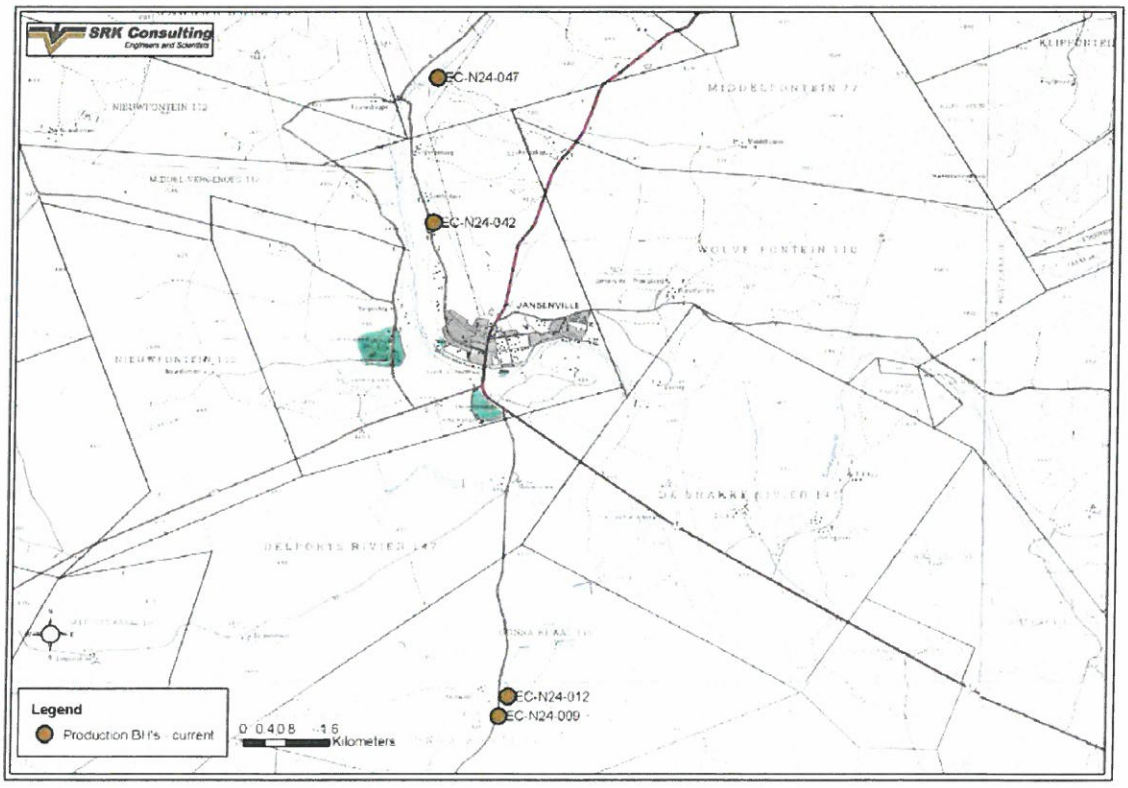


Figure 2: Production boreholes at the time of investigation.

3 Hydrocensus

3.1 Existing boreholes according to the NGDB

A database search of the National Groundwater Database (NGDB) within the boundaries of the municipal area and the adjacent farms, revealed 5 boreholes with recommended yields in the order of 0.1 – 3.0 l/s (See **Figure 3**). These yields are assumed "airlift yields"[1] and not recommended yields[2].

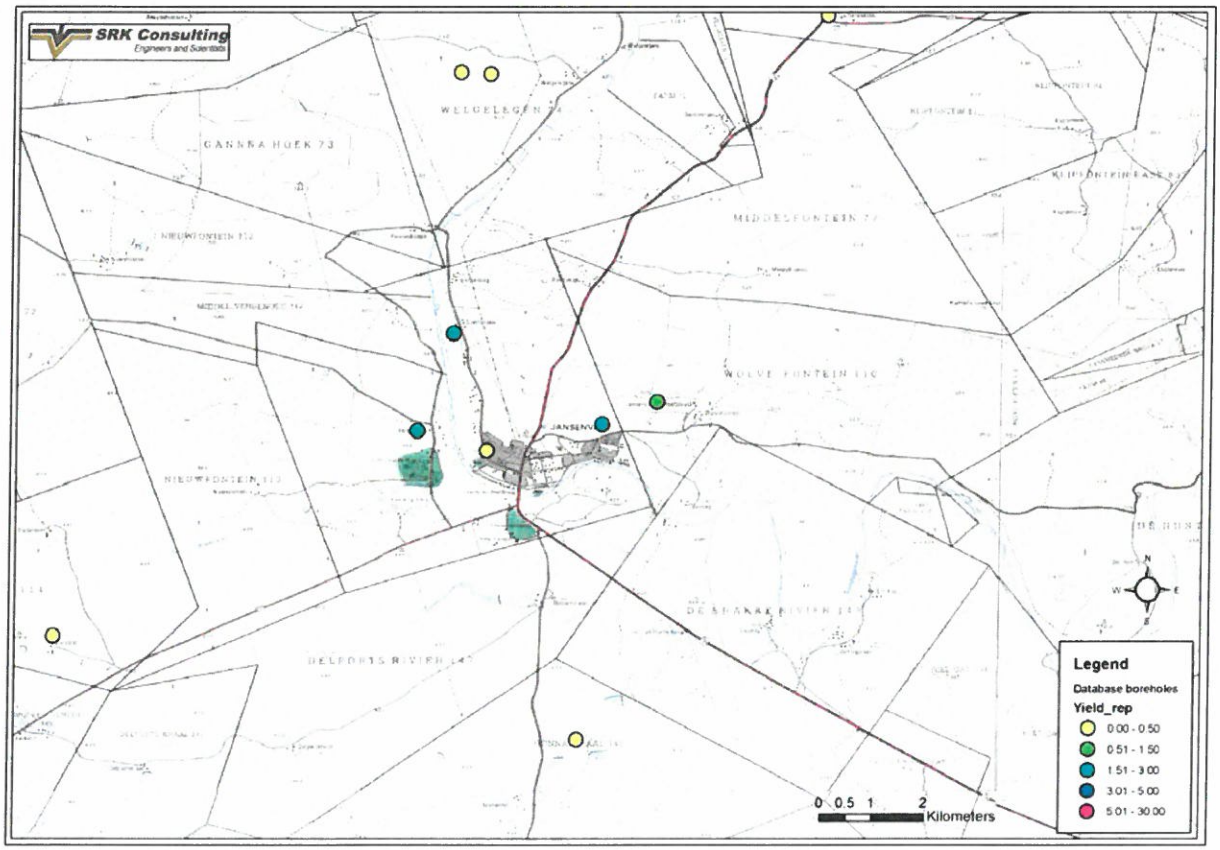


Figure 3: NGDB boreholes

[1] Airlift yield = yield obtained after drilling and by means of airlifting, also called "blow-yield"

[2] Recommended yield = calculated yield after conducting a pumping test.

3.2 SRK Hydrocensus – 2008

3.2.1 Potential pollution sources

During the hydrocensus potential pollution (contamination) sources were identified. **Table 1** lists the main sources. Based on their position relative to high groundwater potential areas / existing boreholes, a preliminary risk classification has been done. **Figure 4** shows the positions of these contamination sites.

Table 1: Potential contamination sources - Jansenville

HYDROCENSUS SUMMARY (Geosite details)

PROJECT NAME: JANSENVILLE PROJECT NR: 378515

POSSIBLE POLLUTION SOURCES

Latitude	Longitude	Solid waste site	Sewerage treatment works	Formal Cemetery	Cattle kraal	Dip kraal	Abattoir	Fuel Depot	Other	Current risk to groundwater pollution?		
										Low	Mod	High
32.95192	24.68828			X								X
32.95295	24.67956			X								X
32.95437	24.67524	X										X
32.95013	24.65081		X						NEW			X
32.95549	24.65615						X					X
32.94791	24.66682							X				X
32.94884	24.66731								SEWAGE PUMP			X

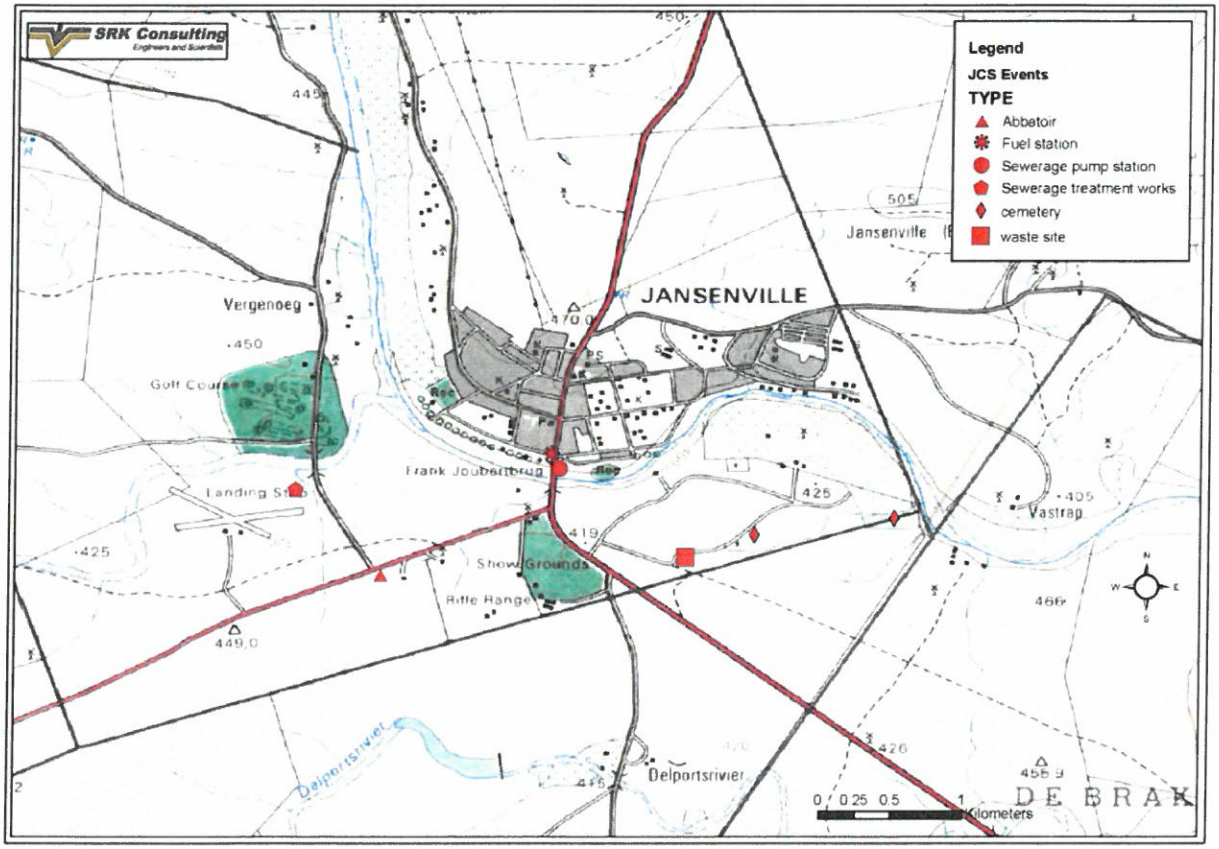


Figure 4: Jansenville Waste Facilities.

3.2.2 Existing Boreholes

In total, **seventy eight existing boreholes** were identified within the municipal boundaries of Jansenville, including the private properties that fall inside the municipal boundaries, but excluding the plots along the river and adjacent farmers (small , medium and large). Due to political and social instability at the time, these farm areas could not be surveyed. From the municipal road passing through the farmlands and plots (small-scale farmers) numerous boreholes were however visible and most were equipped and operational.

Most of the boreholes belonged to private owners and therefore no equipment was removed from the boreholes in order to verify the depth, water levels and general condition of the boreholes.

Included in the survey was also the boreholes used by the municipality which are situated on the farm Kruitwater, approximately 6.5 km south of Jansenville.

Figure 5 indicates the positions of the boreholes found during the hydrocensus. A summary of the hydrocensus data is provided in **Table 2** and in **Appendix 1.**

Table 2: SRK Hydrocensus results

LATITUDE	LONGITUDE	NR ON SOURCE	ALTITUDE	SITE TIPE	EQUIPMENT	Bh DEPTH	WATER LEVEL	LEVEL STATUS	YIELD
				Borehole/Spring		(m)	(mbmp)	Pumped/Recovering/Static	(l/s)
32.93336	24.70151	EC-N24-001	448	Borehole	Monotype pump	85	6.72	Static	1.6
32.92191	24.72057	EC-N24-002	519	Borehole	Monotype pump	100			0.5
32.90548	24.71609	EC-N24-003	527	Borehole	No Equipment	72			
32.90113	24.7286	EC-N24-004	551	Borehole	Submersible pump	100			0.28
33.00613	24.67002	EC-N24-006	433	Borehole	No Equipment	90			1.9
32.90807	24.71442	EC-N24-007	529	Borehole	No Equipment	120			
33.00584	24.67012	EC-N24-009	432	Borehole	Submersible pump	129	23.15	Static	10
33.00264	24.67161	EC-N24-012	431	Borehole	Submersible pump				8
33.0073	24.674	EC-N24-013	443	Borehole	No Equipment	126			
32.93542	24.7	EC-N24-014	441	Borehole	Monotype pump	81			3.5
32.94934	24.6486	EC-N24-015	412	Borehole	No Equipment	80	5.63	static	0.25
32.93347	24.7013	EC-N24-024	448	Borehole	No Equipment		5.65	static	
33.002	24.67463	EC-N24-025	439	Borehole	No Equipment				
33.00337	24.67466	EC-N24-026	446	Borehole	No Equipment				
33.00364	24.67467	EC-N24-027	445	Borehole	No Equipment				
33.00241	24.67979	EC-N24-028	451	Borehole	No Equipment				
33.00262	24.67161	EC-N24-029	431	Borehole	No Equipment				
32.99436	24.67327	EC-N24-030	432	Borehole	No Equipment				
32.95073	24.66387	EC-N24-031	416	Borehole	No Equipment	17			
32.94907	24.66312	EC-N24-032	408	Borehole	No Equipment				4
32.95373	24.65479	EC-N24-033	425	Borehole	No Equipment				
32.95039	24.65137	EC-N24-034	409	Borehole	No Equipment		3.27	Static	
32.956	24.65739	EC-N24-035	434	Borehole	No Equipment		20.9	Static	
32.95579	24.65754	EC-N24-036	433	Borehole	No Equipment				

LATITUDE	LONGITUDE	BH NUMBER	ALTITUDE	SITE TIPE	EQUIPMENT	Bh DEPTH	WATER LEVEL	LEVEL STATUS	YIELD
				Borehole/Spring		(m)	(mbmp)	Pumped/Recovering/Static	(l/s)
32.9591	24.65673	EC-N24-037	436	Borehole	Submersible pump		23.89	static	
32.95268	24.66499	EC-N24-038	422	Borehole	Windpump				
32.9443	24.67247	EC-N24-039	416	Borehole	Windpump		14.8	Static	
32.94506	24.65845	EC-N24-040	417	Borehole	No Equipment				
32.94083	24.66285	EC-N24-041	427	Borehole	No Equipment		23.1	Static	
32.92435	24.65834	EC-N24-042	431	Borehole	Submersible pump		19.4	Static	
32.91291	24.65453	EC-N24-043	427	Borehole	No Equipment		8.19	Static	
32.91295	24.65452	EC-N24-044	427	Borehole	No Equipment				
32.9062	24.65418	EC-N24-045	422	Borehole	No Equipment		4.7	Static	
32.90621	24.65419	EC-N24-046	422	Borehole	No Equipment		4.48	Static	
32.90046	24.65868	EC-N24-047	428	Borehole	Submersible pump		8.57	Pumped	8
32.90046	24.65872	EC-N24-048	428	Borehole	No Equipment				
32.97247	24.67333	EC-N24-049	419	Borehole	No Equipment				
32.94709	24.66632	EC-N24-050	415	Borehole	Submersible pump	23.5	11.65	static	3.3
32.94691	24.66538	EC-N24-051	413	Borehole	No Equipment				
32.94498	24.66184	EC-N24-052	409	Borehole	No Equipment	20.5	9.8		
32.94304	24.66164	EC-N24-053	417	Borehole	Submersible pump		11.8	Static	2.1
32.94209	24.66235	EC-N24-054	414	Borehole	No Equipment	7.4	DRY		
32.94213	24.66065	EC-N24-055	411	Borehole	No Equipment	9.5	DRY	Static	
32.9421	24.66007	EC-N24-056	410	Borehole	Submersible pump	24	8.8	Static	
32.94466	24.66293	EC-N24-057	414	Borehole	No Equipment	42	14.15	Static	
32.94722	24.6677	EC-N24-058	410	Borehole	No Equipment	2.05	DRY		
32.94735	24.66786	EC-N24-059	410	Borehole	No Equipment	14	11.02	Static	
32.94705	24.67018	EC-N24-060	410	Borehole	Submersible pump	24.5	DRY		
32.94745	24.67059	EC-N24-061	409	Borehole	Monotype pump				

LATITUDE	LONGITUDE	NR ON SOURCE	ALTITUDE	SITE TIPE	EQUIPMENT	Bh DEPTH	WATER LEVEL	LEVEL STATUS	YIELD
				Borehole/Spring		(m)	(mbmp)	Pumped/Recovering/Static	(l/s)
32.94716	24.6714	EC-N24-062	406	Borehole	Submersible pump	68			
32.94673	24.67116	EC-N24-063	410	Borehole	Windpump	29.5			
32.94603	24.67111	EC-N24-064	406	Borehole	No Equipment				
32.94557	24.67177	EC-N24-065	414	Borehole	No Equipment	28	13.1	Static	
32.94568	24.67198	EC-N24-066	408	Borehole	No Equipment	9	DRY		
32.94667	24.67225	EC-N24-067	409	Borehole	No Equipment	1.35			
32.94699	24.67229	EC-N24-068	409	Borehole	No Equipment	0.23			
32.94558	24.67389	EC-N24-069	411	Borehole	Monotype pump	36			2.1
32.9457	24.67221	EC-N24-070	417	Borehole	No Equipment	17.5	DRY		
32.94468	24.66821	EC-N24-071	422	Borehole	No Equipment	82.3	17.05	Static	
32.94605	24.66855	EC-N24-072	411	Borehole	No Equipment	91	12.4	Static	
32.94578	24.67021	EC-N24-073	405	Borehole	No Equipment	0.83	DRY		
32.94366	24.66926	EC-N24-074	421	Borehole	No Equipment				
32.94489	24.66953	EC-N24-075	406	Borehole	No Equipment	0.3			
32.94169	24.66768	EC-N24-076	436	Borehole	Submersible pump		31	Static	0.5
32.94262	24.66722	EC-N24-077	420	Borehole	No Equipment	37	23.05	Static	
32.94276	24.66742	EC-N24-078	427	Borehole	No Equipment				
32.94136	24.66657	EC-N24-079	428	Borehole	No Equipment	102	28.27	Static	
32.94113	24.66401	EC-N24-080	430	Borehole	No Equipment				
32.94525	24.66891	EC-N24-081	423	Borehole	Submersible pump	30.2	13.19	Static	
32.94068	24.67504	EC-N24-082	424	Borehole	No Equipment	13	DRY		
32.94235	24.67154	EC-N24-083	422	Borehole	No Equipment	0.32			
32.94598	24.66992	EC-N24-084	413	Borehole	No Equipment	25	13.13	static	
32.9461	24.66996	EC-N24-085	417	Borehole	Submersible pump	56.5	13.21	Static	
32.94929	24.66918	EC-N24-086	406	Borehole	No Equipment	0.68		Obstruction, not measured	

LATITUDE	LONGITUDE	NR ON SOURCE	ALTITUDE	SITE TIPE	EQUIPMENT	Bh DEPTH	WATER LEVEL	LEVEL STATUS	YIELD
				Borehole/Spring		(m)	(mbmp)	Pumped/Recovering/Static	(l/s)
32.94703	24.66403	EC-N24-087	410	Borehole	Submersible pump				
32.94014	24.66158	EC-N24-088	418	Borehole	No Equipment	40.05	13.3	Static	
32.94594	24.67158	EC-N24-089	407	Borehole	Submersible pump	40	12.73	Static	2.1
32.94161	24.66127	EC-N24-090	417	Borehole	Submersible pump	36	17.03	Static	

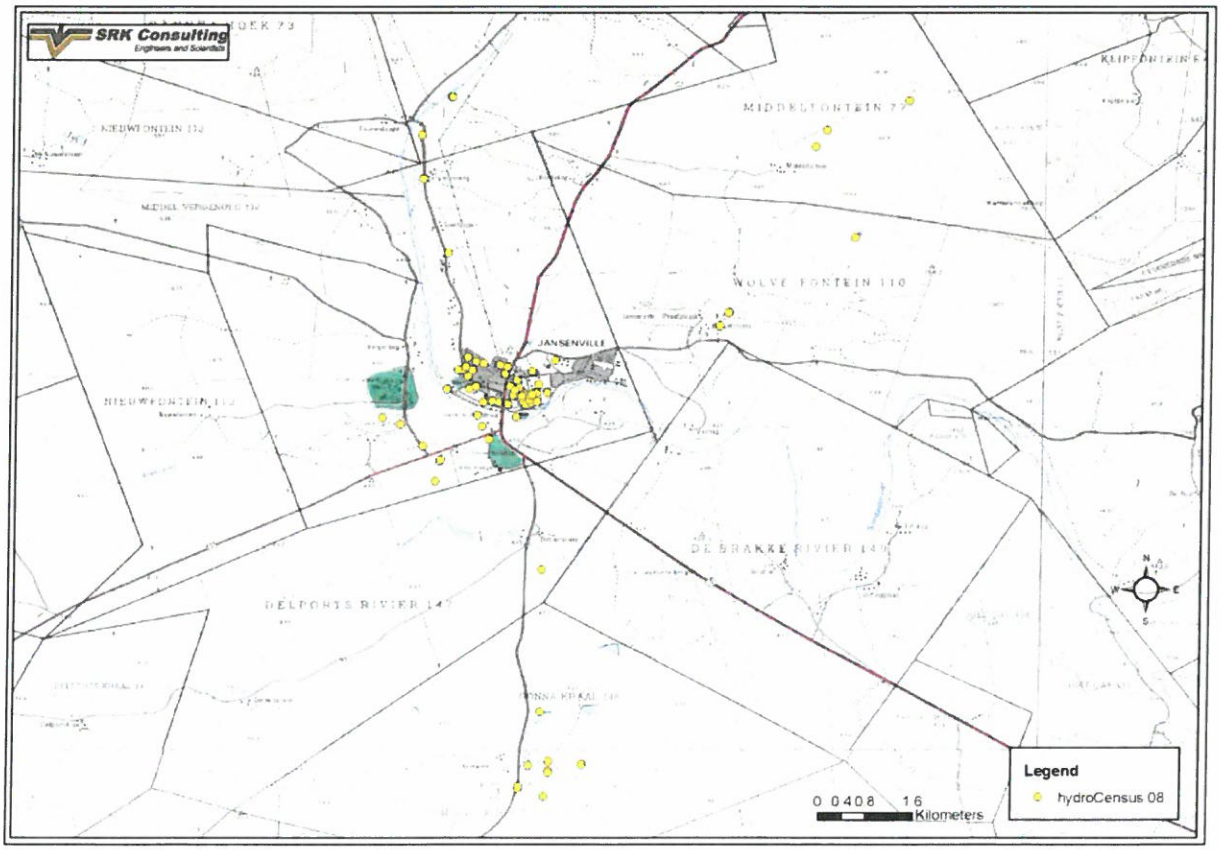


Figure 5: SRK Hydrocensus 2008

4 Geohydrological investigation

4.1 Historical information

4.1.1 Previous studies

A geohydrological investigation was done in 2004 by Khulani VSA Groundwater Consultants (Technical Report No.: TR/KVSA/038/04). The aim of the investigation was to do a situation assessment and provide the municipality with recommendations pertaining to the way forward. In short, the recommendation at the time was to refurbish some of the existing production boreholes and parts of the reticulation network. The investigation concluded the following:

- Production boreholes were being over-pumped and no groundwater management was being done. Borehole EC/N24/001 was recommended to be pumped at 1.5 l/s (12-hrs), but at the time was being pumped at 7 l/s for a continuous period of 48 hrs to fill the town's reservoir. This caused damage to the aquifer.
- It was recommended that bulk meters should be installed.
- No hydrocensus was done at the time and it was recommended that a complete hydrocensus be conducted in and around Jansenville.

Another investigation was done by Khulani VSA in 2005 where additional production boreholes were drilled, including the ones currently in use at Kruitwater (Rep Ref TR/KVSA/038/2/05. Their conclusions / recommendations included:

- Abstraction needed to be balanced with recharge,
- Suitably qualified personnel should initially manage the groundwater resources and do the O&M,
- All production boreholes must be licensed and fitted with water level monitoring devices.

A geohydrological study was also conducted in 2002 by Geocon, in which certain boreholes were surveyed, pump tested and new ones drilled. **No report** was issued, but the data was provided to SRK for the purpose of this study.

Table 3 summarises the data as investigated by the above consultants. **Figure 6** portrays the positions of the boreholes that were included in the above studies.

Table 3: Borehole summary - previous work.

BH_NR	LAT	LONG	DEPTH	SWL	AIRLIFT	MR24	CLASS	TYPE
EC/N24/009	-33.005806	24.670111	129	3.95	12	5.60	4	KVSA
EC/N24/011	-33.005083	24.667694	68	5.11	0	4.24	3	EXIST/3A
EC/N24/012	-33.002611	24.671611	118	1.10	20	2.00	3	KVSA
EC/N24/013	-33.007278	24.674000	126	-1.00	1	-1.00	-1	KVSA
EC/N24/014	-32.935472	24.700000	81	12.97	5	2.00	3	KVSA
EC/N24/015	-32.949472	24.649806	80	-1.00	2	0.25	-1	KVSA
EC/N24/016	-32.950889	24.691750	74	10.44	5	1.40	3	KVSA
605-1001	-33.003583	24.674750	112	-1.00	1	-1.00	-1	KVSA
605-1002	-33.003333	24.674611	88	-1.00	1	-1.00	-1	KVSA
605-1003	-33.003361	24.671806	80	-1.00	1	-1.00	-1	KVSA
605-1004	-32.994333	24.673222	100	-1.00	0	-1.00	-1	KVSA
605-1005	-32.972278	24.673389	100	-1.00	1	-1.00	-1	KVSA
605-1006	-33.002000	24.674639	120	-1.00	0	-1.00	-1	KVSA
EC/N24/006	-33.006047	24.670366	0	-1.00	-1	-1.00	-1	EXIST/J4
EC/N24/001	-32.933399	24.701640	0	-1.00	-1	-1.00	-1	EXIST/J1
EC/N24/002	-32.921810	24.720512	0	-1.00	-1	-1.00	-1	EXIST
EC/N24/007	-32.908048	24.713873	0	-1.00	-1	-1.00	-1	EXIST/J8
EC/N24/003	-32.905431	24.715666	0	-1.00	-1	-1.00	-1	EXIST/J6
EC/N24/004	-32.901216	24.728458	0	-1.00	-1	-1.00	-1	EXIST/J7
G106	-32.912644	24.654771	0	-1.00	-1	-1.00	-1	EXIST
G8	-32.904011	24.654771	0	-1.00	-1	-1.00	-1	EXIST
G6/JP14	-32.924000	24.658000	0	-1.00	-1	-1.00	3	EXIST/J8
G4	-32.906478	24.654031	0	-1.00	-1	-1.00	-1	EXIST/J2
G1	-32.900682	24.658224	0	-1.00	-1	-1.00	4	EXIST/J1
6B	-32.901390	24.720750	0	0.00	0	0.00	0	AGES - EXIST
J2	-32.906111	24.654167	0	0.00	0	0.00	0	AGES - EXIST
6A	-32.912300	24.709180	0	0.00	0	0.00	0	AGES - EXIST
4A	-32.905070	24.682370	0	0.00	0	0.00	0	AGES - EXIST
A4	-32.929760	24.718140	0	0.00	0	0.00	0	AGES - EXIST

A6	-32.909960	24.625030	0	0.00	0	0.00	0	AGES - EXIST
A5	-32.926610	24.720120	0	0.00	0	0.00	0	AGES - EXIST
J17	-32.917194	24.643889	0	0.00	0	0.00	0	AGES - EXIST
J3	-32.920890	24.641600	0	0.00	0	0.00	0	AGES - EXIST
J13	-32.917889	24.654167	0	0.00	0	0.00	0	AGES - EXIST
J14	-32.917083	24.653611	0	0.00	0	0.00	0	AGES - EXIST
J15	-32.914722	24.653611	0	0.00	0	0.00	0	AGES - EXIST
M1	-32.915278	24.654722	0	0.00	0	0.00	0	AGES - EXIST
J8	-32.924444	24.658333	0	0.00	0	0.00	0	AGES - EXIST

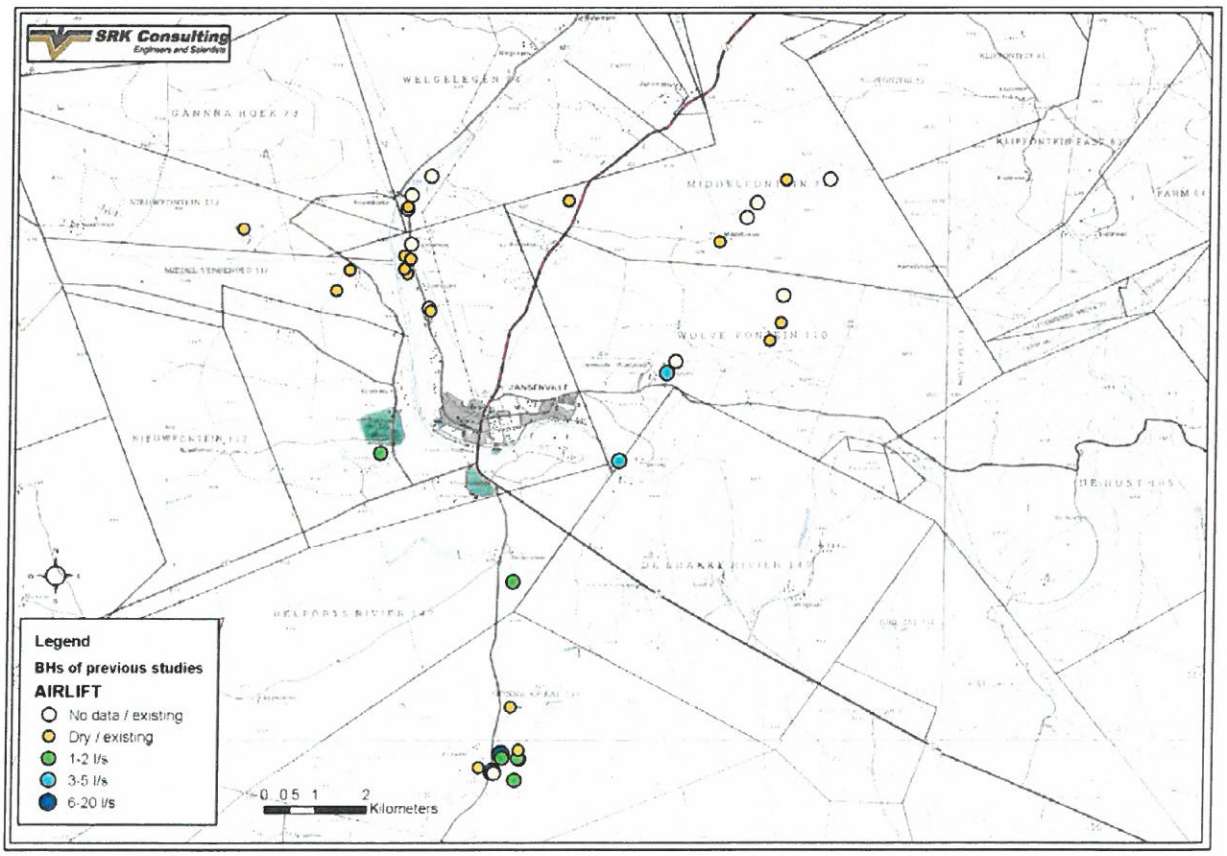


Figure 6: Map indicating the boreholes covered by previous studies.

4.2 Regional Hydrogeology

Jansenville falls across the N24C and N24D quaternary drainage regions (Refer to the 1: 2 000 000; "Water Management areas of the Republic of South Africa" Map, 2000; Map Author Directorate Catchment Management, DWAF, GIS and Cartographic: Helena Fourie). The probability of drilling a high yielding production borehole (yield > 2l/s) within this area is between 30 and 40% and between 40 – 60% of drilling a low-yielding borehole (0.1 l/s). (***Vegter, J.R., Seymour A., 1995. Groundwater Resources of the Republic of South Africa – Two Map sheets and explanatory brochure. DWAF***). According to the map "***An evaluation of groundwater vulnerability and pollution risk assessment in the preparation of a groundwater protection strategy for South Africa" (Reynders, A.G., 1996)***, the groundwater vulnerability is **medium**.

4.2.1 Geology

According to the geological map series (3224 Graaf Reinet, South Africa 1:250 000 Geological Series), the town of Jansenville is situated on mudstone and sandstone of the Koonap Formation, Adelaide Subgroup, Beaufort Group. Although not clearly visible on the surface, the Jansenville area is underlain by a series of synclines and anti-clines (folds - see **Figure 7**), with fold axis extending northwest to southeast and running parallel to the town.

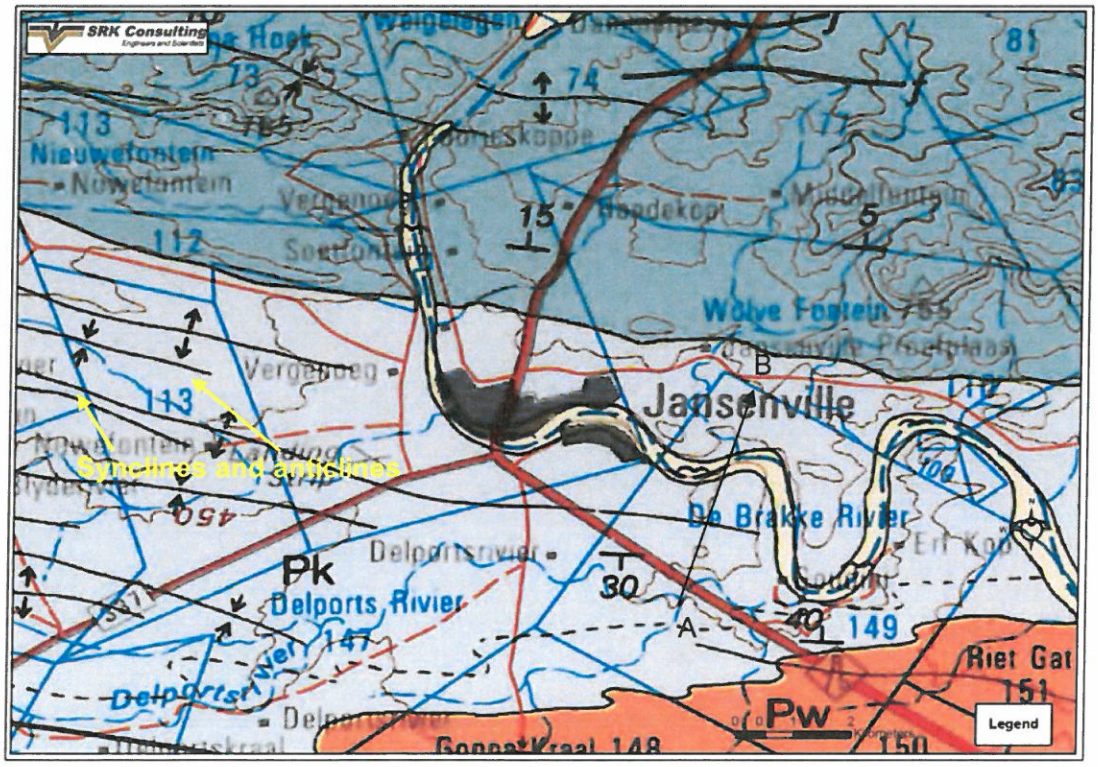


Figure 7: 3224 Graaf Reinet, 1 250 000 Geological Series, Geological Survey.

4.2.2 *Aerial photograph / Landsat Image interpretation*

Mapping on aerial photographs and Landsat Images on the study area were performed for the purpose of defining:

- Geological boundaries
- and structure analyses such as synclines, anticlines (folds), fault zones and lineament/linear structures

Geo-referencing of the photos was done to fit the 1:50000 Topographical sheets. As the drilling and geophysical work had to be focused within the municipal boundaries, extrapolation of potential lineaments / folds from outside the municipal had to be done. Refer to **Figure 8** for the aerial photograph. The quality of the images are however poor.

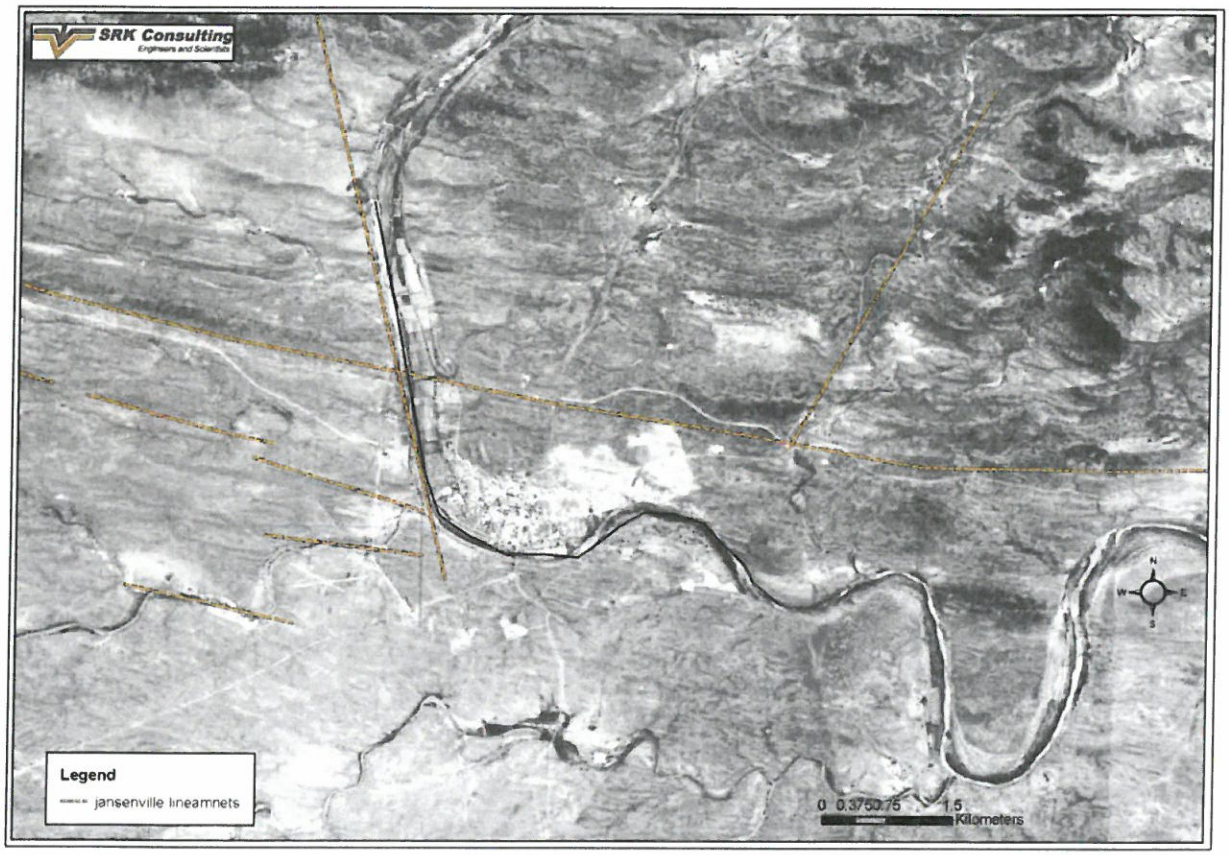


Figure 8: Potential lineaments from aerial photos

4.2.3 *Current Water levels*

From the water level data as collected from the hydrocensus, a water level contour map has been compiled and is shown in **Figure 9**. Also shown in **Figure 10** are the positions of the **waste facilities in relation to the anticipated groundwater flow**. It is clear that the current abstraction is "reversing" the natural groundwater flow and contamination can be drawn into the effective radius of abstraction.

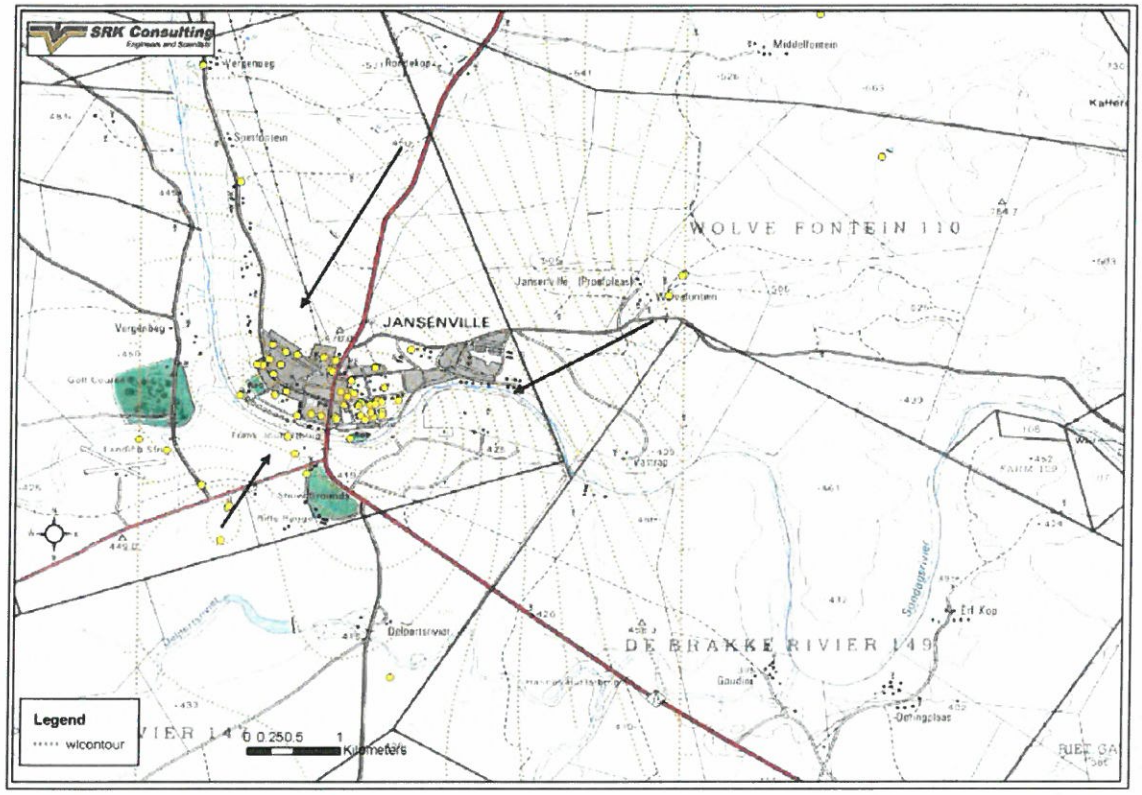


Figure 9: Water level contour map.

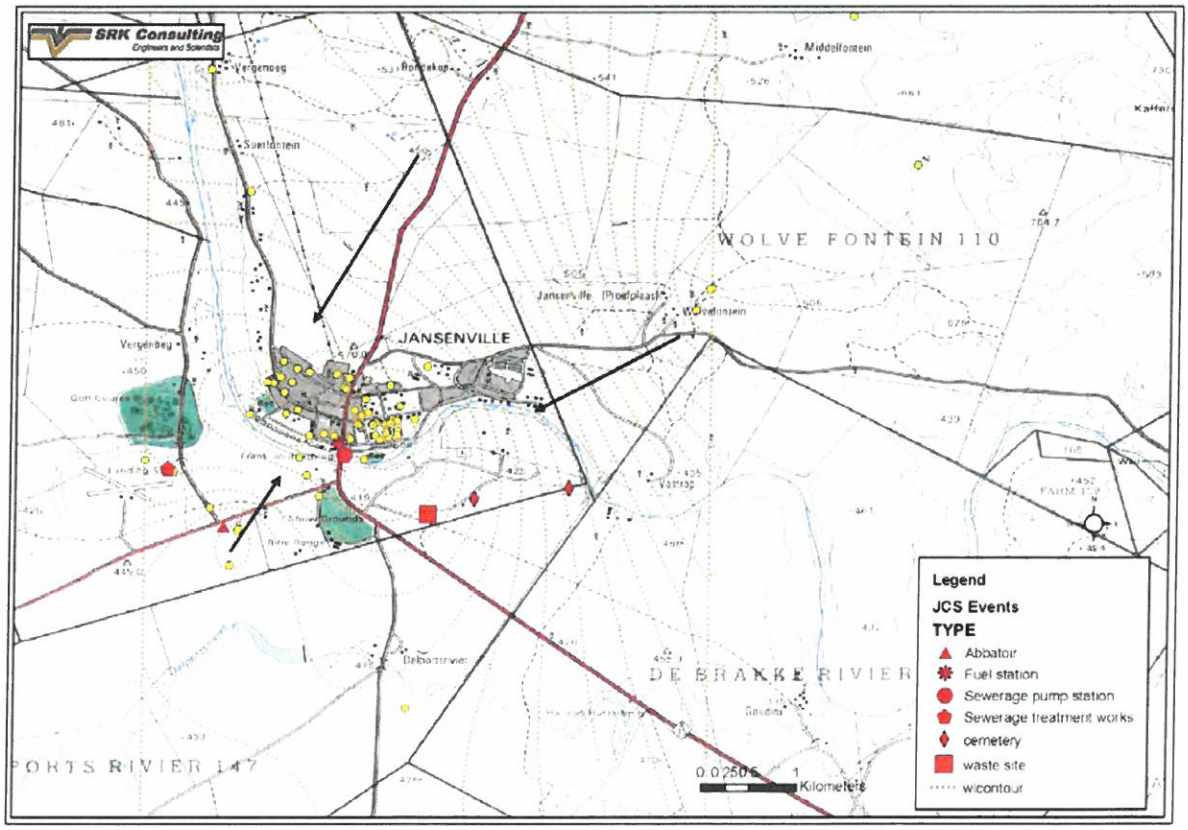


Figure 10: Water levels and waste facilities.

4.3 Geophysical surveys

From the hydrocensus, aerial photo mapping and geological reconnaissance targets were selected for drilling purposes. The lineaments as shown in **Figure 8** were targeted and eight geophysical traverses were done. The geophysical surveys could only be done inside the municipal boundaries and were further restricted by the presence of existing / planned waste facilities. The municipal area southeast of the town (see **Figure 11**) could not be targeted due to the existing waste site and existing cemeteries. Parts of the municipal land are also rented out and could not be targeted.

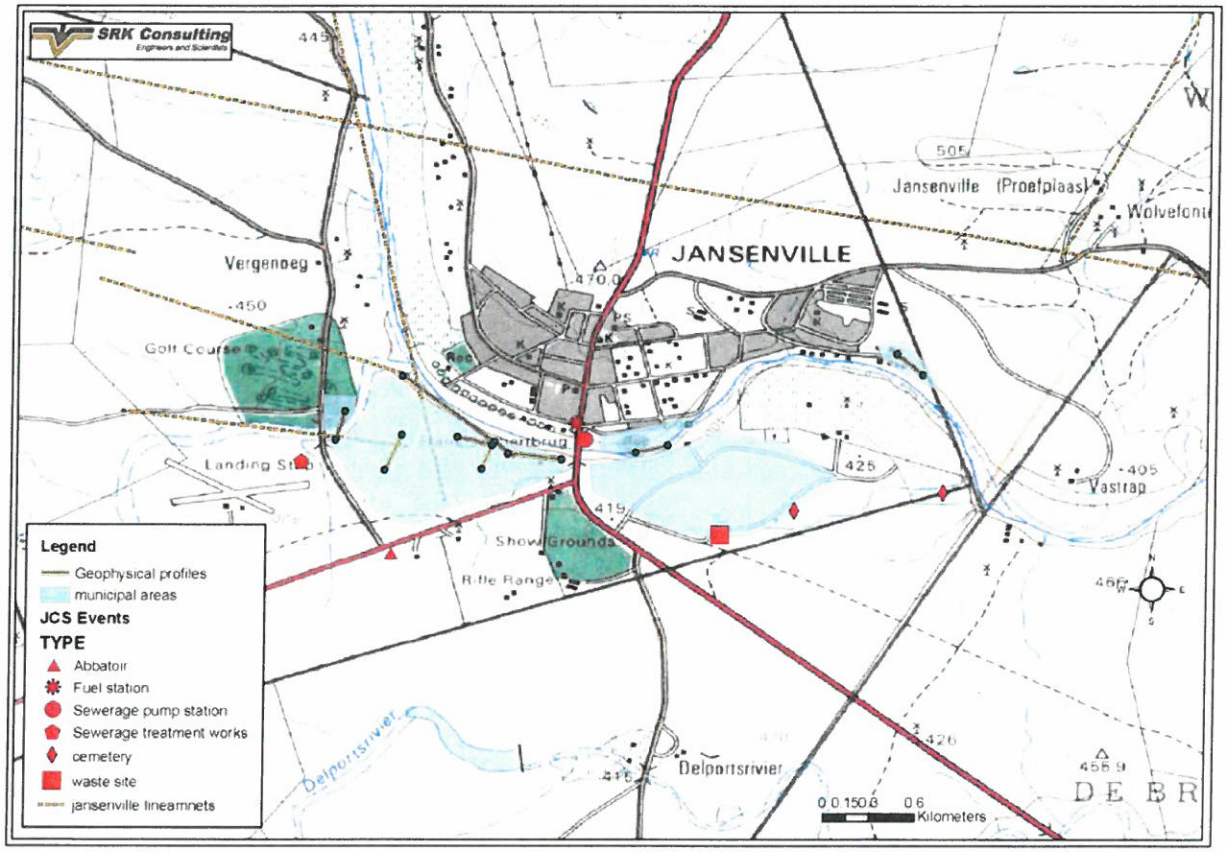


Figure 11: Geophysical target areas.

The geophysical profiles are presented in **Appendix 2.**

4.4 Drilling

Steyns Drilling Trust commenced drilling in June 2008 and completed the drilling at the end of September 2008. Approximately 1460 m were drilled.

As the majority of existing boreholes in Jansenville seem to have been drilled shallow to intersect the alluvial deposits that occur along the Sondagsriver, deeper drilling was also done. Borehole EC/N24/100 was drilled to a depth of 254 m with the last recorded water strike being at 123 m (0.58 l/s). The majority of the significant water strikes however still occurred shallow and probably alluvium fed. Seasonal changes in the rainfall will have an affect on these shallow water strikes (shallow is considered < 30 m in this case).

The drilling results are portrayed in **Figure 12**, **Table 4** and the drilling logs in **Appendix 3.**

Table 4: Drilling results at Jansenville

BOREHOLE NUMBER	Latitude	Longitude	Date drilled	BH depth (m)	Main Strikes Depths (m)	Airlift yield (l/s)
EC/N24/091	32.94706000	24.65350000	20 June '08	115	14, 22	2.3
EC/N24/092	32.94755000	24.65325000	24 June '08	60	12, 30	0.8
EC/N24/093	32.94891000	24.65330000	25 June '08	121	8	0.08
EC/N24/094	32.94910000	24.66190000	01 July '08	183	14, 55	4.4
EC/N24/095	32.94532000	24.65700000	02 July '08	100	39, 69	2.55
EC/N24/096	32.94986000	24.66405000	04 July '08	80	28	0.04
EC/N24/097	32.94919000	24.67194000	05 July '08	150	24	1.84
EC/N24/098	32.94940000	24.67130000	08 July '08	141	13, 62	1.26
EC/N24/099	32.94474	24.68667	10 July '08	127	36,103,109	1.26
EC/N24/100	32.94867000	24.67257000	12 Sep '08	254	38,86,123	1.84
EC/N24/101	32.94435000	24.68624000	30 Sep '08	130	60,75	3.8

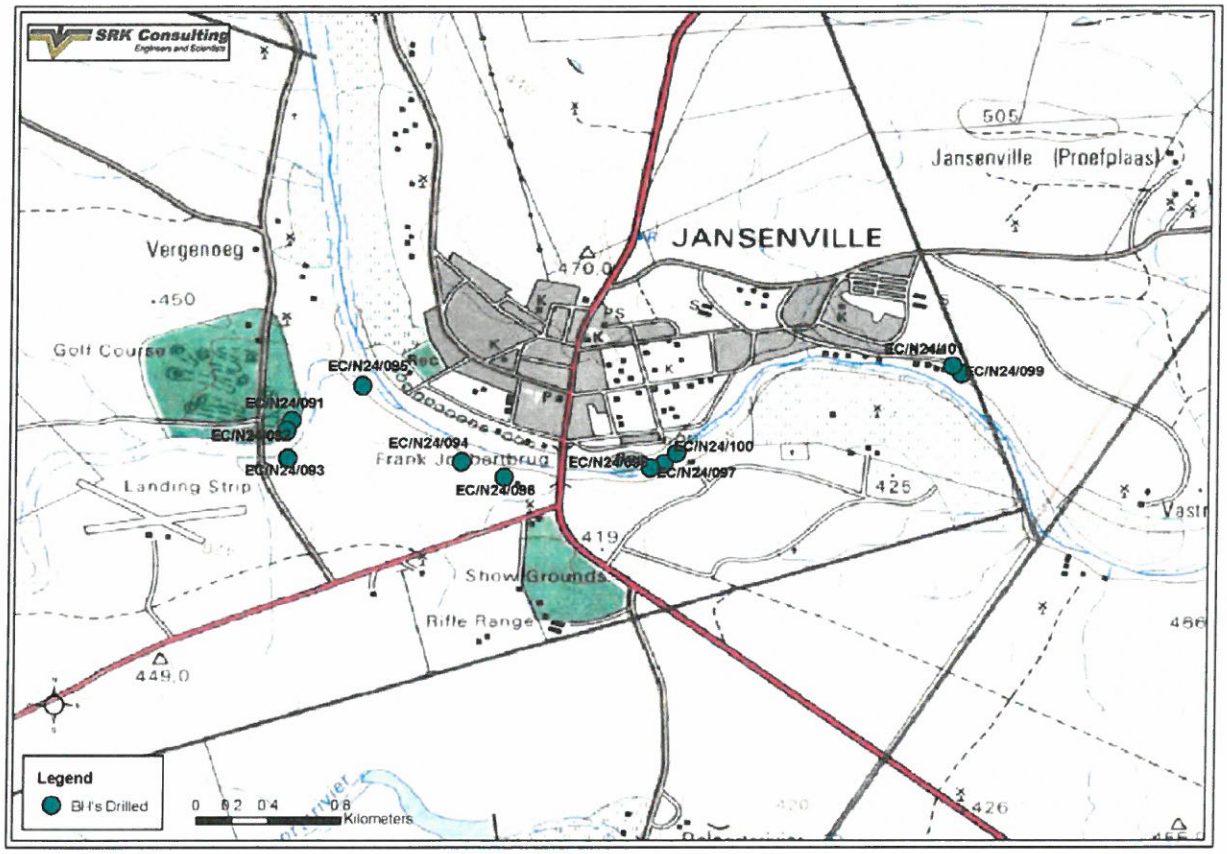


Figure 12: Summary of drilling results.

4.5 Aquifer Testing

Only the newly drilled boreholes were pump tested and no existing boreholes. The municipal boreholes were in full operation at the time of the investigation and could not be stopped for pump testing.

Standard aquifer testing methods were used and the data was evaluated with the FC Method[3]. **Figure 13** indicates the boreholes that were pump tested and their respective 24-hr recommended yields. **Table 5** lists the boreholes as tested and the full yield test records are displayed in **Appendix 4**. The management recommendations are given in **Appendix 6.** Noticeable from Table 5 is the good recoveries on all the boreholes. This is indicative of an inter-connected fracture network and good recharge.

[3] FC Method – software developed by the Institute of Groundwater Studies.

Table 5: Pump testing results

BOREHOLE NUMBER	Final Airlift yield (l/s)	CONSTANT DISCHARGE (CD) & RECOVERY					Recommended Yield (l/s)	
		Water Level (mbgl)	Duration (min)	Draw-down	CD Yield [l/s]	Recovery %	24 hr cycle	12-hr cycle
EC/N24/091	2.3	8.4	1440	13.26	3.15	100	1.0	1.4
EC/N24/094	4.4	11.2	2880	23	3.53	94	1.0	1.4
EC/N24/095	2.55	10.5	1440	17.7	2.02	100	0.7	1.0
EC/N24/097	1.84	0.0	1440	11.4	2.04	100	1.0	1.4
EC/N24/098	1.26	8.75	1440	9.01	1.51	100	0.5	0.7
EC/N24/099	1.26	9.06	1440	14.6	1.02	100	0.6	0.8
EC/N24/100	1.84	8.2	1440	21.5	1.3	100	0.5	0.7
EC/N24/101	3.8	9.1	1440	14.5	4.1	100	1.8	2.5

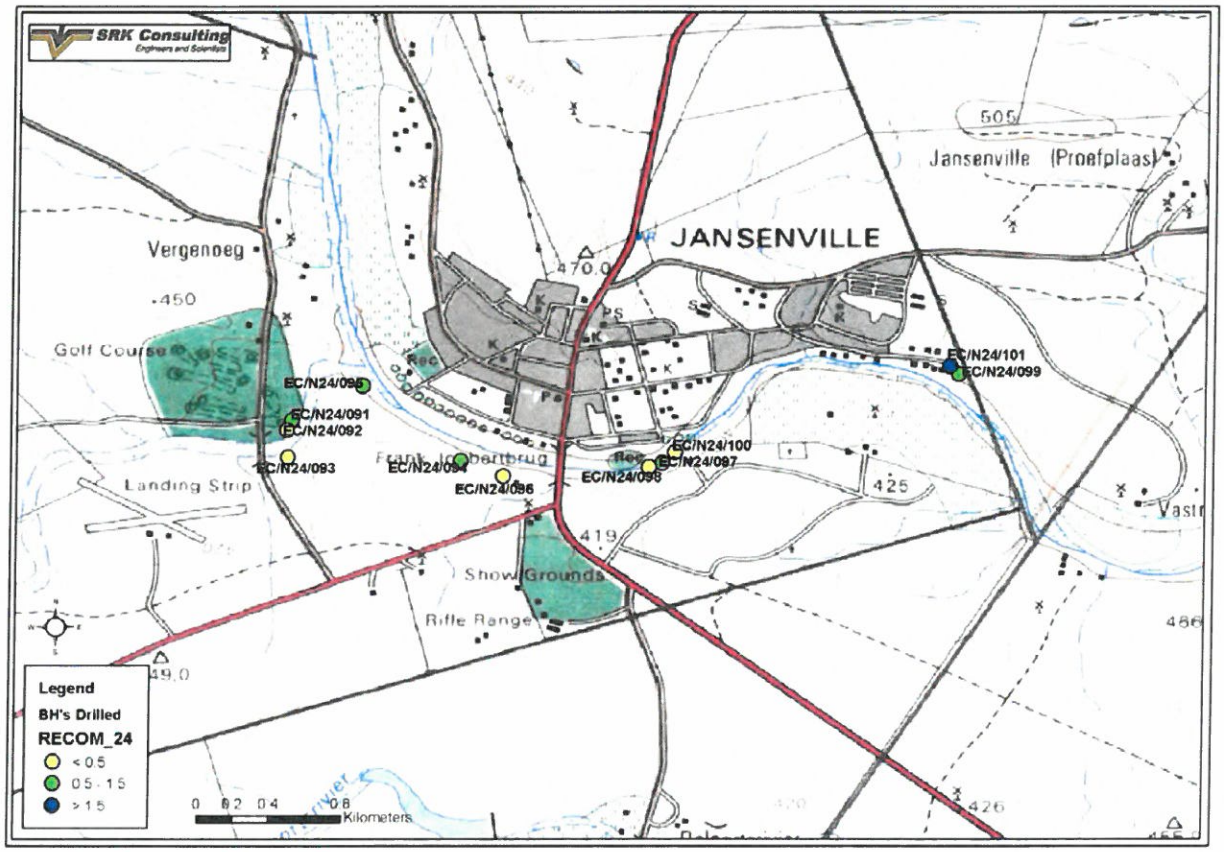


Figure 13: Recommended Yields (24-hr).

4.6 Groundwater quality

The water is traditionally of poor quality, especially on aesthetic value (odour). The new boreholes that were drilled all classed between **Marginal to Poor**, mainly due to the following elements:

- Chloride (100% of the boreholes)
- Electrical conductivity (100% of the boreholes)
- Sodium (100% of the boreholes)
- Sulphate (40% of the boreholes)
- Nitrate (25% of the boreholes)
- Fluoride (only in EC/N24/94)
- Total Hardness (~ 40% of the boreholes)

The water quality is summarised in **Appendix 5.** **Figure 14** displays the water quality classes.

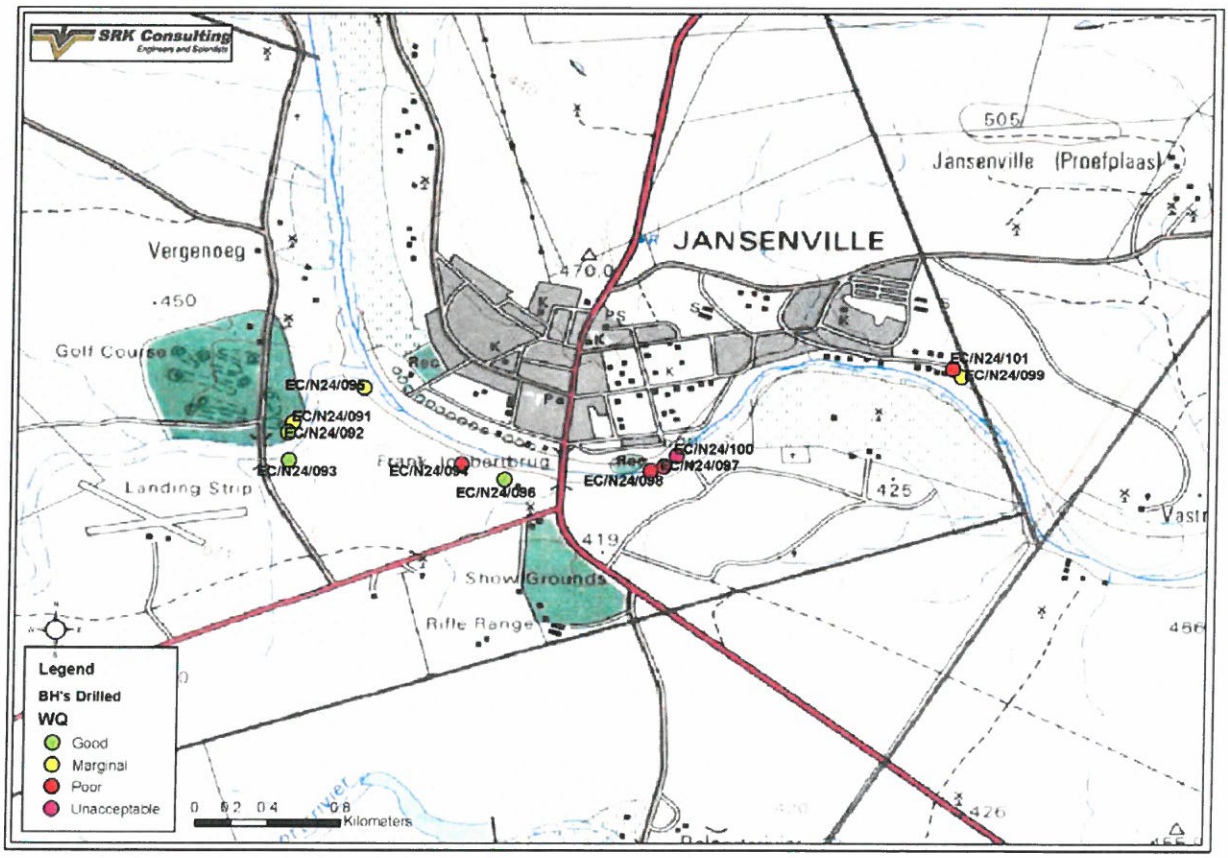


Figure 14: Water Quality classes.

5 Conclusions

5.1 Areas for investigation:

The municipal area is too confined to do a proper groundwater investigation and the major groundwater targets (i.e. faults and fold axis) fall outside the municipal area. The surrounding farms and agricultural areas should make available their land for further investigations. This will however require written agreements between the land owners and the municipality prior to the investigations.

5.2 Status quo

5.2.1 Current production boreholes and abstractions

As far as could be ascertained during this investigation, over-abstraction is currently taking place in most of the municipal boreholes. Although not confirmed, as result of inadequate data, the farmer at Kruitwater is suggesting that the over-abstraction of the municipal boreholes on his property is having an affect on his private boreholes.

Table 6 shows the current abstraction versus the recommended abstraction from the pumping tests in 2004 by Khulani VSA.

Table 6: Current yield versus recommended yield.

BH No	Recom Yield 2004	Current abstraction	Comments
EC/N24/047	Not tested	8.0 l/s	
EC/N24/042	Not tested	8 l/s (estimated)	
EC/N24/012	2.0 l/s	8 l/s	**Over-abstracting**
EC/N24/009	5.6 l/s	10 l/s	**Over-abstracting**

5.2.2 Existing groundwater monitoring

The municipality could not provide to SRK any documentation that implied that groundwater monitoring and/or management is taking place. No data on water levels, water quality or abstraction could be provided.

5.2.3 Potential contamination sources

The waste facilities, with exception of the Abattoir, are all situated along the banks of the Sundays River and if contamination occurs, it would enter the aquifer/s from where groundwater abstraction occurs. DWAF recently established monitoring boreholes at some of these facilities for the purpose of groundwater monitoring. The sewerage pump station is situated a few metres from the river and should any mechanical breakdown occurs whilst in operation, serious spillages could occur which will affect the surface water, near surface water and groundwater.

5.2.4 Water levels

The water level contour map, compiled from the hydrocensus results, indicate a possible reversal of the natural groundwater flow towards the centre of town. A possible interpretation would be large-scale dewatering towards the town area, causing a "cone of depression". This could result in contamination being drawn towards the town and towards the boreholes within the town boundaries.

5.3 Groundwater balance

A preliminary groundwater balance (recharge from rainfall versus total abstraction from boreholes) could not be done on Jansenville as no abstraction data is available of all borehole sources. Over 70 boreholes exist in Jansenville with no abstraction data, including those of the municipality. The extent of the aquifer/s is also unsure due to the complexity of the geology (folding, alluvial deposits).

5.4 New production boreholes

The boreholes that were drilled as part of this investigation can be used by the municipality for emergency water supply purposes, but the recommended yields should not be exceeded and the water should be treated prior to use. Pumping these newly drilled boreholes would however put more strain on the aquifer/s and should be seen as an interim solution. Due to the proximity of the waste facilities, the water quality of these boreholes should be monitored at least monthly and for all parameters that can be expected from these type of facilities.

5.5 Groundwater potential

Based on this investigation and previous investigations, the "shallow aquifer" groundwater potential is seen to be **low** within the municipal boundaries. Previous drilling at Kruitwater proved that the groundwater potential along the major fault and folded zones can be considered **high**. Currently groundwater cannot supply in the demand of the municipality.

6 RECOMMENDATIONS

- Abstraction from existing sources should adhere to the original recommendations. If, however, this is not possible as the demand is too high, then alternative sources outside the municipal boundaries must be investigated and developed in conjunction with the relevant land owners.

- A water treatment plant is required.

- A balance between abstraction volumes and demand volumes should be reached by the municipality. By means of controlling water losses (e.g. leaks in pipelines) and introducing water restrictions, the water demand must be lowered.

- Water level monitoring devices must be installed in all the production boreholes (private and municipal) within the municipal boundaries. Water level monitoring should continue in all unequipped boreholes in order to detect changes in the groundwater flow. Borehole owners should be made aware of possible contamination in their boreholes. Water quality tests should be done to make sure that the boreholes are not contaminated.

- Private groundwater abstraction within the municipal boundaries, as well as farmers adjacent to Jansenville, must be registered and licensed (where applicable). In awarding the abstraction permits / licenses, cognisance must be taken of the scenario of low rainfall, low recharge and high current abstractions.

- Once all existing users are registered and all abstractions documented, can a groundwater balance be done to determine the available water versus the reserve.

- Where installed, the monitoring boreholes must be monitored regularly for changes in water quality. Cognisance must be taken of the fact that different pollution sources can produce different pollutants which should be included in the sampling programme.

- A full analysis of the current drinking water must be done, including a full spectrum of elements and not just macro and bacteriological.

- Disaster management plans must be put in place to prepare for potential disasters such as flooding (especially in the area of the new sewerage treatment works), mechanical failures of the sewerage pump station, etc.

- Deep drilling (> 300m) should be investigated by means of specialised geophysical and drilling equipment.

7 REFERENCES

1. 3224 Graaf Reinett, South Africa 1 : 250 000 Geological Series
2. Water Research Commission No: TT 162/01, 2002. "Quality of Domestic Water Supplies, Volume 5: Management Guide". DWAF, WRC, Dept. of Health.
3. Khulani VSA Geoconsultants, Technical report and budget assessment for the Jansenville emergency water supply scheme, TR/KVSA/038/04, 2004
4. Khulani VSA Geoconsultants, Letter Report – emergency water supply, October 2004.
5. Vegter, J.R., Seymour A., 1995. Groundwater Resources of the Republic of South Africa – Two Map sheets and explanatory brochure. DWAF
6. An evaluation of groundwater vulnerability and pollution risk assessment in the preparation of a groundwater protection strategy for South Africa" (Reynders, A.G., 1996).

APPENDIX 1: HYDROCENSUS RESULTS

DWAF Source Nr	Lattitude (South)	Longitude (East)	Alt	Map Nr 1:50000	Status of Site	Equipment	BH Depth	Water Level [mbgl]	Can Water Level be Measured	Why Not?	Level Status	Discharge Rate [l/s]	Comment	Elec Conductivity [ms/m]	pH	Temp	Sample Taken	Pump Condition	Comment
EC-N24-001	-32.93336	24.70151	448	3224DC	G # In Use	M # Monotype Pump	85	6.72	Yes		S # Static	1.6	12 hour rate				No		Pump is faulty.
EC-N24-002	-32.92191	24.72057	519	3224DC	G # In Use	M # Monotype Pump	100		No	No condute pipe		0.5	12 hr rate				No	G # Good	Farmer is using the borehole for stock water. Municipality is not using the borehole because the yield is to small.
EC-N24-003	-32.90548	24.71609	527	3224DC	U # Unused	N # No Equipment	72		No	Welded cap							No		Borehole was drilled by the government, number is welded on borehole cap.
EC-N24-004	-32.90113	24.7286	551	3224DC	G # In Use	S # Submersible Pump	100		No	No condute pipe		0.28	12/24 hr rate				No		Farmed installed a submersible pump in the hole with a solar panel as power supply, the borehole was drilled by the government.
EC-N24-006	-33.00613	24.67002	433	3324BA	U # Unused	N # No Equipment	90		No	Welded cap		1.9	12 hr constant				No		
EC-N24-007	-32.90807	24.71442	529	3224DC	U # Unused	N # No Equipment	120		No	Welded cap							No		Borehole was drilled by the government.
EC-N24-009	-33.00584	24.67012	432	3324BA	G # In Use	S # Submersible Pump	129	23.15	Yes		S # Static	10	24 hr constant				No	G # Good	
EC-N24-013	-33.0073	24.674	443	3224DC	U # Unused	N # No Equipment	126		No	Welded cap							No		
EC-N24-014	-32.93542	24.7	441	3224DC	G # In Use	M # Monotype Pump	81		No	No condute pipe		3.5	8 hrs constant				No	P # Poor	Pump not in use, needs new seals.
EC-N24-015	-32.94934	24.6486	412	3224DC	U # Unused	N # No Equipment	80	5.63	Yes		S # Static	0.25	24 hrs rate				No		
EC-N24-024	-32.93347	24.7013	448	3224DC	U # Unused	N # No Equipment		5.65	Yes		S # Static						No		Borehole was drilled and the last water strike dried up a spring close to the borehole. Water quality is bad because of the last water strike.
EC-N24-025	-33.002	24.67463	439	3324BA	U # Unused	N # No Equipment			No	Welded cap							No		
EC-N24-026	-33.00337	24.67466	446	3324DC	D # Destroyed	N # No Equipment			No	Backfilled							No		Borehole backfilled.
EC-N24-027	-33.00364	24.67467	445	3324BA	D # Destroyed	N # No Equipment			No	Backfilled							No		Borehole is backfilled.
EC-N24-028	-33.00241	24.67979	451	3224BA	D # Destroyed	N # No Equipment			No	Filled with stones							No		Borehole has no casing, filled with stones.
EC-N24-029	-33.00262	24.67161	431	3324BA	U # Unused	N # No Equipment			No	Welded cap							No		
EC-N24-030	-32.99436	24.67327	432	3224DC	D # Destroyed	N # No Equipment			No	Backfilled							No		Borehole is backfilled.
EC-N24-031	-32.95073	24.66387	416	3224DC	D # Destroyed	N # No Equipment	17		No	No water in hole.							No		Only open casing with no water.
EC-N24-032	-32.94907	24.66312	408	3224DC	U # Unused	N # No Equipment			No	Cap with rusted nuts.		4					No		
EC-N24-033	-32.95373	24.65479	425	3224DC	U # Unused	N # No Equipment			No	Filled with stones							No		
EC-N24-034	-32.95039	24.65137	409	3224DC	U # Unused	N # No Equipment		3.27	Yes		S # Static						No		Only open casing.
EC-N24-035	-32.956	24.65739	434	3224DC	U # Unused	N # No Equipment		20.9	Yes		S # Static						No		+/- 100m from abbatoir.
EC-N24-036	-32.95579	24.65754	433	3224DC	D # Destroyed	N # No Equipment			No	Filled with stones							No		Borehole is filled with stones +/- 100m from abbatoir.
EC-N24-037	-32.9591	24.65673	436	3224DC	U # Unused	S # Submersible Pump		23.89	Yes								No		Borehole was used for abbatoir, not in use anymore.
EC-N24-038	-32.95268	21.66499	422	3224DC	U # Unused	W # Windpump			No	No condute pipe							No		Windmill is broken.
EC-N24-039	-32.9443	24.67247	416	3224DC	U # Unused	W # Windpump		14.8	Yes		S # Static						No		Borehole used to have a windmill, butt the windmill has been removed, only pipes in hole.
EC-N24-040	-32.94506	24.65845	417	3224DC	U # Unused	N # No Equipment			No	Welded cap							No		Only casing with drilling rod stuck in hole. Welded cap.
EC-N24-041	-32.94083	24.66285	427	3224DC	U # Unused	N # No Equipment		23.1	Yes		S # Static						No		Only open casing.

EC-N24-042	-32.92435	24.65834	431	3224DC	G # In Use	S # Submersible Pump		19.4	Yes		S # Static						NA	G # Good	
EC-N24-043	-32.91291	24.65453	427	3224DC	U # Unused	N # No Equipment		8.19	Yes		S # Static						No		Only open PVC casing.
EC-N24-044	-32.91295	24.65452	427	3224DC	U # Unused	N # No Equipment			No	Welded cap							No		Only casing with welded cap.
EC-N24-045	-32.9062	24.65418	422	3224DC	U # Unused	N # No Equipment		4.7	Yes		S # Static						No		
EC-N24-046	-32.90621	24.65419	422	3224DC	U # Unused	N # No Equipment		4.48	Yes		S # Static						No		
EC-N24-047	-32.90046	24.65868	428	3224DC	G # In Use	S # Submersible Pump		8.57	Yes		P # Pumped	8	24hrs				No	G # Good	
EC-N24-048	-32.90046	24.65872	428	3224DC	U # Unused	N # No Equipment			No	Welded cap							No		
EC-N24-049	-32.97247	24.67333	419	3224DC	U # Unused	N # No Equipment			No	Welded cap							No		The borehole was drilled by the government.
EC-N24-050	-32.94709	24.66632	415	3224DC	G # In Use	S # Submersible Pump	23.5	11.65	Yes			3.3		733	24.7	6.8	Yes	G # Good	Correctional services private borehole.
EC-N24-051	-32.94691	24.66538	413	3224DC	U # Unused	N # No Equipment			No	Welded cap							No		There might be a revolver in the hole according to the police.
EC-N24-052	-32.94498	24.66184	409	3224DC	U # Unused	N # No Equipment	20.5	9.8	Yes								No		
EC-N24-053	-32.94304	24.66164	417	3224DC	G # In Use	S # Submersible Pump		11.8	Yes		S # Static	2.1		986	6.68	24.8	Yes	G # Good	
EC-N24-054	-32.94209	24.66235	414	3224DC	U # Unused	N # No Equipment	7.4	DRY	Yes								No		Borehole is dry.
EC-N24-055	-32.94213	24.66065	411	3224DC	U # Unused	N # No Equipment	9.5	DRY	Yes		S # Static						No		Borehole is dry.
EC-N24-056	-32.9421	24.66007	410	3224DC	G # In Use	S # Submersible Pump	24	8.8	Yes		S # Static						No	G # Good	
EC-N24-057	-32.94466	24.66293	414	3224DC	U # Unused	N # No Equipment	42	14.15	Yes		S # Static						No		
EC-N24-058	-32.94722	24.66771	410	3224DC	D # Destroyed	N # No Equipment	2.05		No	Dry	D # Dry						No		
EC-N24-059	-32.94735	24.66786	410	3224DC	U # Unused	N # No Equipment	14	11.02	Yes		S # Static						No		
EC-N24-060	-32.94705	24.67018	410	3224DC	U # Unused	S # Submersible Pump	24.5	DRY	Yes		D # Dry						No	V # Very Poor	Pump does not work anymore and is not connected to power.
EC-N24-061	-32.94745	24.67059	409	3224DC	U # Unused	M # Monotype Pump			No	No condute pipe							No	V # Very Poor	Borehole has a monopump with no engen, the pump is not in working condition.
EC-N24-062	-32.94716	24.6714	406	3224DC	U # Unused	S # Submersible Pump	68		No	Obstruction by pipes							No	V # Very Poor	
EC-N24-063	-32.94673	24.67116	410	3224DC	U # Unused	W # Windpump	29.5		No	Obstruction by pipes							No	V # Very Poor	Windpump is broken
EC-N24-064	-32.94603	24.67111	406	3224DC	D # Destroyed	N # No Equipment			No	Filled with stones							No		Borehole destroyed
EC-N24-065	-32.94557	24.67177	414	3224DC	U # Unused	N # No Equipment	28	13.1	Yes		S # Static						No		
EC-N24-066	-32.94568	24.67198	408	3224DC	U # Unused	N # No Equipment	9	DRY	Yes		D # Dry						No		
EC-N24-067	-32.94667	24.67225	409	3224DC	D # Destroyed	N # No Equipment	1.35		No	Filled with stones							No		
EC-N24-068	-32.94699	24.67229	409	3224DC	D # Destroyed	N # No Equipment	0.23		No	Filled with stones							No		
EC-N24-069	-32.94558	24.67389	411	3224DC	G # In Use	M # Monotype Pump	36		No	No condute pipe		2.1		507	7.02	24.2	Yes	G # Good	Pump is leaking.
EC-N24-070	-32.9457	24.67221	417	3224DC	U # Unused	N # No Equipment	17.5		Yes	Dry	D # Dry						Yes		Borehole is dry.
EC-N24-071	-32.94468	24.66821	422	3224DC	U # Unused	N # No Equipment	82.3	17.05	Yes		S # Static						No		Borehole used to have a windmill
EC-N24-072	-32.94605	24.66855	411	3224DC	U # Unused	N # No Equipment	91	12.4	Yes		S # Static						No		The submersible pump was removed from the borehole because it was faulty. It was never repaired. The borehole has a windmill stand.

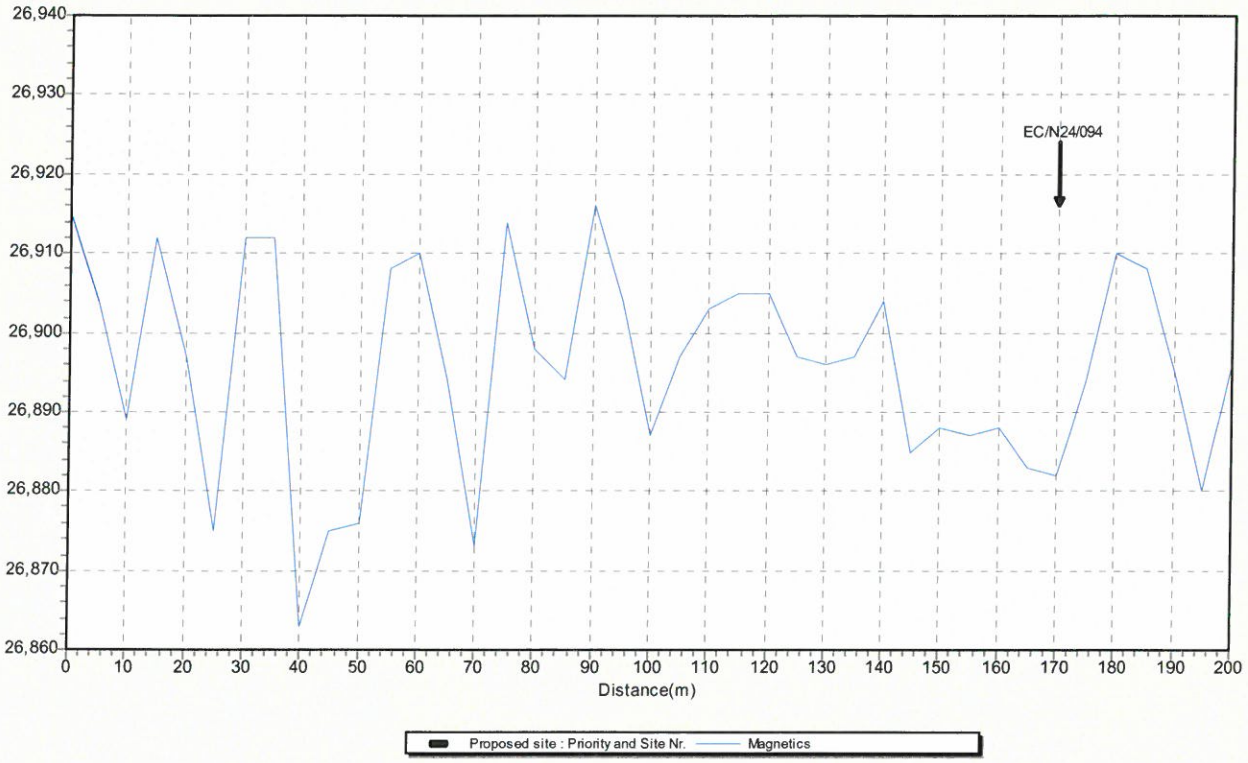
EC-N24-073	-32.94578	24.67021	405	3224DC	D # Destroyed	N # No Equipment	0.83	DRY	Yes		D # Dry						No			
EC-N24-074	-32.94366	24.66926	421	3224DC	D # Destroyed	N # No Equipment			No	Filled with stones							No			
EC-N24-075	-32.94489	24.66953	406	3224DC	D # Destroyed	N # No Equipment	0.3		No	Filled with stones	O # Obstruction, Not Measured						No			Borehole is filled with stones.
EC-N24-076	-32.94169	24.66768	436	3224DC	G # In Use	S # Submersible Pump		31	Yes		S # Static	0.5		626	6.69	24.7	Yes	G # Good		Borehole is only used when town water supply is cut off.
EC-N24-077	-32.94262	24.66722	420	3224DC	U # Unused	N # No Equipment	37	23.05	Yes		S # Static						No			
EC-N24-078	-32.94276	24.66742	427	3224DC	D # Destroyed	N # No Equipment			No	Completely destroyed							No			Borehole is completely destroyed
EC-N24-079	-32.94136	24.66657	428	3224DC	U # Unused	N # No Equipment	102	28.27	Yes		S # Static						No			Water was tested and is unsuitable for human consumption and garden use. Borehole was used for schools swimming pool. Submersible pump was faulty and never replaced.
EC-N24-080	-32.94113	24.66401	430	3224DC	U # Unused	N # No Equipment			No	Cap with rusted nuts.							No			
EC-N24-081	-32.94525	24.66891	423	3224DC	U # Unused	S # Submersible Pump	30.5	13.19	Yes		S # Static						No	V # Very Poor		Borehole has a submersible pump, but is faulty.
EC-N24-082	-32.94068	24.67504	424	3224DC	U # Unused	N # No Equipment	13	DRY	Yes		D # Dry						No			
EC-N24-083	-32.94235	24.67154	422	3224DC	U # Unused	N # No Equipment	0.32		No	Filled with stones	O # Obstruction, Not Measured						No			
EC-N24-084	-32.94598	24.66992	413	3224DC	U # Unused	N # No Equipment	25	13.13	Yes		S # Static						No			Pump used to have windmill, but the windmill is broken.
EC-N24-085	-32.9461	24.66996	417	3224DC	G # In Use	S # Submersible Pump	56.5	13.21	Yes		S # Static			402	6.95	26.2	Yes	G # Good		
EC-N24-086	-32.94929	24.66918	406	3224DC	D # Destroyed	N # No Equipment	0.68		No	Filled with stones	O # Obstruction, Not Measured						No			
EC-N24-087	-32.94703	24.66403	410	3224DC	U # Unused	S # Submersible Pump			No	No condute pipe							No			Borehole has not been used for at least 7 years, not sure if submersible pump is still working.
EC-N24-088	-32.94014	24.66158	418	3224DC	U # Unused	N # No Equipment	40.05	13.3	Yes		S # Static						No			
EC-N24-089	-32.94594	24.67158	407	3224DC	G # In Use	S # Submersible Pump	40	12.73	Yes		S # Static	2.1		554	6.8	24.3	Yes	G # Good		
EC-N24-090	-32.94161	24.66127	417	3224DC		S # Submersible Pump	36	17.03	Yes		S # Static						No	G # Good		

APPENDIX 2: GEOPHYSICAL PROFILES

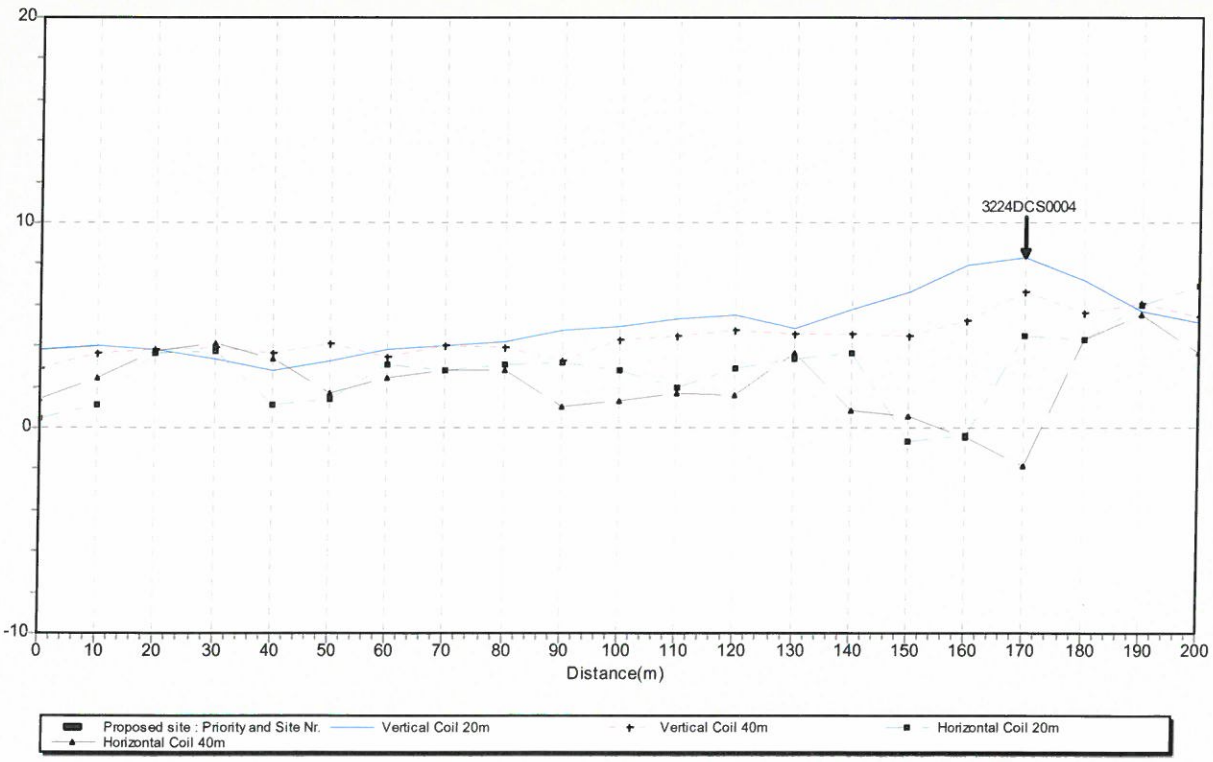
Distance dependent chart(s)

Date compiled: 1/20/2009

Magnetic Traverse: 20071001TRAV0001
378515 JAN 1



EM34 Traverse: 20071001TRAV0001
378515 JAN 1



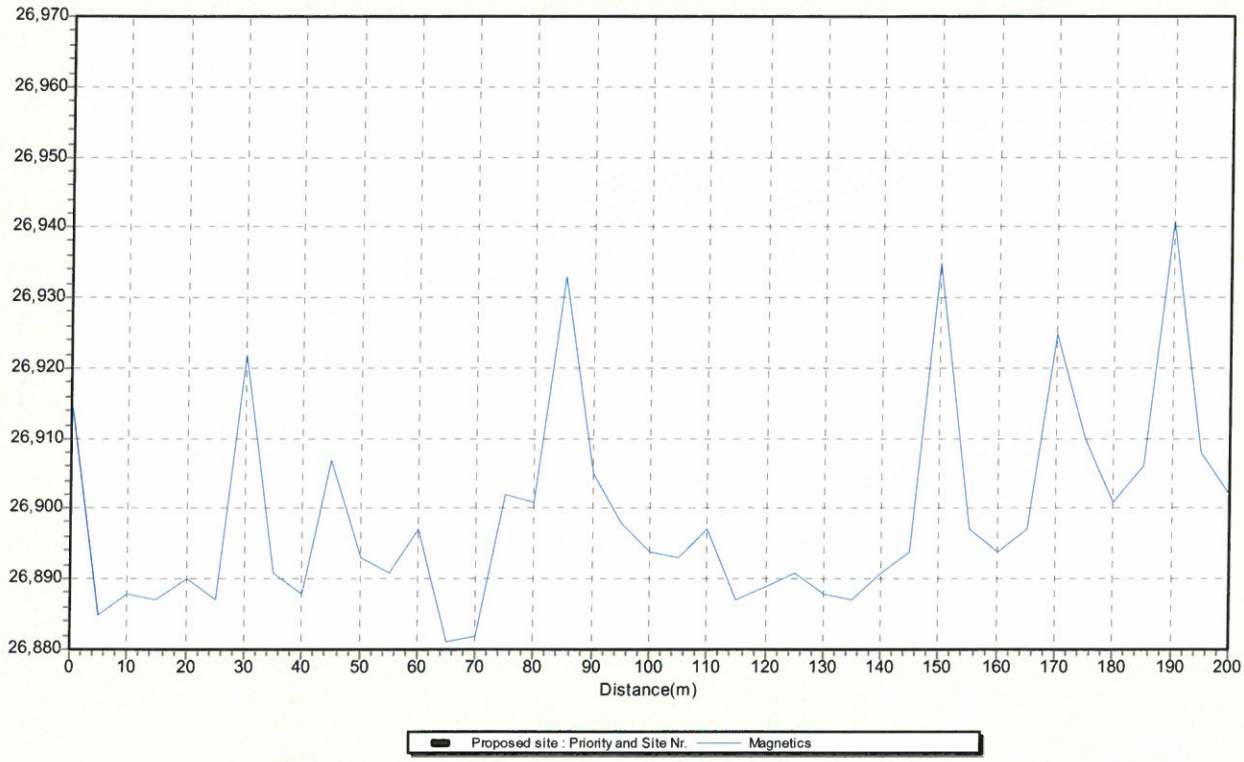
PROJECT DESCRIPTION:
JANSENVILLE

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

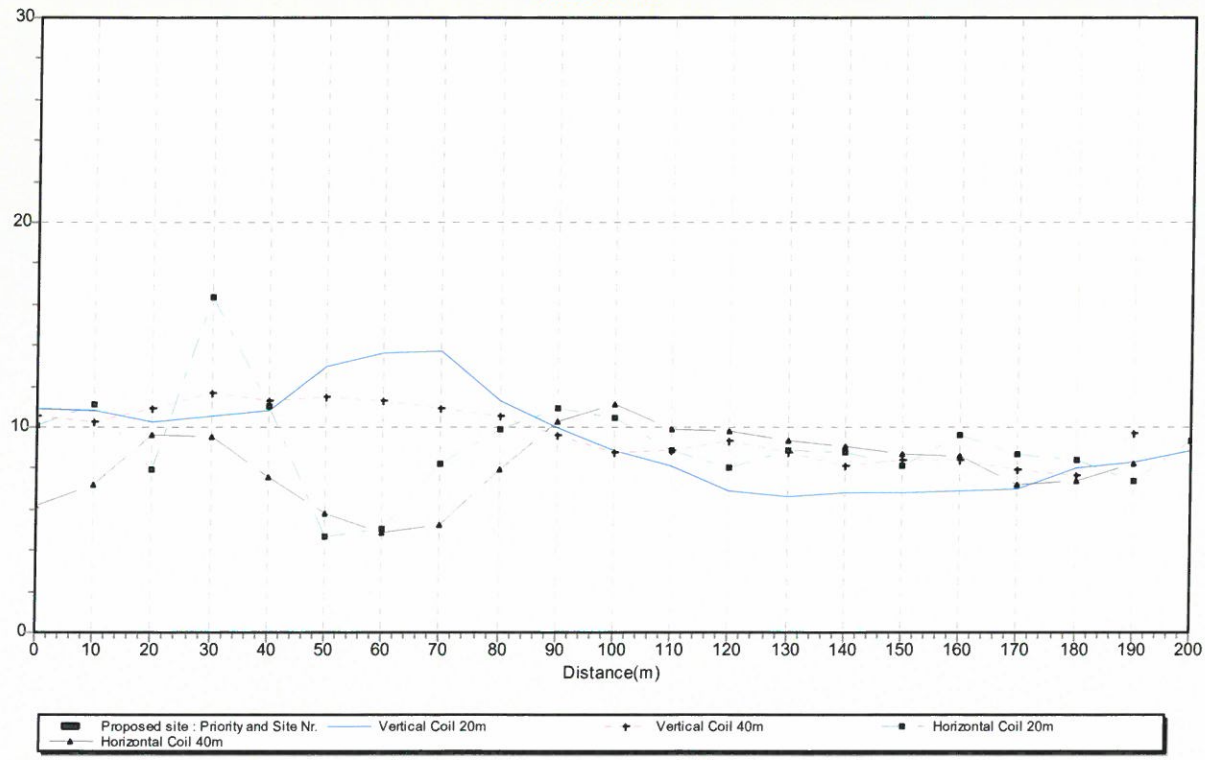
Distance dependent chart(s)

Date compiled: 1/20/2009

Magnetic Traverse: 20071001TRAV0002
378515 JAN 2



EM34 Traverse: 20071001TRAV0002
378515 JAN 2



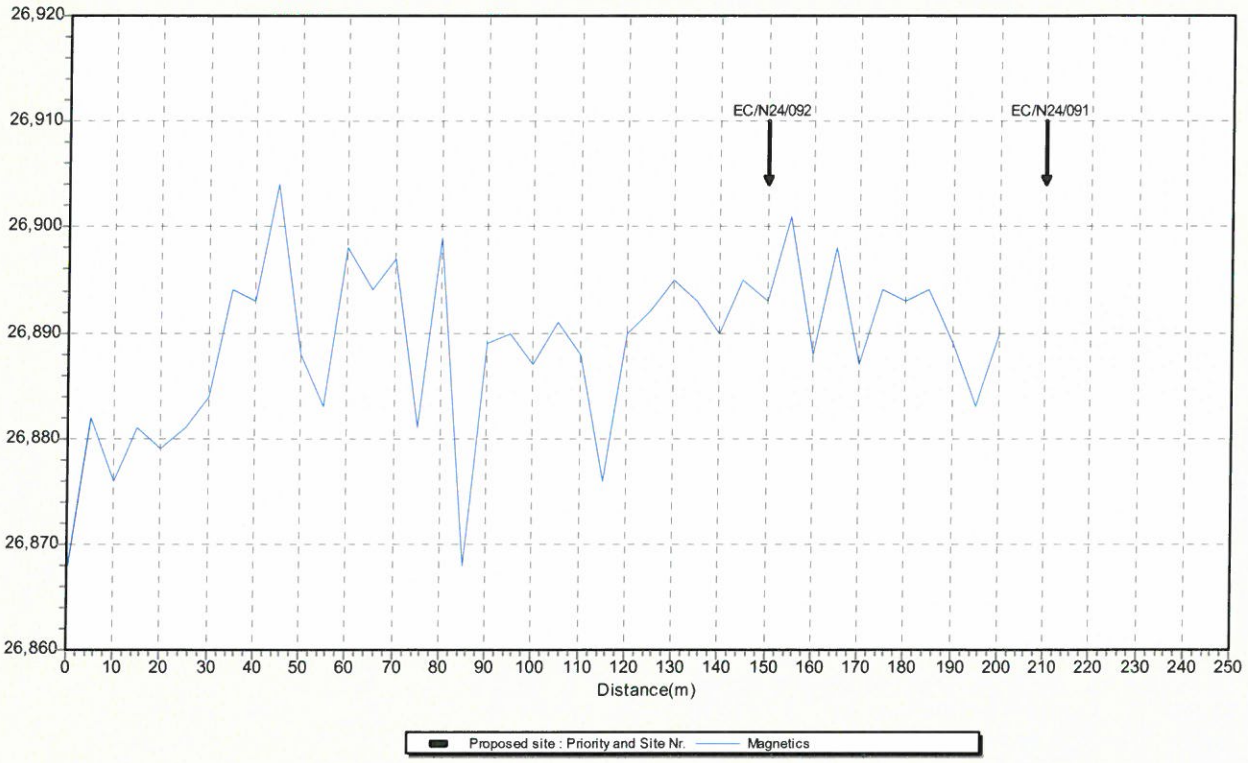
PROJECT DESCRIPTION:
JANSENVILLE

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

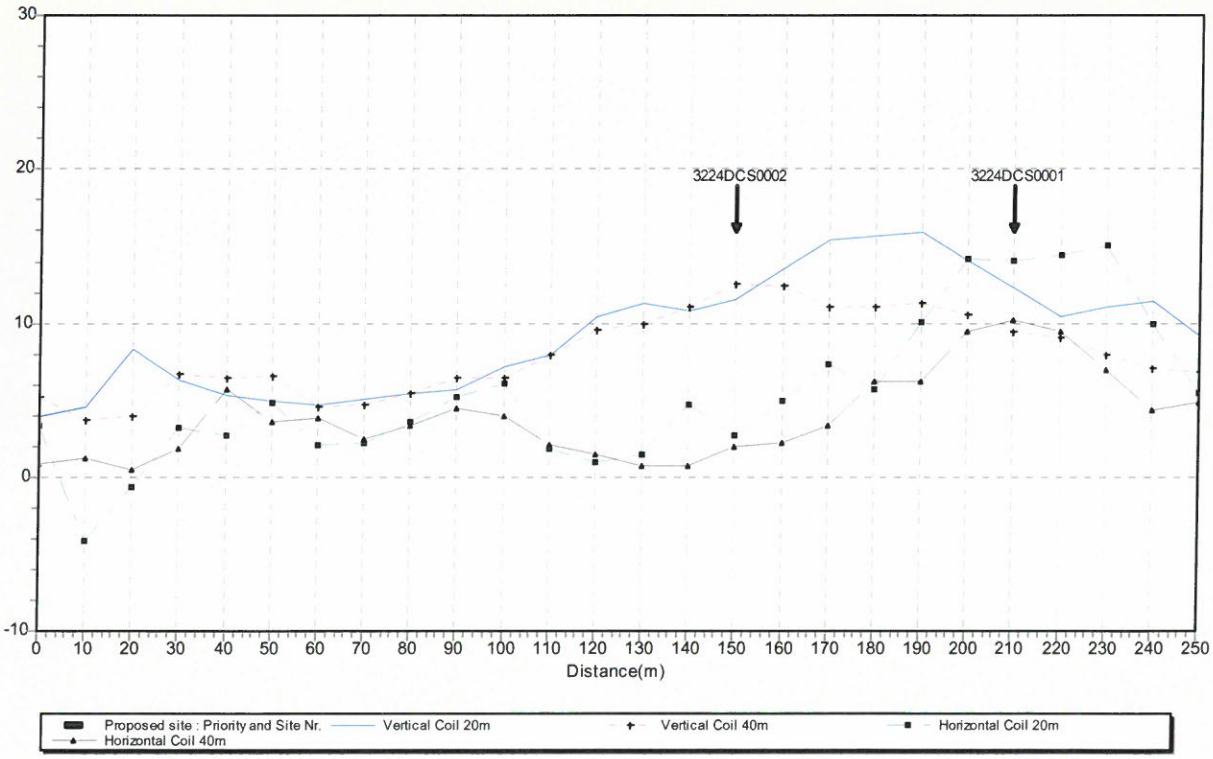
Distance dependent chart(s)

Date compiled: 1/20/2009

Magnetic Traverse: 20071001TRAV0003
378515 JAN 3



EM34 Traverse: 20071001TRAV0003
378515 JAN 3



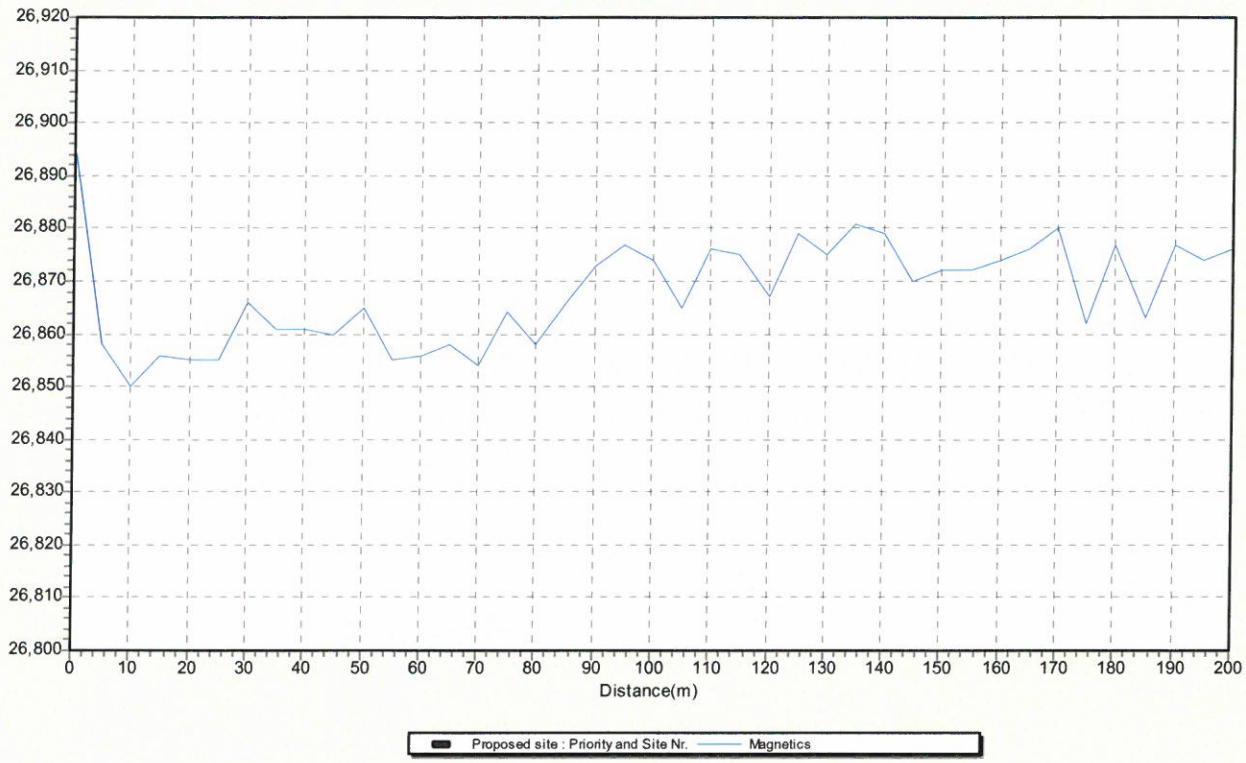
PROJECT DESCRIPTION:
JANSENVILLE

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

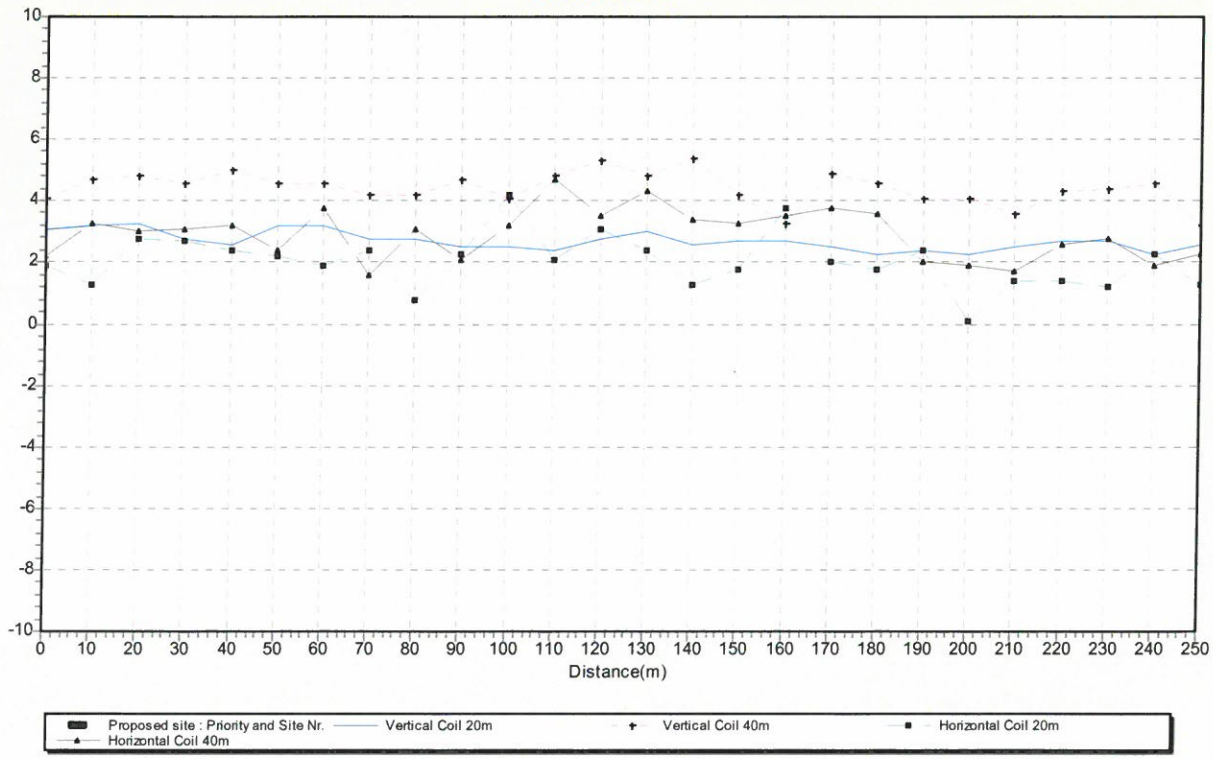
Distance dependent chart(s)

Date compiled: 1/20/2009

Magnetic Traverse: 20071001TRAV0004
378515 JAN 4



EM34 Traverse: 20071001TRAV0004
378515 JAN 4



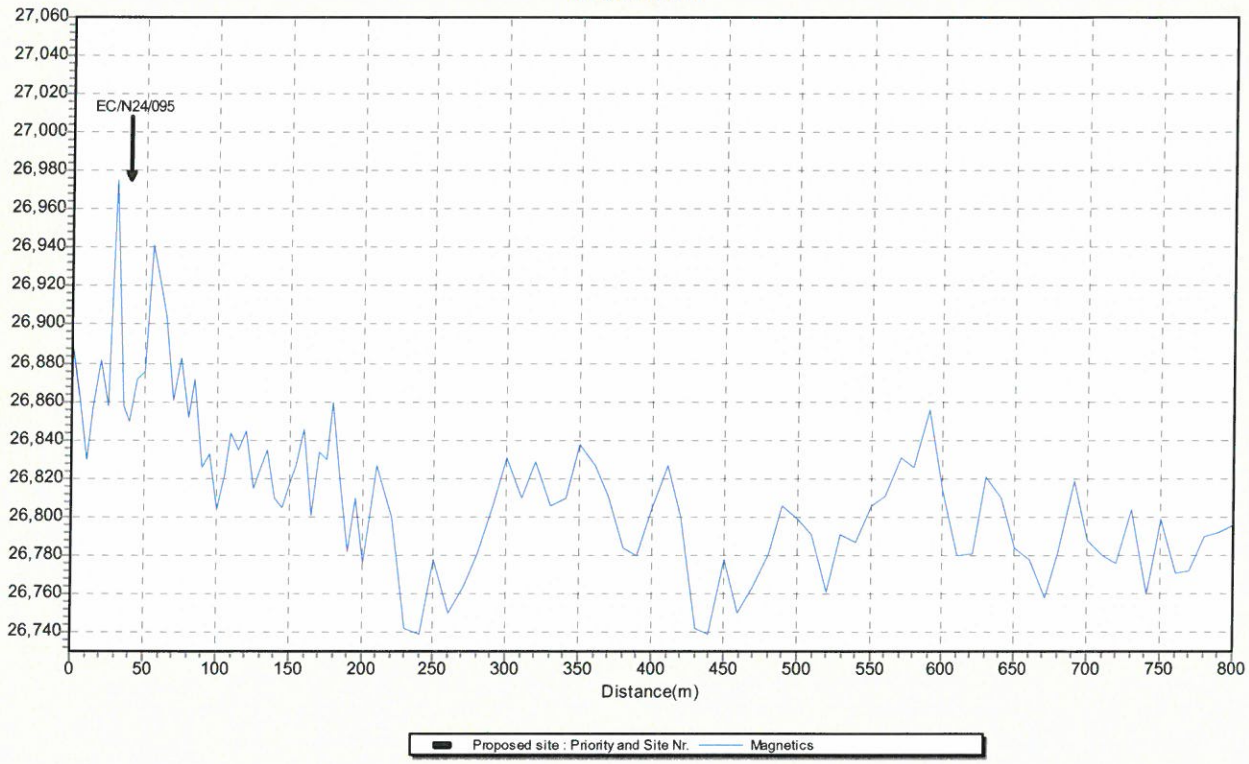
PROJECT DESCRIPTION:
JANSENVILLE

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

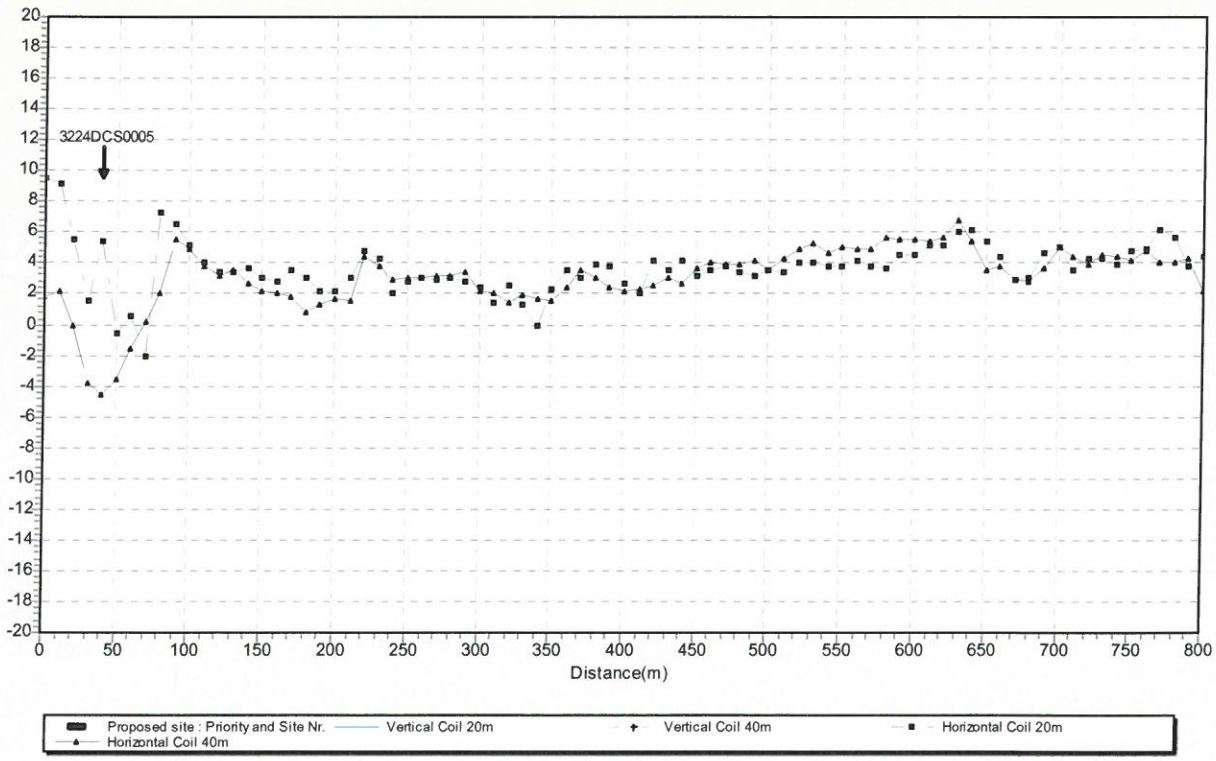
Distance dependent chart(s)

Date compiled: 1/20/2009

Magnetic Traverse: 20080708TRAV0001
378515 JAN 5



EM34 Traverse: 20080708TRAV0001
378515 JAN 5



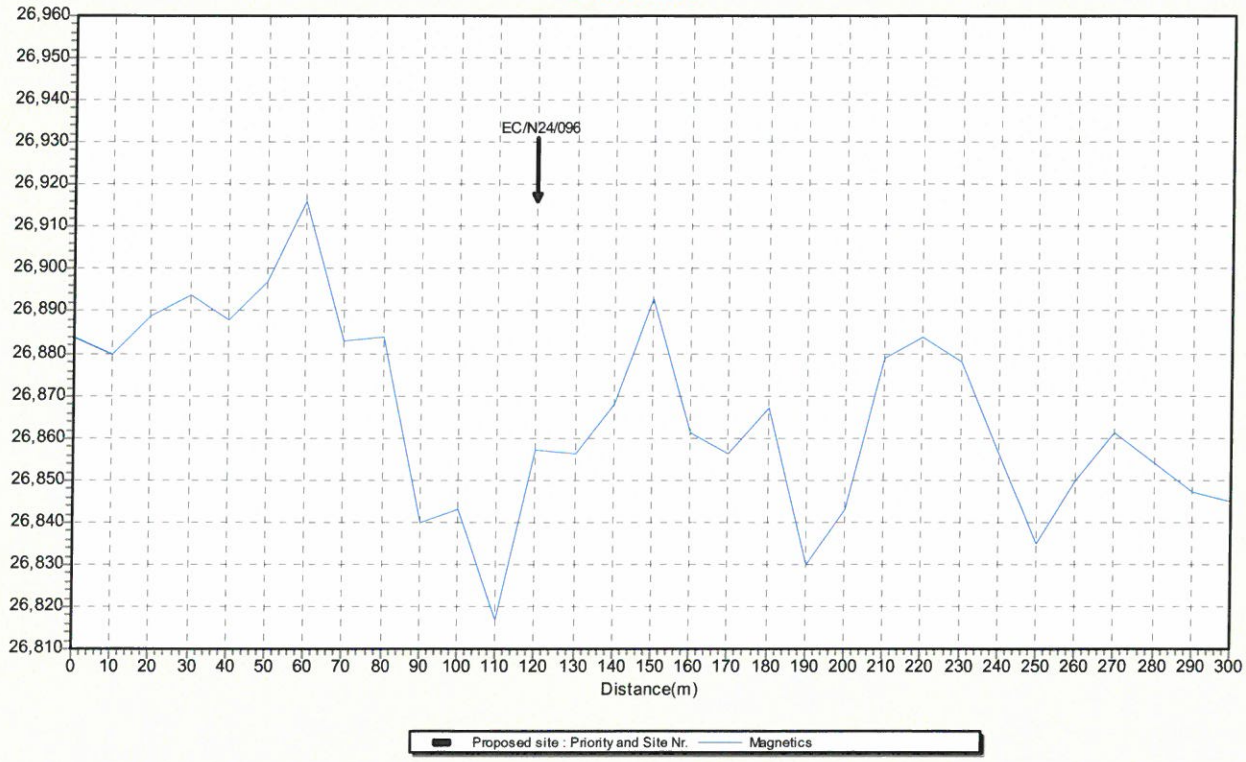
PROJECT DESCRIPTION:
JANSENVILLE

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

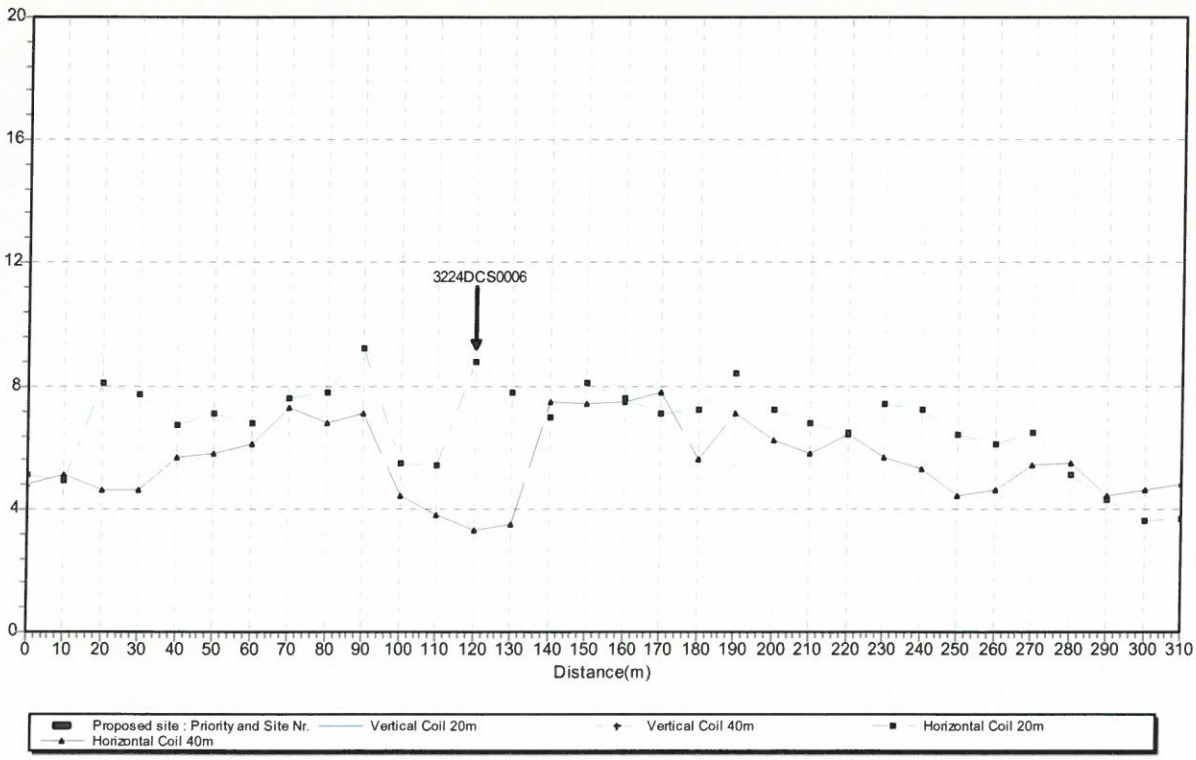
Distance dependent chart(s)

Date compiled: 1/20/2009

Magnetic Traverse: 20080708TRAV0002
378515 JAN 6



EM34 Traverse: 20080708TRAV0002
378515 JAN 6



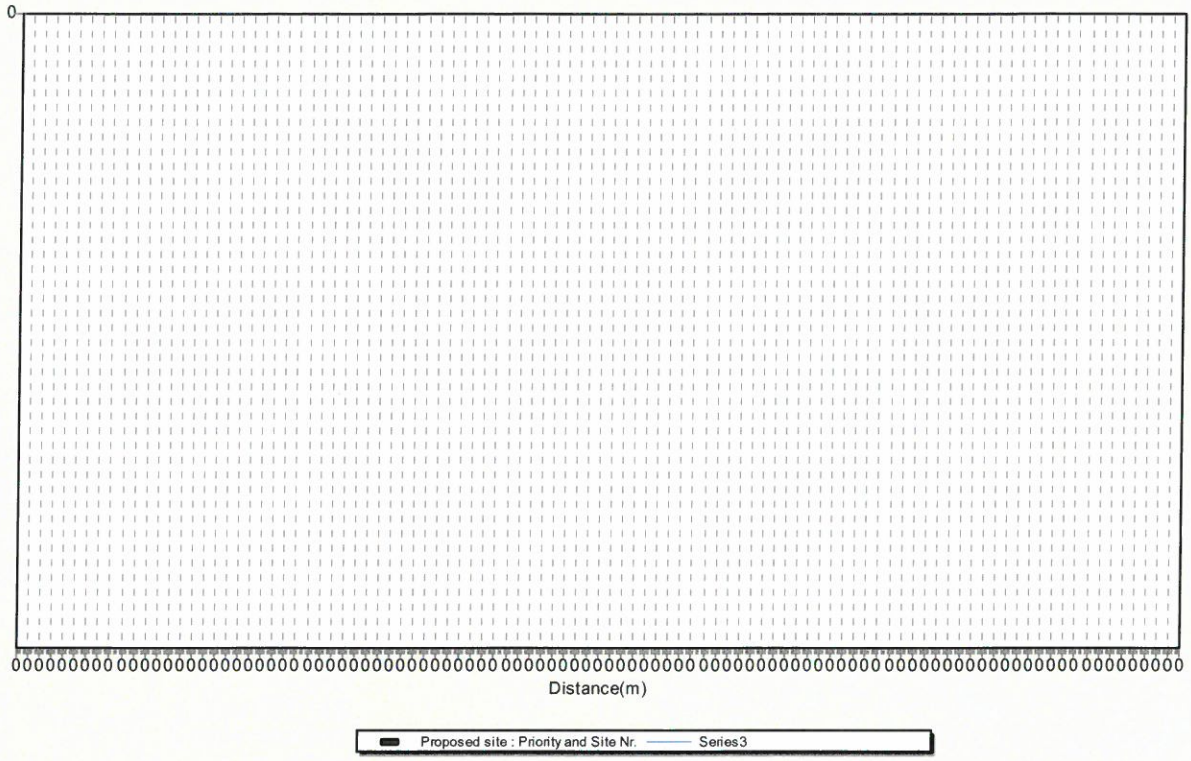
PROJECT DESCRIPTION:
JANSENVILLE

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

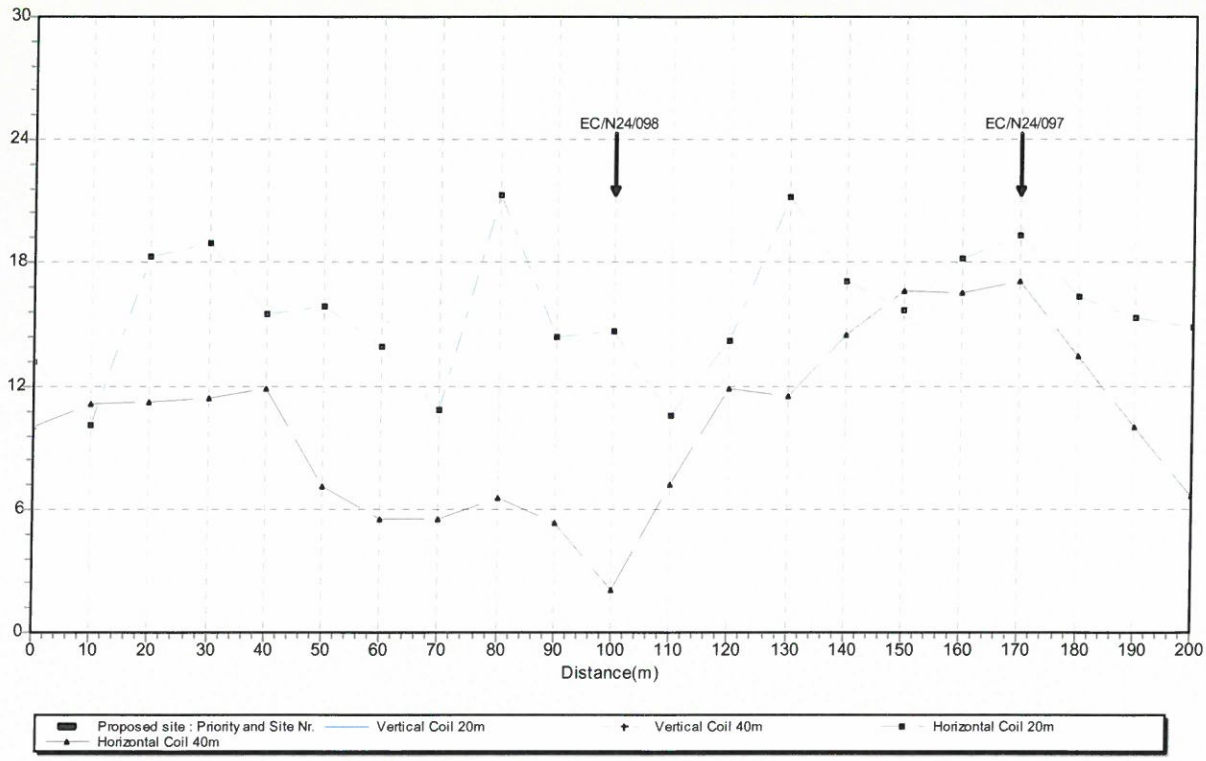
Distance dependent chart(s)

Date compiled: 1/20/2009

Magnetic Traverse: 20080708TRAV0003
378515 JAN 7



EM34 Traverse: 20080708TRAV0003
378515 JAN 7



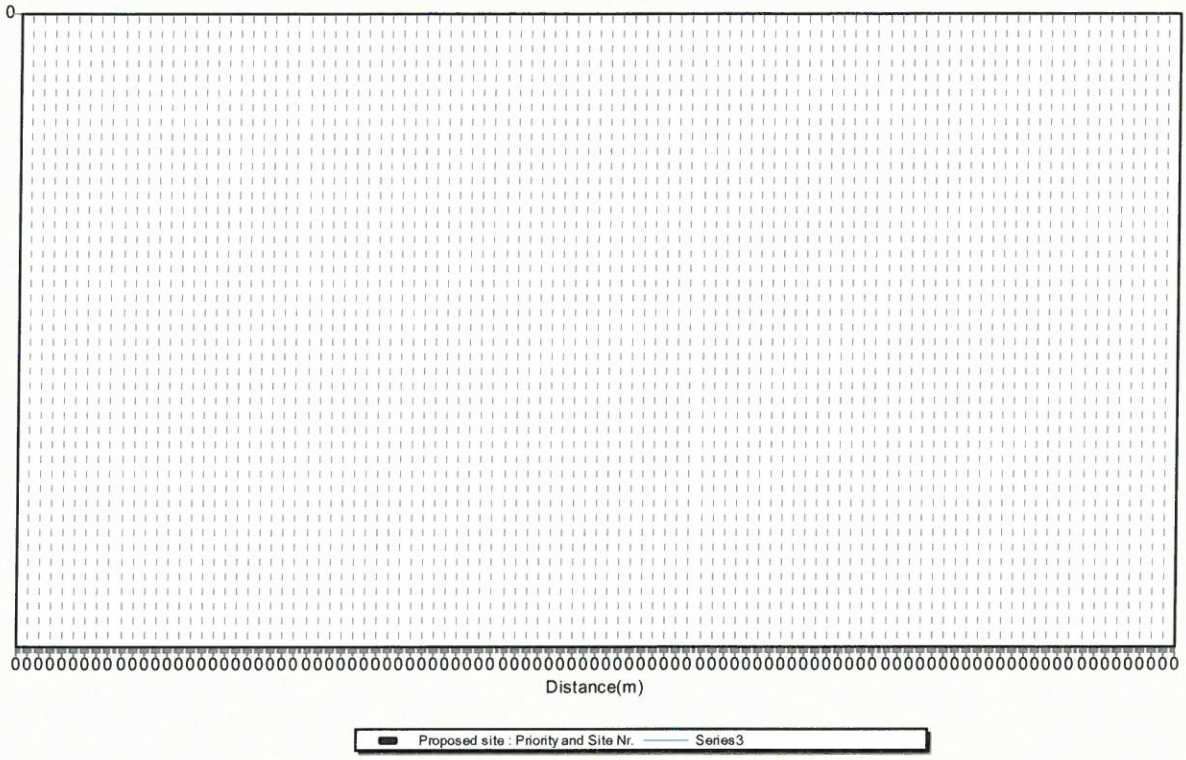
PROJECT DESCRIPTION:
JANSENVILLE

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

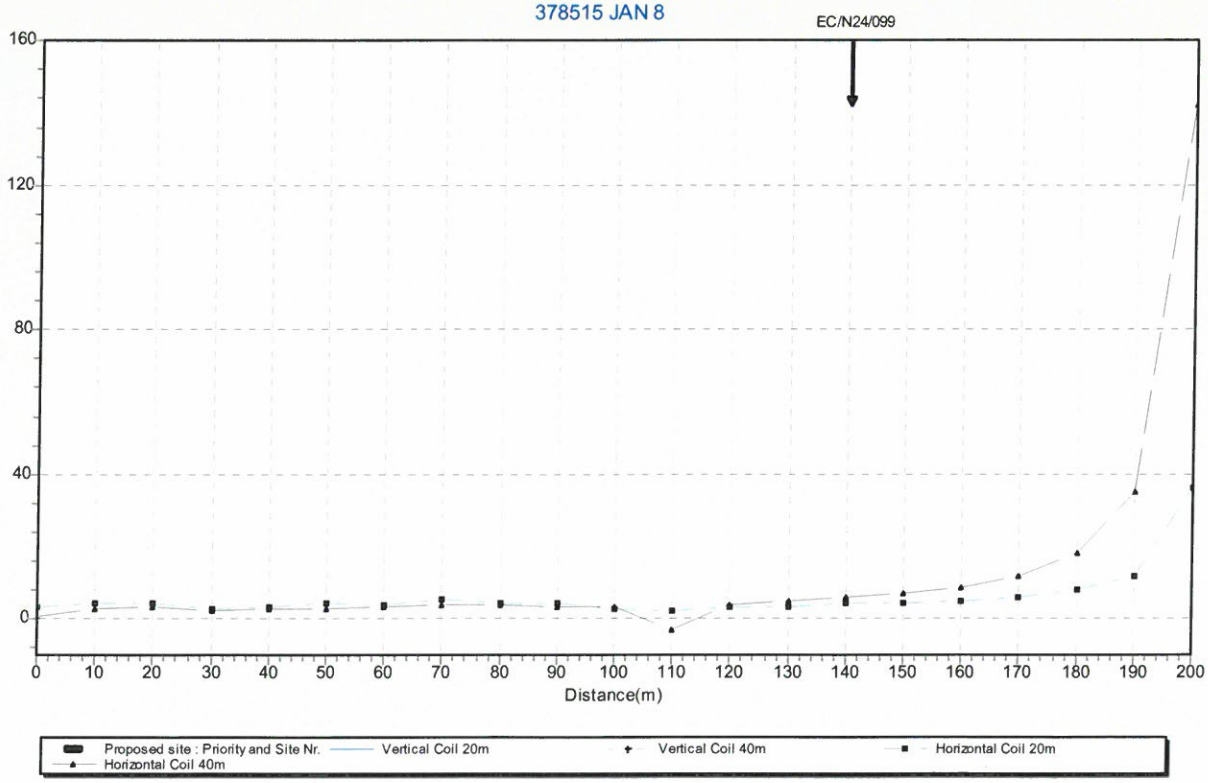
Distance dependent chart(s)

Date compiled: 1/20/2009

Magnetic Traverse: 20080708TRAV0004
378515 JAN 8



EM34 Traverse: 20080708TRAV0004
378515 JAN 8



PROJECT DESCRIPTION:
JANSENVILLE

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

APPENDIX 3: DRILLING LOGS

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0001 ***Number:*** EC/N24/091 ***Site type:*** Borehole

Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

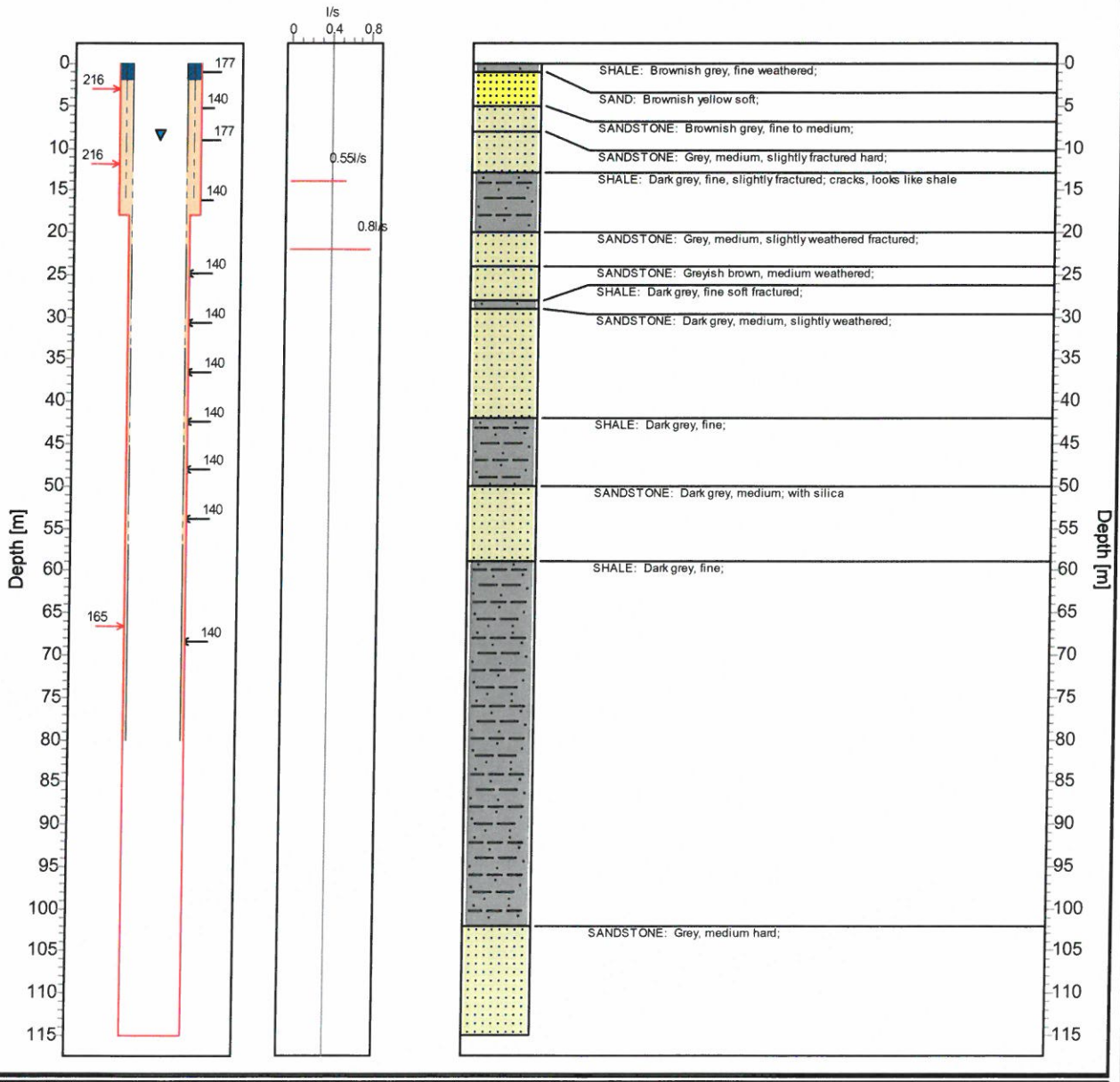
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.947060	***Reg./BB.:***	***Topo-set.:***	***Depth [m]:***	115.00
Longitude [°]:	24.653500	***G-Nr.:***	***Site status:*** Unused	***Col. ht. [m]:***	0.34
Altitude [m]:	407.00		***Site purp.:*** Production (water supply)	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units		***Use applic.:*** Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System		***Equipment:*** No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend

Hole
Casing (plain / perforated, sloted)
Screen / Mesh Screen
Piezometer
165 — Hole diameter [mm]
152 — Casing diameter [mm]
Water level measured: 23/11/08
0:50 — Piezometer (Nr. & Diameter [mm])
Sanitary seal
Gravel (> 2mm)



COMMENT:
Final yield 0.55l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0002 ***Number:*** EC/N24/092 ***Site type:*** Borehole

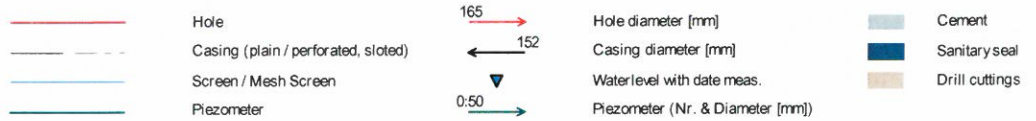
Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

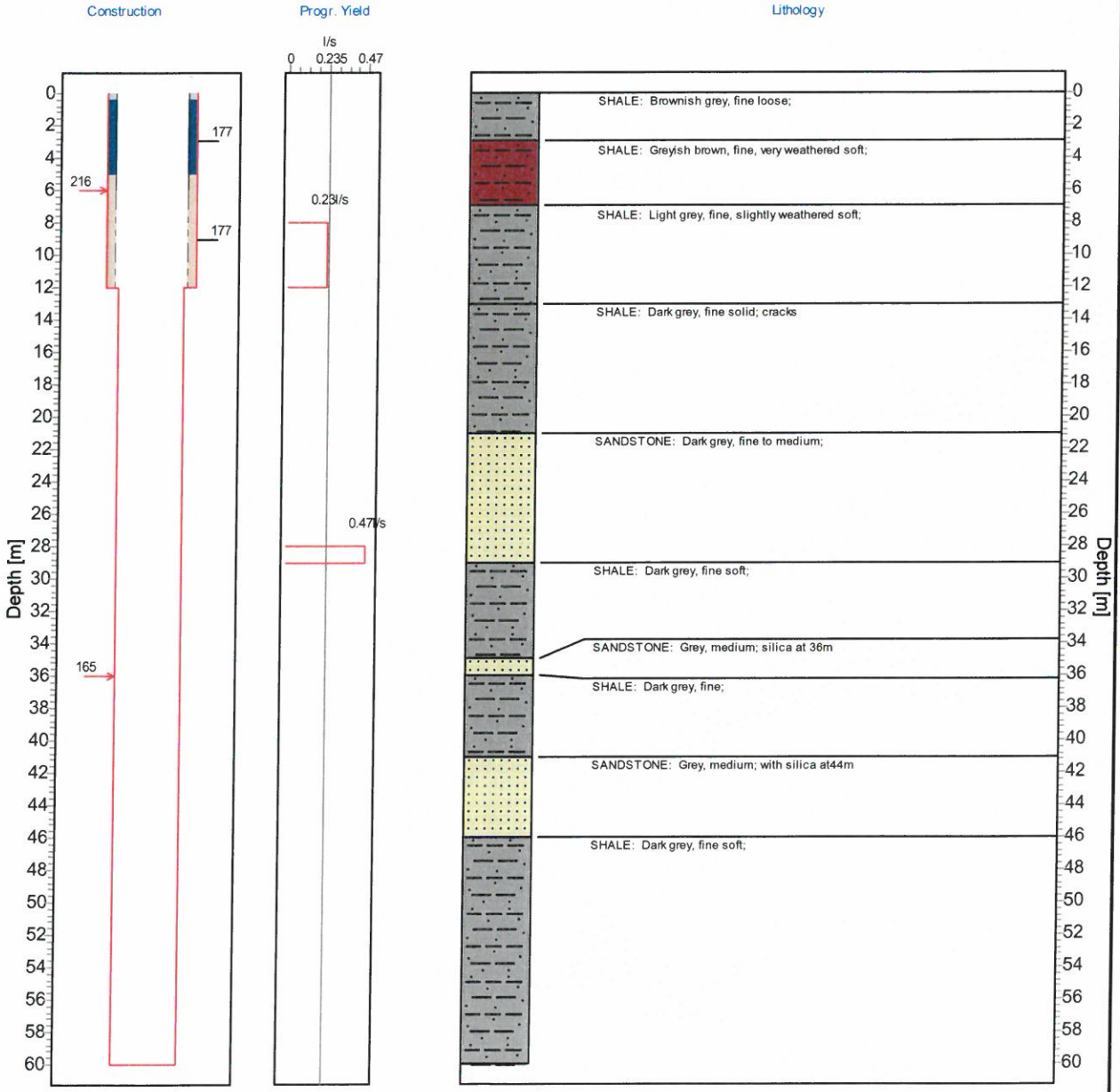
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.947550	***Reg./BB.:***	***Topo-set.:***	In or along river	***Depth [m]:*** 60.00
Longitude [°]:	24.653250	***G-Nr.:***	***Site status:***	Unused	***Col. ht. [m]:*** 0.50
Altitude [m]:	408.00		***Site purp.:***	Production (water supply)	***Diam. [mm]:*** 169
Coord. acc.:	Accurate to within 10 units		***Use applic.:***	Domestic - all purposes	***Drain. reg.:*** N24
Coord. meth.:	Global Positioning System		***Equipment:***	No equipment	***Rep. inst.:*** SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend





COMMENT:
Final yield 0.55l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0003 ***Number:*** EC/N24/093 ***Site type:*** Borehole

Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

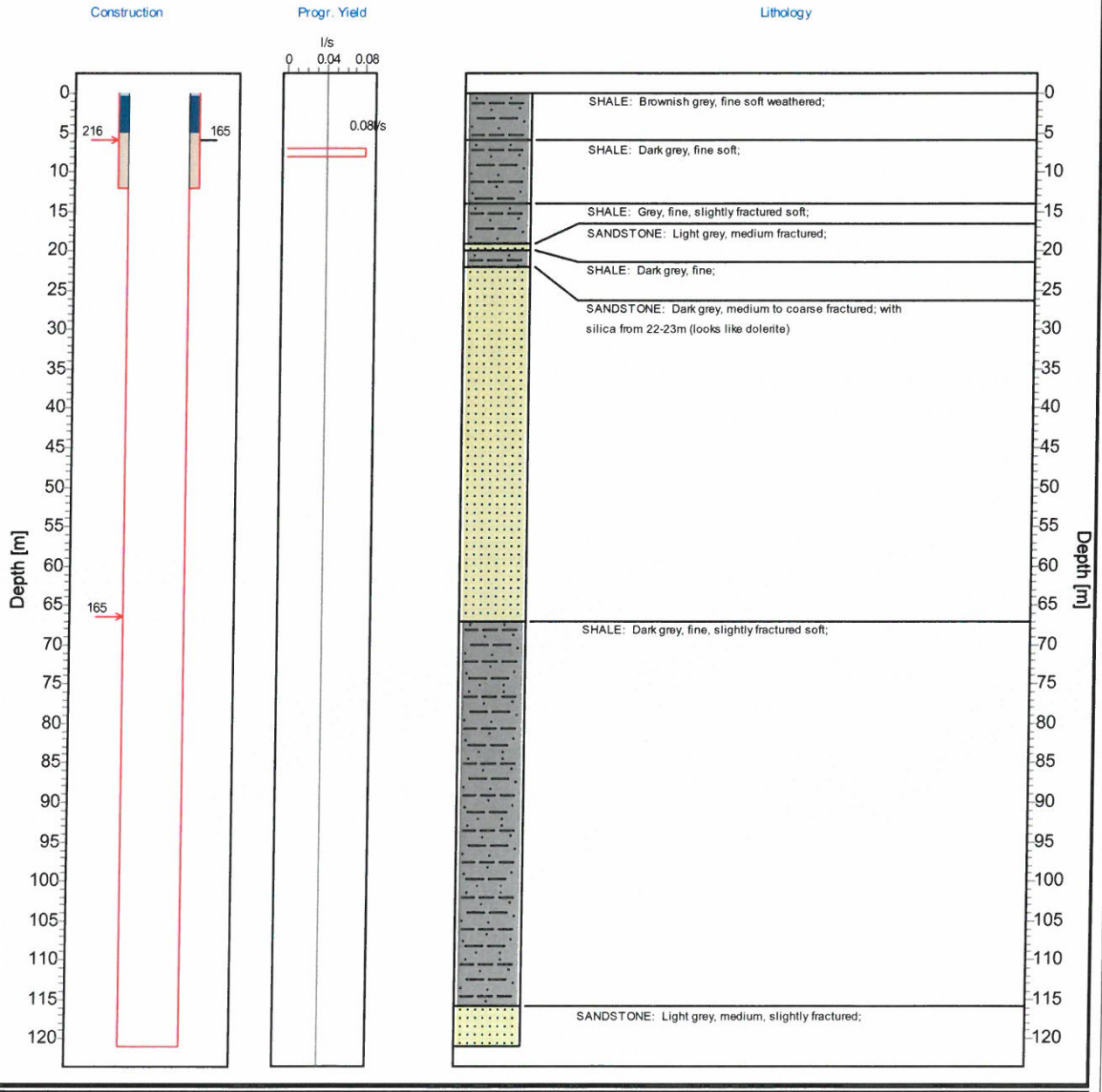
Region Type: District Council ***Region Descr.:*** CACADU`

Latitude [°]:	32.948910	***Reg./BB.:***		***Topo-set.:***	In or along river	***Depth [m]:***	121.00
Longitude [°]:	24.653300	***G-Nr.:***		***Site status:***	Unused	***Col. ht. [m]:***	0.50
Altitude [m]:	400.00			***Site purp.:***	Production (water supply)	***Diam. [mm]:***	
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend

Hole
Casing (plain / perforated, sloted)
Screen / Mesh Screen
Piezometer
165 — Hole diameter [mm]
152 — Casing diameter [mm]
Water level with date meas.
0:50 — Piezometer (Nr. & Diameter [mm])
Cement
Sanitary seal
Drill cuttings



COMMENT:
Final yield 0.08l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0004 ***Number:*** EC/N24/094 ***Site type:*** Borehole

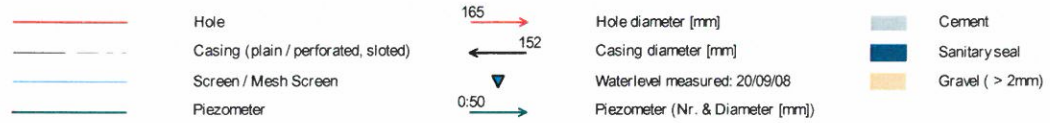
Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

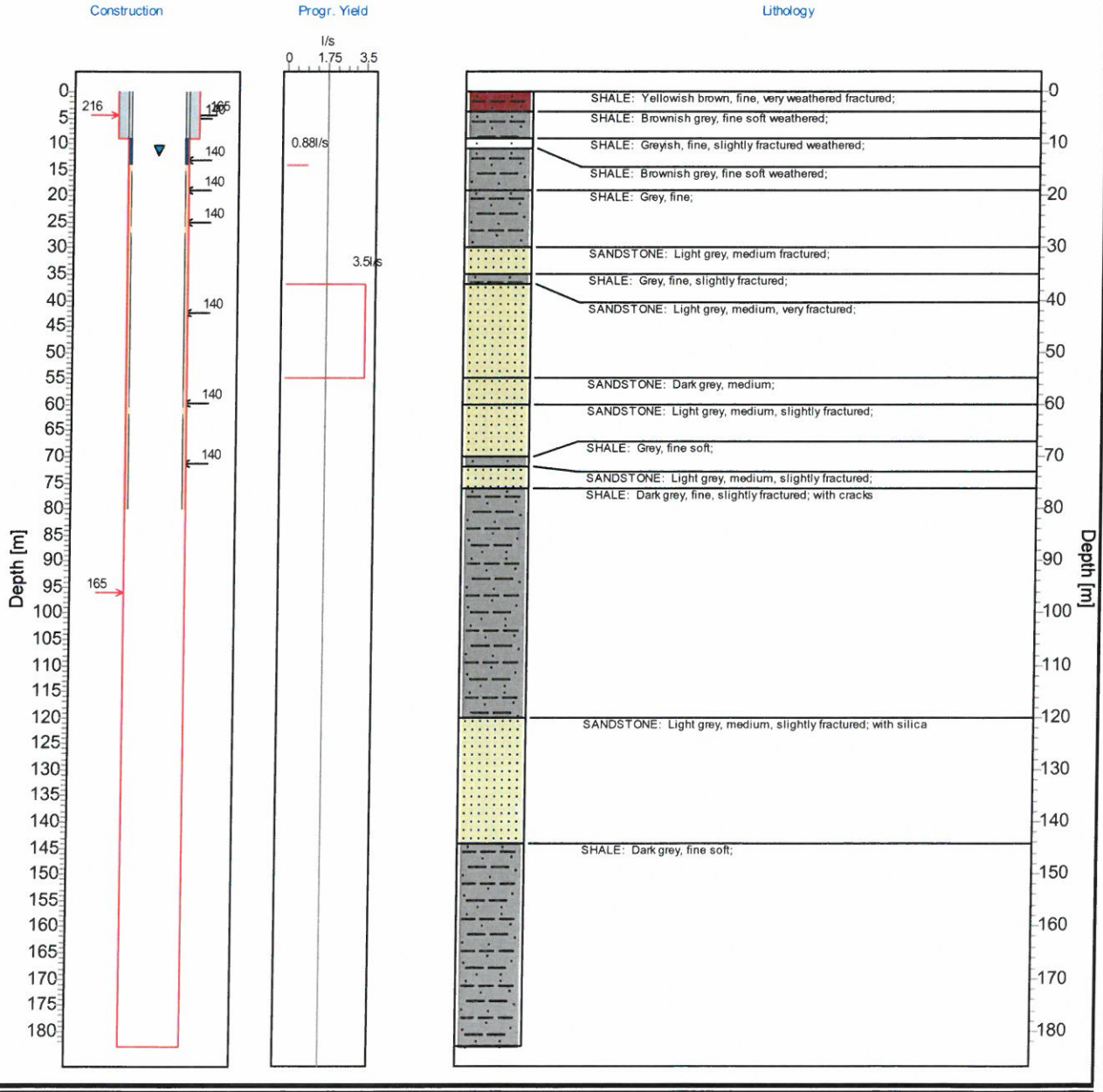
Region Type: District Council ***Region Descr.:*** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.949100	***Reg./BB.:***	***Topo-set.:***	Flat surface, plain	***Depth [m]:*** 183.00
Longitude [°]:	24.661900	***G-Nr.:***	***Site status:***	Unused	***Col. ht. [m]:*** 0.50
Altitude [m]:	400.00		***Site purp.:***	Production (water supply)	***Diam. [mm]:*** 169
Coord. acc.:	Accurate to within 10 units		***Use applic.:***	Domestic - all purposes	***Drain. reg.:*** N24
Coord. meth.:	Global Positioning System		***Equipment:***	No equipment	***Rep. inst.:*** SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend





COMMENT:
Final yield 4.4l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0005 ***Number:*** EC/N24/095 ***Site type:*** Borehole

Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

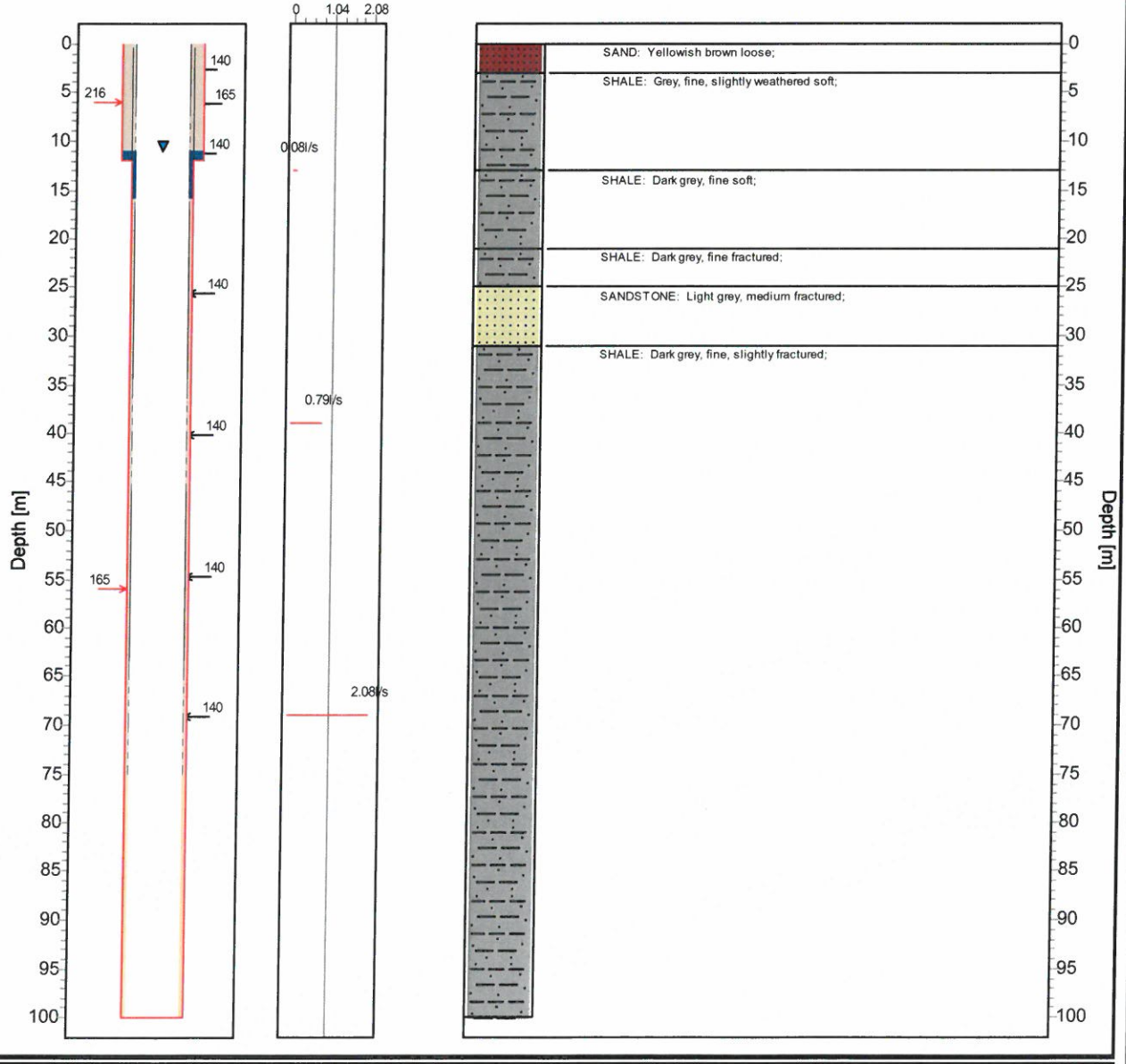
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.945320	***Reg./BB.:***		***Topo-set.:***	In or along river	***Depth [m]:***	100.00
Longitude [°]:	24.657000	***G-Nr.:***		***Site status:***	Unused	***Col. ht. [m]:***	0.50
Altitude [m]:	408.00			***Site purp.:***	Production (water supply)	***Diam. [mm]:***	169
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend

Hole
Casing (plain / perforated, sloted)
Screen / Mesh Screen
Piezometer
165 → Hole diameter [mm]
152 ← Casing diameter [mm]
▼ Water level measured: 25/11/08
0:50 → Piezometer (Nr. & Diameter [mm])
Drill cuttings
Sanitary seal



COMMENT:
Final yield 0.55

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0006 ***Number:*** EC/N24/096 ***Site type:*** Borehole

Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

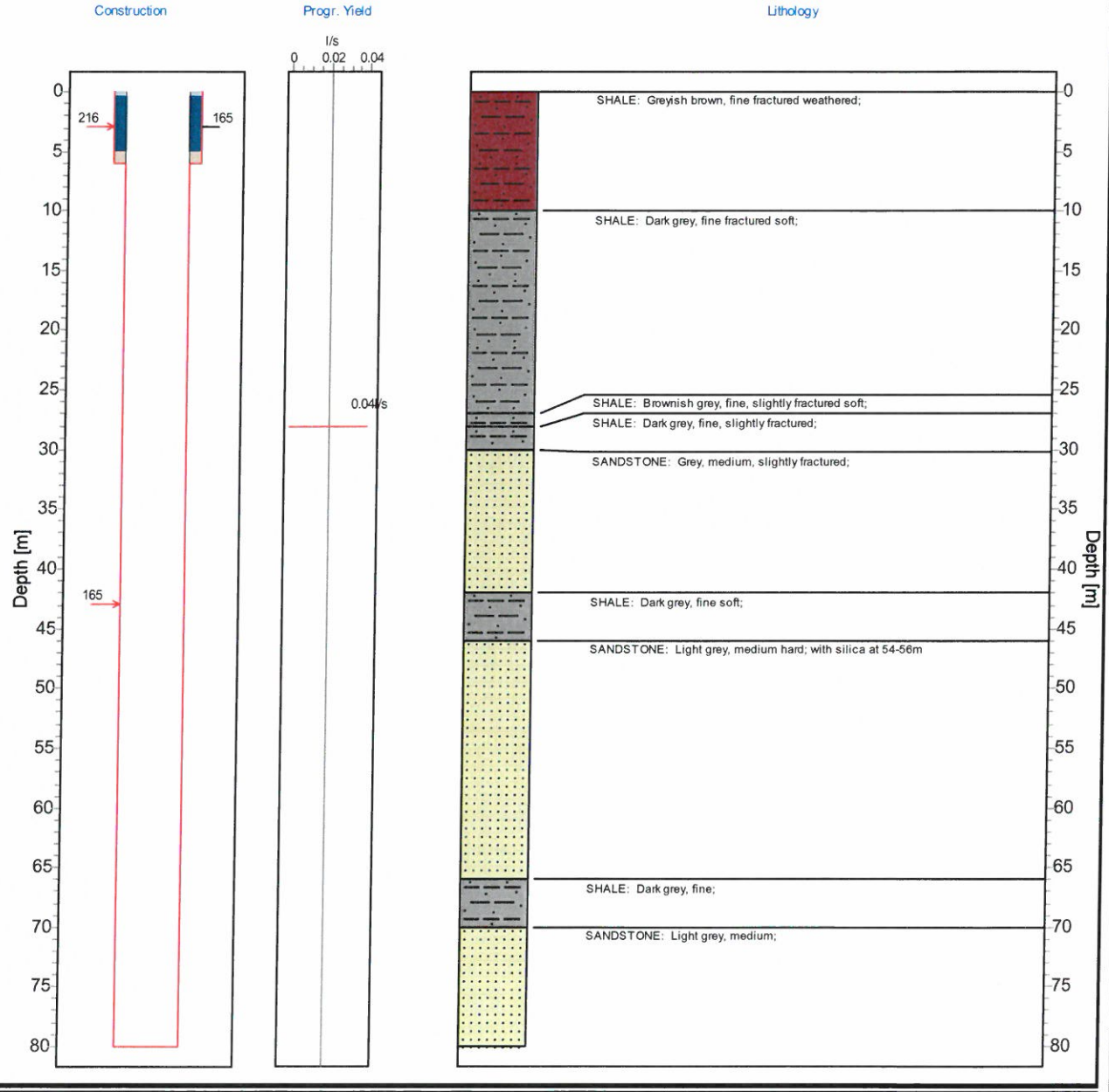
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.949860	***Reg./BB.:***	***Topo-set.:***	***Depth [m]:***	80.00
Longitude [°]:	24.664050	***G-Nr.:***	***Site status:*** Unused	***Col. ht. [m]:***	0.50
Altitude [m]:	409.00		***Site purp.:*** Production (water supply)	***Diam. [mm]:***	169
Coord. acc.:	Accurate to within 10 units		***Use applic.:*** Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System		***Equipment:*** No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend

Hole
Casing (plain / perforated, sloted)
Screen / Mesh Screen
Piezometer
165 — Hole diameter [mm]
152 — Casing diameter [mm]
Water level with date meas.
0:50 — Piezometer (Nr. & Diameter [mm])
Cement
Sanitary seal
Drill cuttings



COMMENT:
Final yield 0.04l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0007 ***Number:*** EC/N24/097 ***Site type:*** Borehole

Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

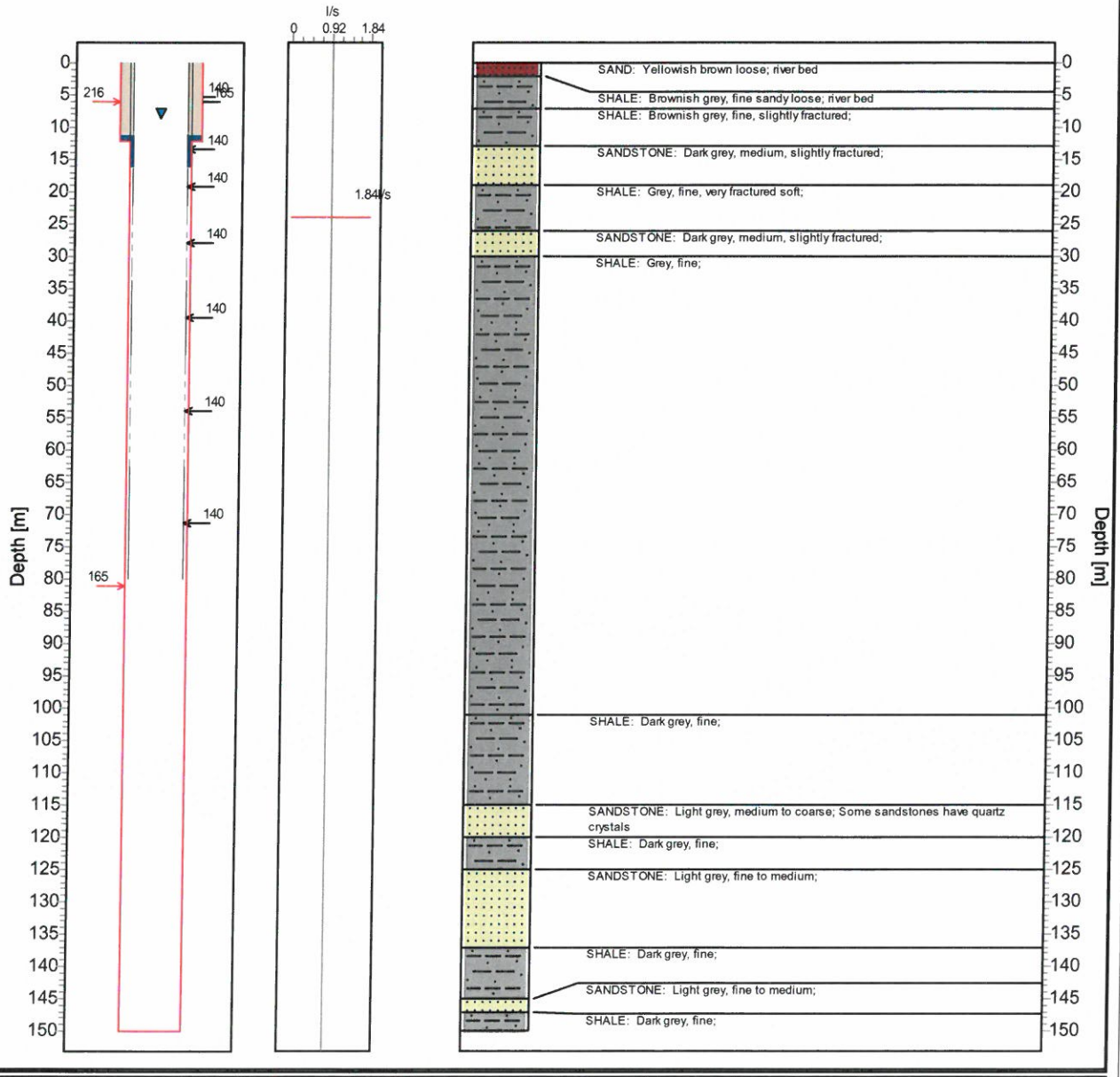
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.949190	***Reg./BB.:***		***Topo-set.:***	In or along river	***Depth [m]:***	150.00
Longitude [°]:	24.671940	***G-Nr.:***		***Site status:***	Unused	***Col. ht. [m]:***	0.50
Altitude [m]:	403.00			***Site purp.:***	Production (water supply)	***Diam. [mm]:***	217
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend

Hole
Casing (plain / perforated, sloted)
Screen / Mesh Screen
Piezometer
165 — Hole diameter [mm]
152 — Casing diameter [mm]
Water level measured: 04/09/08
0:50 — Piezometer (Nr. & Diameter [mm])
Cement
Sanitary seal
Drill cuttings



COMMENT:
Final yield 1.84l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0008 ***Number:*** EC/N24/098 ***Site type:*** Borehole

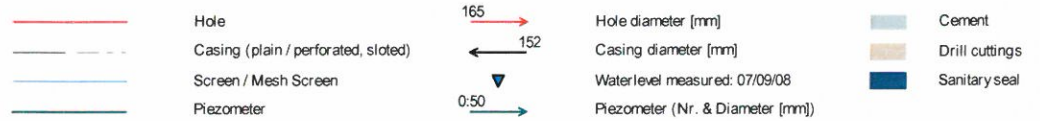
Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

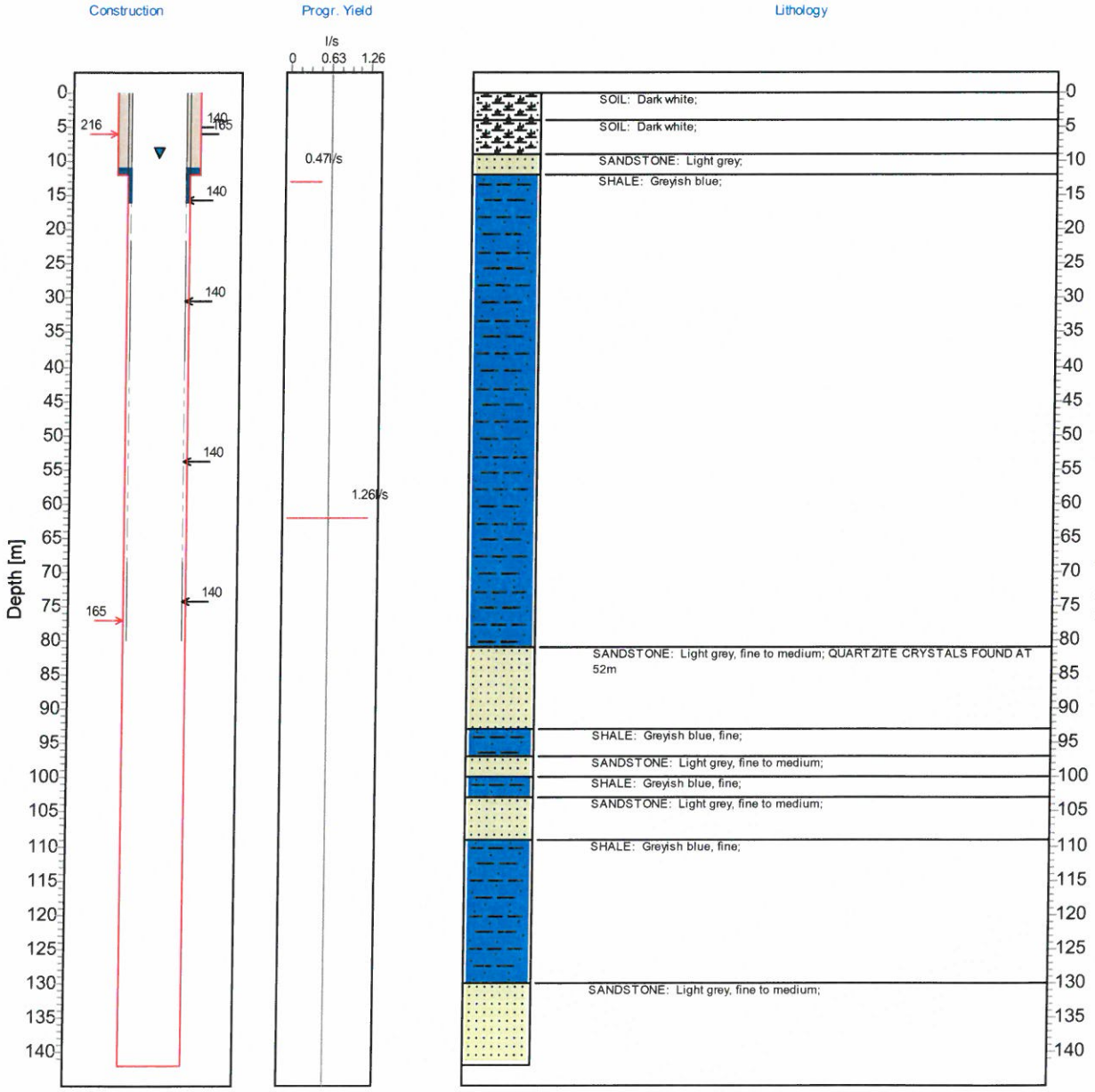
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.949400	***Reg./BB.:***	***Topo-set.:***	***Depth [m]:***	141.00
Longitude [°]:	24.671300	***G-Nr.:***	***Site status:*** Unused	***Col. ht. [m]:***	0.50
Altitude [m]:	415.00		***Site purp.:*** Production (water supply)	***Diam. [mm]:***	216
Coord. acc.:	Accurate to within 10 units		***Use applic.:*** Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System		***Equipment:*** No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend





COMMENT:
Final yield 1.26l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0009 ***Number:*** EC/N24/099 ***Site type:*** Borehole

Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

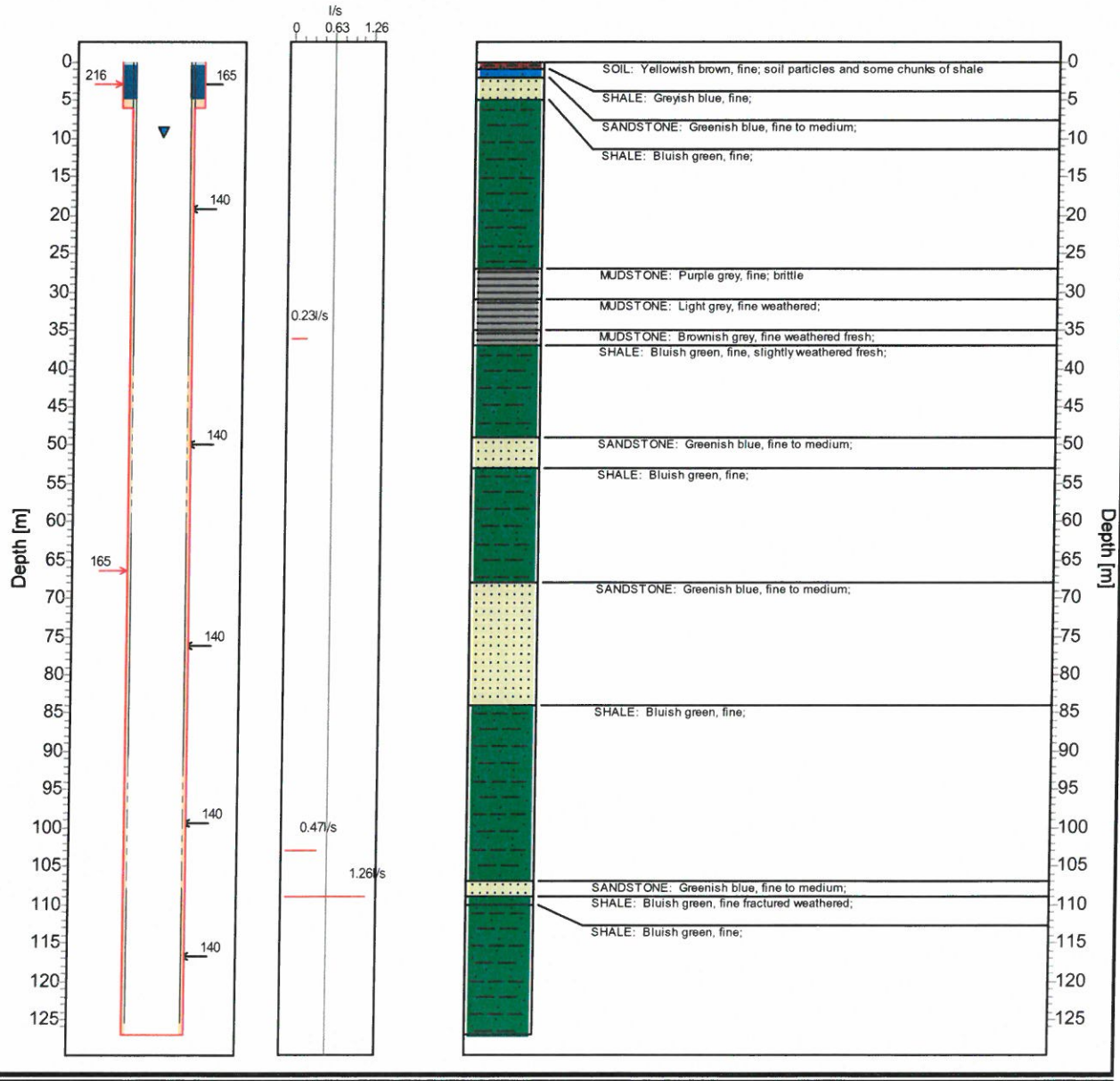
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.944740	***Reg./BB.:***	***Topo-set.:***	***Depth [m]:***	127.00
Longitude [°]:	24.686670	***G-Nr.:***	***Site status:*** Unused	***Col. ht. [m]:***	
Altitude [m]:	403.00		***Site purp.:*** Production (water supply)	***Diam. [mm]:***	
Coord. acc.:	Accurate to within 10 units		***Use applic.:*** Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System		***Equipment:*** No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend

Hole
Casing (plain / perforated, sloted)
Screen / Mesh Screen
Piezometer
165 — Hole diameter [mm]
152 — Casing diameter [mm]
Waterlevel measured: 09/10/08
0:50 — Piezometer (Nr. & Diameter [mm])
Cement
Sanitary seal
Gravel (> 2mm)



COMMENT:
Final yield 1.26l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0010 ***Number:*** EC/N24/100 ***Site type:*** Borehole

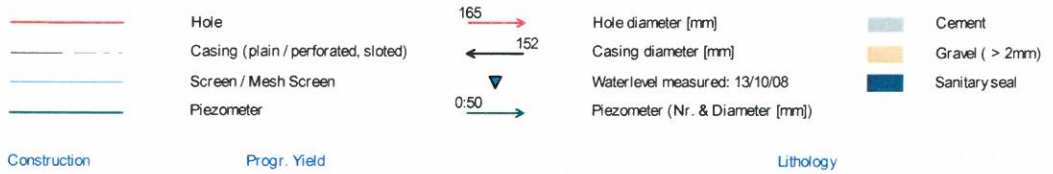
Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

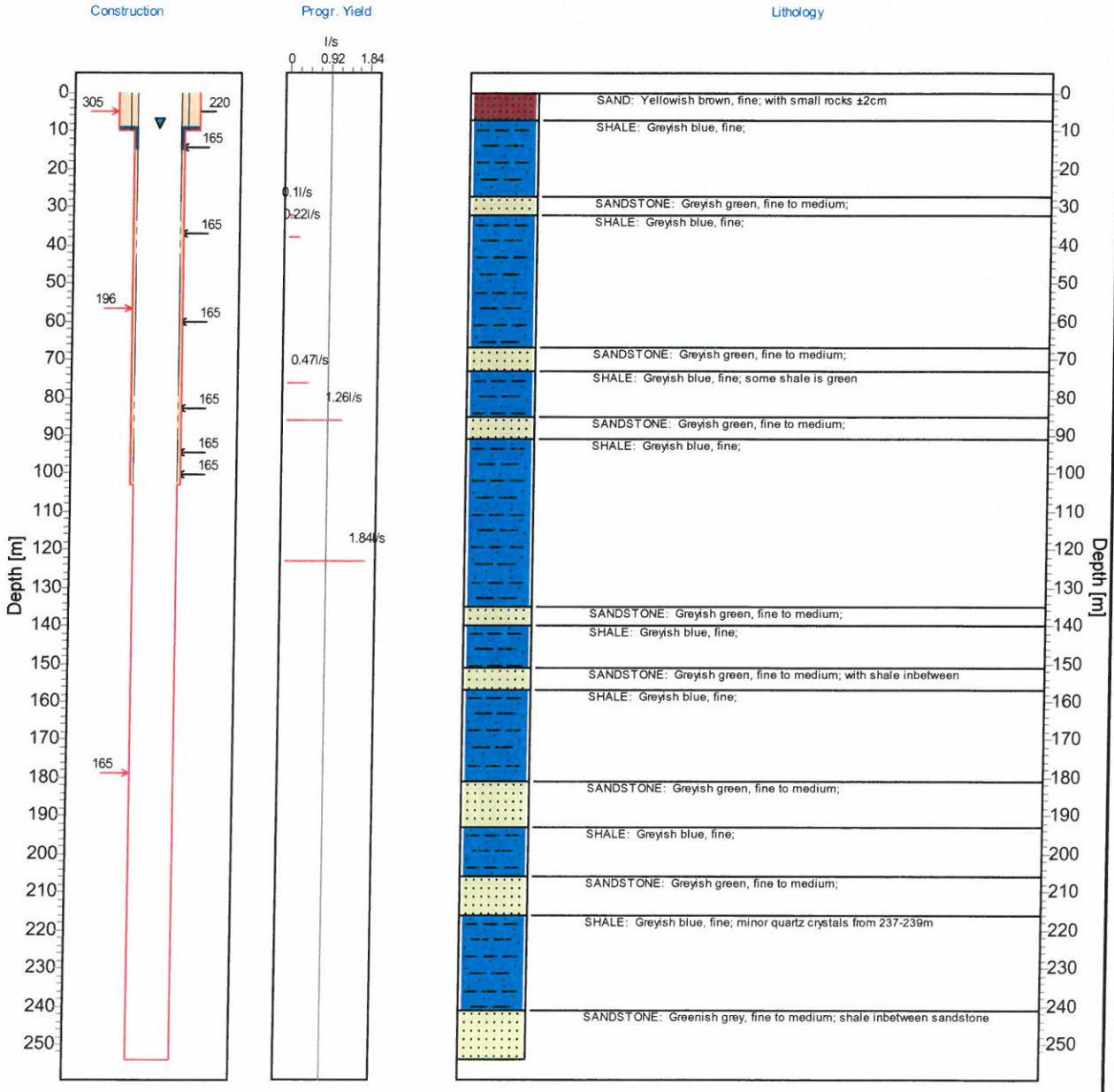
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.948670	***Reg./BB.:***	***Topo-set.:***	Flat surface, plain	***Depth [m]:*** 254.00
Longitude [°]:	24.672570	***G-Nr.:***	***Site status:***	Unused	***Col. ht. [m]:***
Altitude [m]:	701.00		***Site purp.:***	Production (water supply)	***Diam. [mm]:*** 305
Coord. acc.:	Accurate to within 10 units		***Use applic.:***	Domestic - all purposes	***Drain. reg.:*** N24
Coord. meth.:	Global Positioning System		***Equipment:***	No equipment	***Rep. inst.:*** SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend





COMMENT:
Final yield 1.84l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

Borehole Construction and Geological Log

Date compiled: 1/20/2009

BASIC SITE INFORMATION: ***Site Identifier:*** 3224DCS0011 ***Number:*** EC/N24/101 ***Site type:*** Borehole

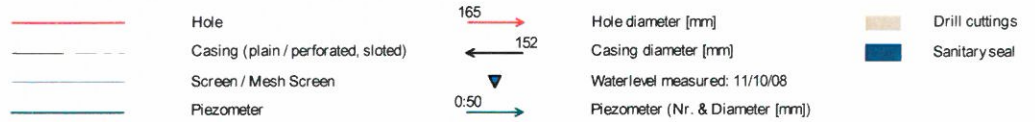
Distr./Farm No.: TOWN ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

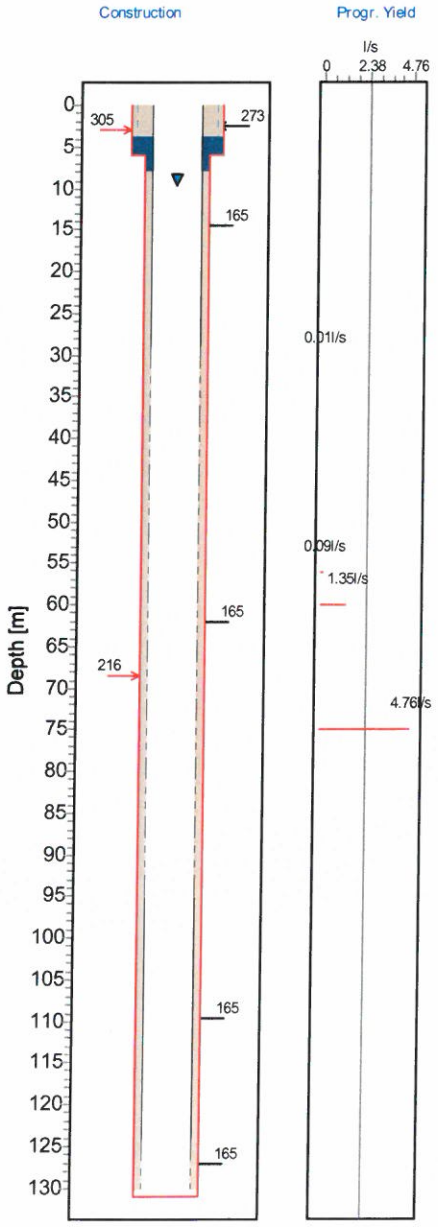
Region Type: District Council ***Region Descr.:*** CACADU

Latitude [°]:	32.944350	***Reg./BB.:***	***Topo-set.:***	***Depth [m]:***	130.00
Longitude [°]:	24.686240	***G-Nr.:***	***Site status:*** Unused	***Col. ht. [m]:***	0.01
Altitude [m]:			***Site purp.:*** Production (water supply)	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units		***Use applic.:*** Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System		***Equipment:*** No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Construction and Geohydrological Legend





COMMENT:
Final yield 3.80l/s

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

APPENDIX 4: PUMPTESTING

PUMPING TEST REPORT

Date compiled: 1/19/2009

BASIC SITE INFORMATION:

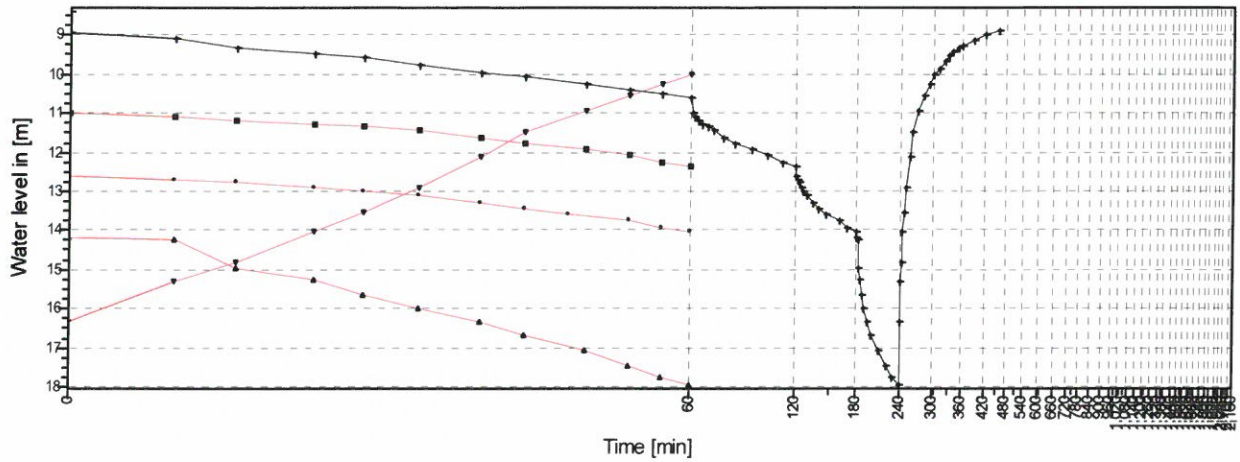
Site Identifier: 3224DCS0001 **Number:** EC/N24/091 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

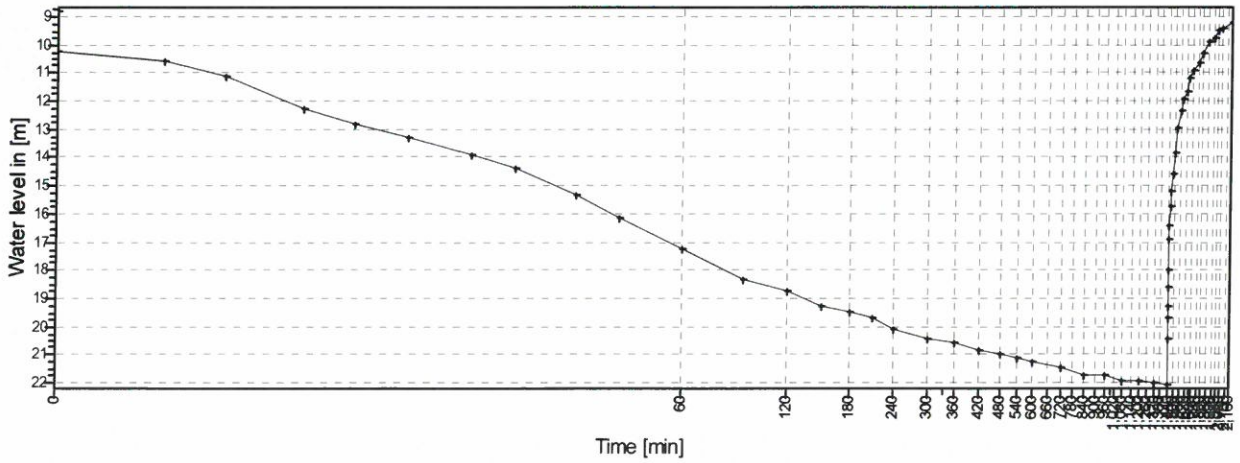
Latitude [°]	32.947060	**Alt. No. 1:**		**Diam. [mm]:**	165	**Water lev. [m]:**	8.80
Longitude [°]	24.653500	**Alt. No. 2:**		**Depth [m]:**	115.00	**Piezometer:**	0
Altitude [m]:	407.00	**Rep. inst.:**	SRK	**Col. ht. [mm]:**	0.34	**Date WL meas.:**	20081123

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Multirate Test



Constant Rate Test



PUMPING TEST:

Rep. Inst.	Meth. tested	Depth to intake [m]	Starting Date	Time	Ending Date	Time	Transmis. [m²/d]	Storativ.	Rec. abs. [l/s]
SRK	Step test	63.00	20081123	1015	20081123	1755			
SRK	Constant rate test	63.00	20081123	1800	20081125	0600			

TESTING DETAILS:

Description	Time start.	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recov. [m]	%	Rec. Dur. [min]	Trans. [m²/d]	Perm. [m/d]	Storat.	Q/st
STEP 1	1015	60	63.00	0.99	2.22							0.45
STEP 2	1115	60	63.00	1.60	3.97							0.40
STEP 3	1215	60	63.00	2.00	5.64							0.35
STEP 4	1315	60	63.00	3.16	9.55	0.49	95	240				0.33
CD	1800	1440	63.00	3.15	13.26	0.42	96	720				0.24

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

PUMPING TEST REPORT

Date compiled: 1/19/2009

BASIC SITE INFORMATION:

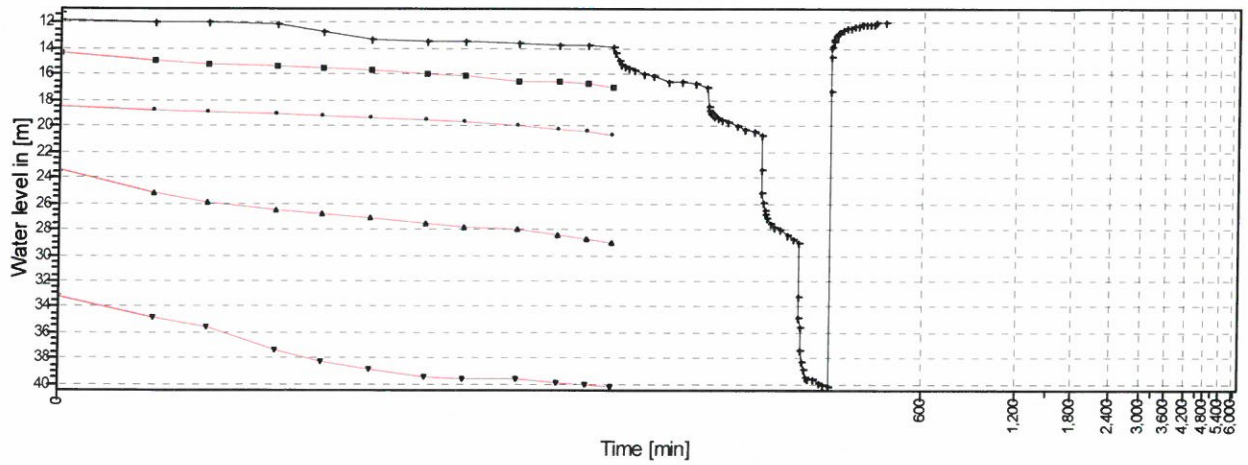
Site Identifier: 3224DCS0004 **Number:** EC/N24/094 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

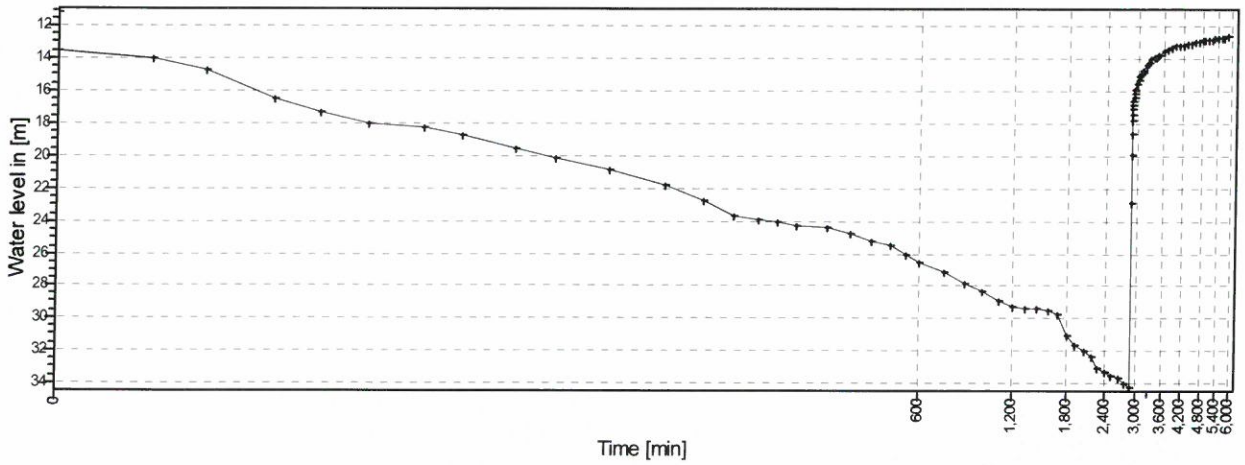
Latitude [°]	32.949100	**Alt. No. 1:**		**Diam. [mm]:**	169	**Water lev. [m]:**	11.20
Longitude [°]	24.661900	**Alt. No. 2:**		**Depth [m]:**	183.00	**Piezometer:**	0
Altitude [m]:	400.00	**Rep. inst.:**	SRK	**Col. ht. [mm]:**	0.50	**Date WL meas.:**	20080926

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Multirate Test



Constant Rate Test



PUMPING TEST:

Rep. Inst.	Meth. tested	Depth to intake [m]	Starting Date	Time	Ending Date	Time	Transmis. [m²/d]	Storativ.	Rec. abs. [l/s]
SRK	Step test	69.00	20080920	1130	20080920	1900			
SRK	Constant rate test	69.00	20080926	1120	20080930	1120			

TESTING DETAILS:

Description	Time start.	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recov. [m]	%	Rec. Dur. [min]	Trans. [m²/d]	Perm. [m/d]	Storat.	Q/st
STEP 1	1130	60	69.00	2.16	2.64							0.82
STEP 2	1230	60	69.00	3.20	5.72							0.56
STEP 3	1330	60	69.00	3.74	9.47							0.39
STEP 4	1430	60	69.00	4.82	17.85							0.27
STEP 5	1530	60	69.00	6.57	28.97	0.69	98	150				0.23
CD	1120	2880	69.00	3.53	22.99	1.45	94	2880				0.15

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

PUMPING TEST REPORT

Date compiled: 1/19/2009

BASIC SITE INFORMATION:

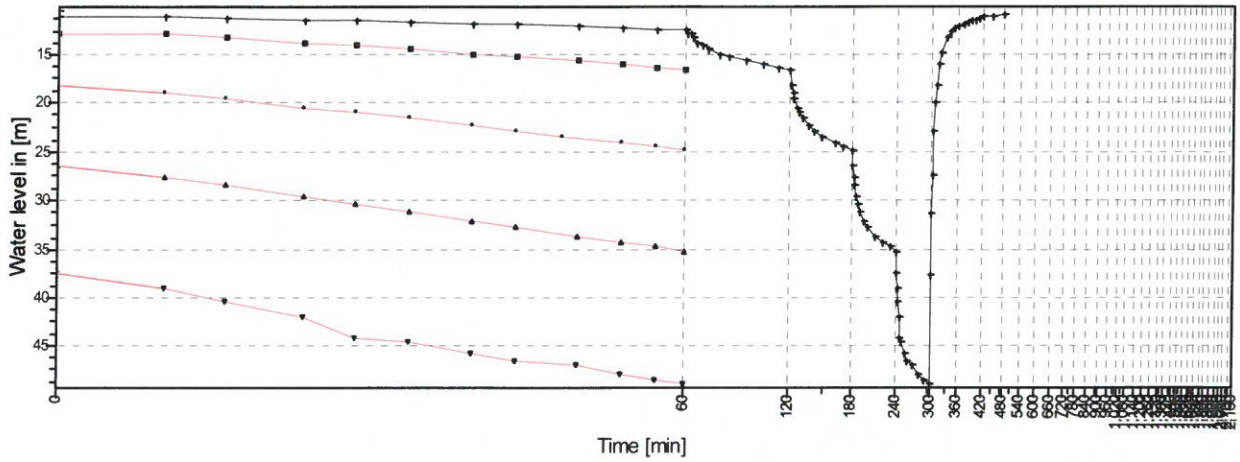
Site Identifier: 3224DCS0005 **Number:** EC/N24/095 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

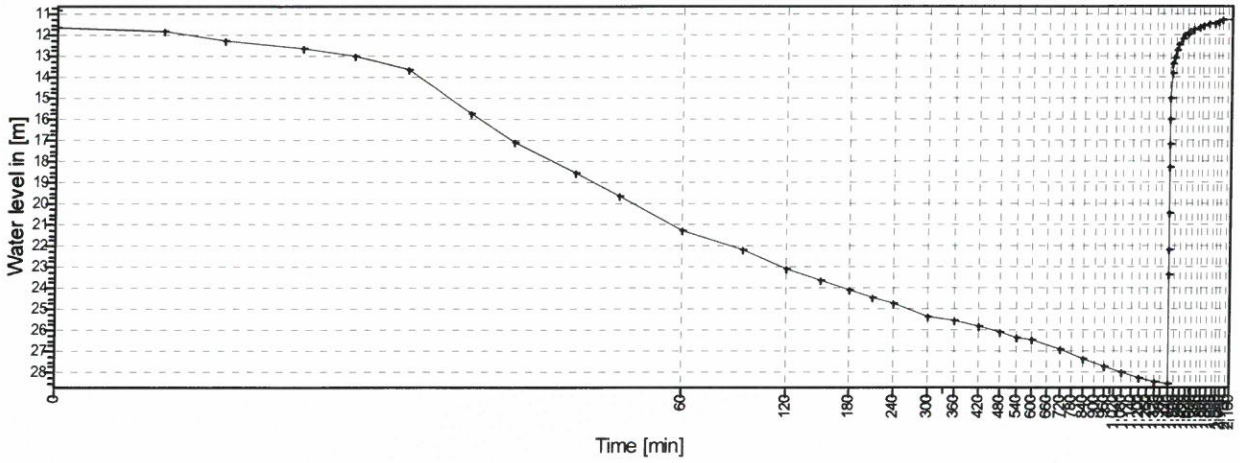
Latitude [°]	32.945320	**Alt. No. 1:**		**Diam. [mm]:**	169	**Water lev. [m]:**	10.80
Longitude [°]	24.657000	**Alt. No. 2:**		**Depth [m]:**	100.00	**Piezometer:**	0
Altitude [m]:	408.00	**Rep. inst.:**	SRK	**Col. ht. [mm]:**	0.50	**Date WL meas.:**	20081126

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Multirate Test



Constant Rate Test



PUMPING TEST:

Rep. Inst.	Meth. tested	Depth to intake [m]	Starting Date	Time	Ending Date	Time	Transmis. [m²/d]	Storativ.	Rec. abs. [l/s]
SRK	Step test	69.00	20081125	1110	20081125	1910			
SRK	Constant rate test	69.00	20081126	0812	20081127	2012			

TESTING DETAILS:

Description	Time start.	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recov. [m]	%	Rec. Dur. [min]	Trans. [m²/d]	Perm. [m/d]	Storat.	Q/st
STEP 1	1110	60	69.00	1.00	2.06							0.49
STEP 2	1210	60	69.00	1.52	6.11							0.25
STEP 3	1310	60	69.00	2.33	14.32							0.16
STEP 4	1410	60	69.00	3.16	24.69							0.13
STEP 5	1510	60	69.00	4.12	38.34	0.47	99	180				0.11
CD	0812	1440	69.00	2.02	17.71	0.42	98	720				0.11

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

PUMPING TEST REPORT

Date compiled: 1/19/2009

BASIC SITE INFORMATION:

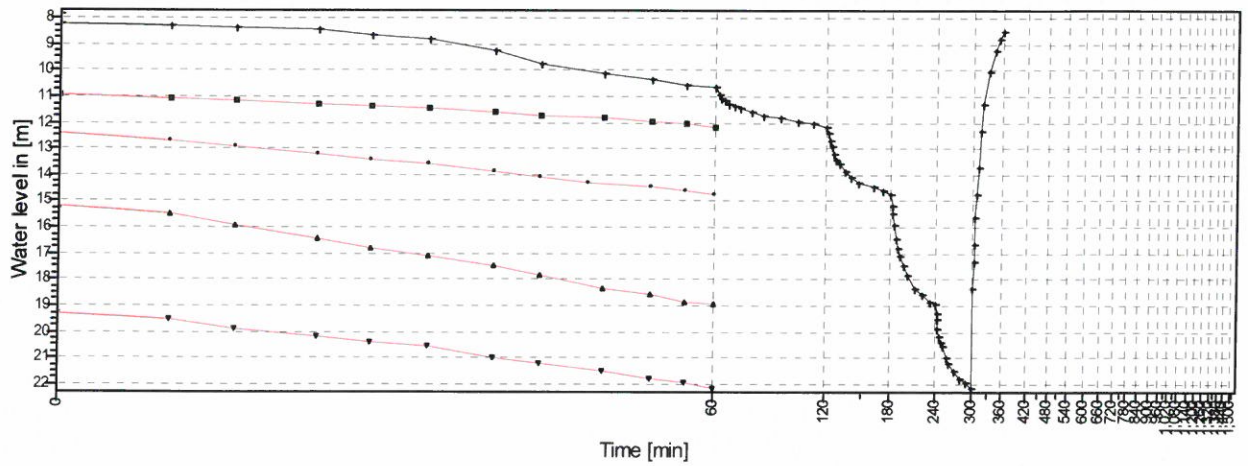
Site Identifier: 3224DCS0007 **Number:** EC/N24/097 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

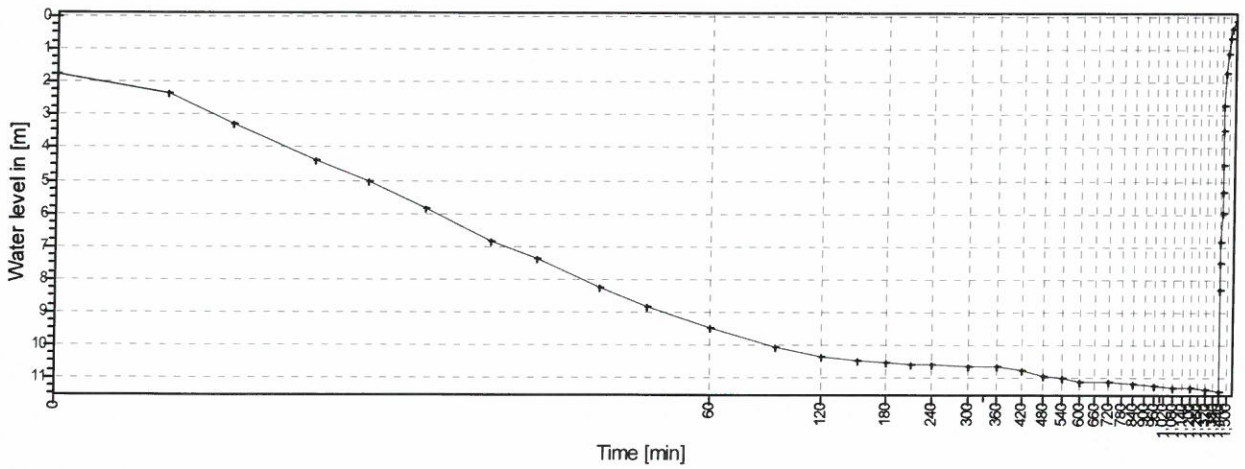
Latitude [°]	32.949190	**Alt. No. 1:**		**Diam. [mm]:**	217	**Water lev. [m]:**	0
Longitude [°]	24.671940	**Alt. No. 2:**		**Depth [m]:**	150.00	**Piezometer:**	0
Altitude [m]:	403.00	**Rep. inst.:**	SRK	**Col. ht. [mm]:**	0.50	**Date WL meas.:**	20080905

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Multirate Test



Constant Rate Test



PUMPING TEST:

Rep. Inst.	Meth. tested	Depth to intake [m]	Starting Date	Time	Ending Date	Time	Transmis. [m²/d]	Storativ.	Rec. abs. [l/s]
SRK	Step test	51.00	20080904	1640	20080904	2240			
SRK	Constant rate test	51.00	20080905	0845	20080906	1045			

TESTING DETAILS:

Description	Time start.	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recov. [m]	%	Rec. Dur. [min]	Trans. [m²/d]	Perm. [m/d]	Storat.	Q/st
STEP 1	1640	60	51.00	0.81	2.77							0.29
STEP 2	1740	60	51.00	1.00	4.32							0.23
STEP 3	1840	60	51.00	1.52	6.87							0.22
STEP 4	1940	60	51.00	2.42	11.09							0.22
STEP 5	2040	60	51.00	3.08	14.30	0.68	95	60				0.22
CD	0845	1440	51.00	2.04	11.39	0.10	99	120				0.18

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

PUMPING TEST REPORT

Date compiled: 1/19/2009

BASIC SITE INFORMATION:

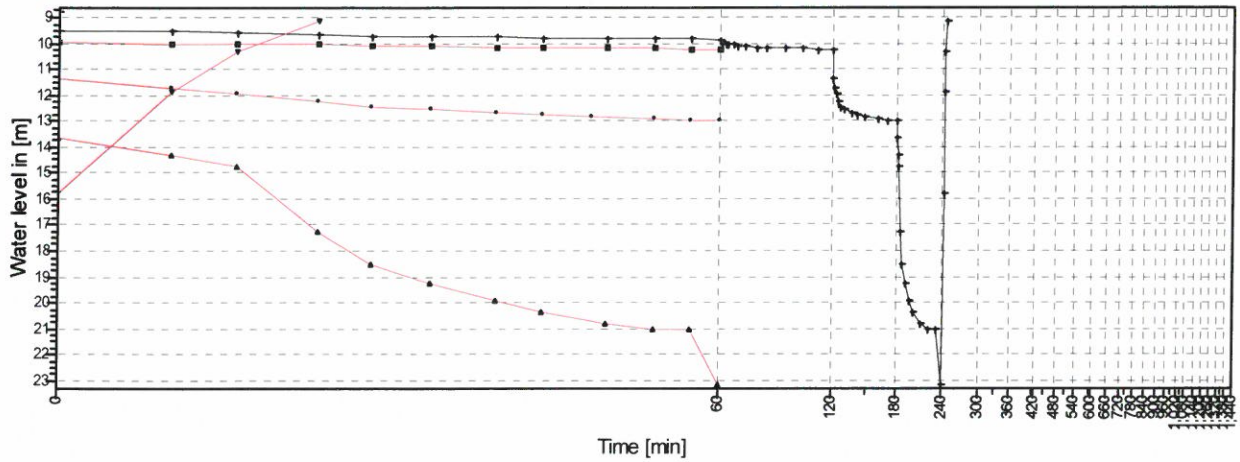
Site Identifier: 3224DCS0008 **Number:** EC/N24/098 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

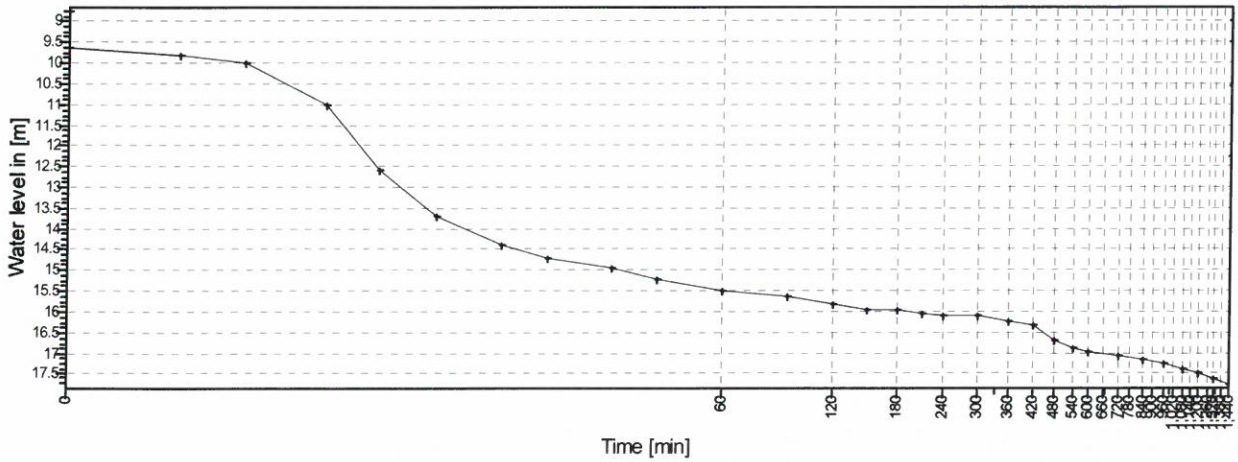
Latitude [°]	32.949400	**Alt. No. 1:**		**Diam. [mm]:**	216	**Water lev. [m]:**	8.75
Longitude [°]	24.671300	**Alt. No. 2:**		**Depth [m]:**	141.00	**Piezometer:**	0
Altitude [m]:	415.00	**Rep. inst.:**	SRK	**Col. ht. [mm]:**	0.50	**Date WL meas.:**	20080908

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Multirate Test



Constant Rate Test



PUMPING TEST:

Rep. Inst.	Meth. tested	Depth to intake [m]	Starting Date	Time	Ending Date	Time	Transmis. [m²/d]	Storativ.	Rec. abs. [l/s]
SRK	Step test	69.00	20080907	1150	20080907	1555			
SRK	Constant rate test	69.00	20080908	0850	20080909	0855			

TESTING DETAILS:

Description	Time start.	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recov. [m]	%	Rec. Dur. [min]	Trans. [m²/d]	Perm. [m/d]	Storat.	Q/st
STEP 1	1150	60	69.00	0.72	1.09							0.66
STEP 2	1250	60	69.00	0.91	1.50							0.61
STEP 3	1350	60	69.00	1.22	4.22							0.29
STEP 4	1450	60	69.00	2.10	14.43	0.37	97	5				0.15
CD	0850	1440	69.00	1.51	9.01	0.25	97	5				0.17

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

PUMPING TEST REPORT

Date compiled: 1/20/2009

BASIC SITE INFORMATION:

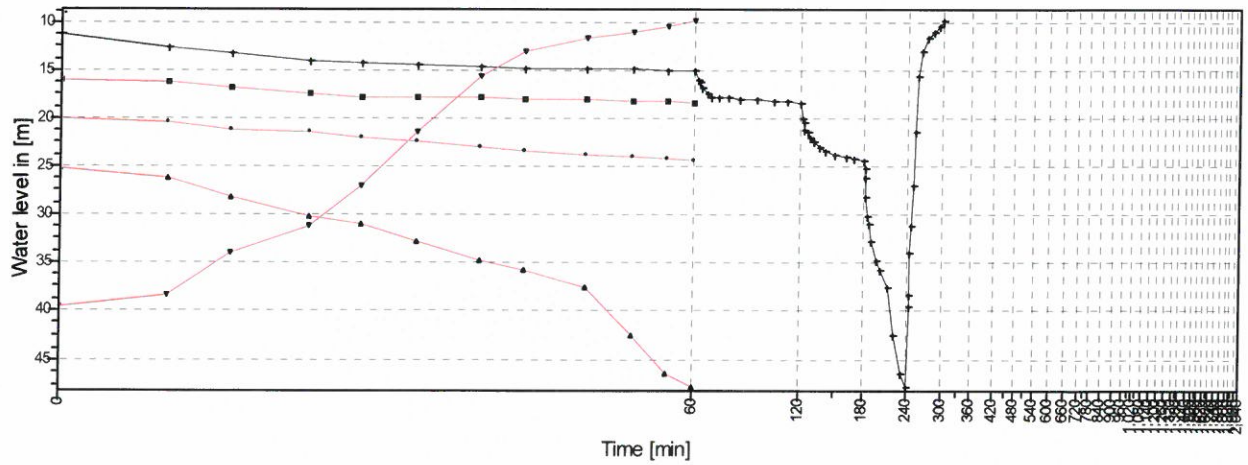
Site Identifier: 3224DCS0009 **Number:** EC/N24/099 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

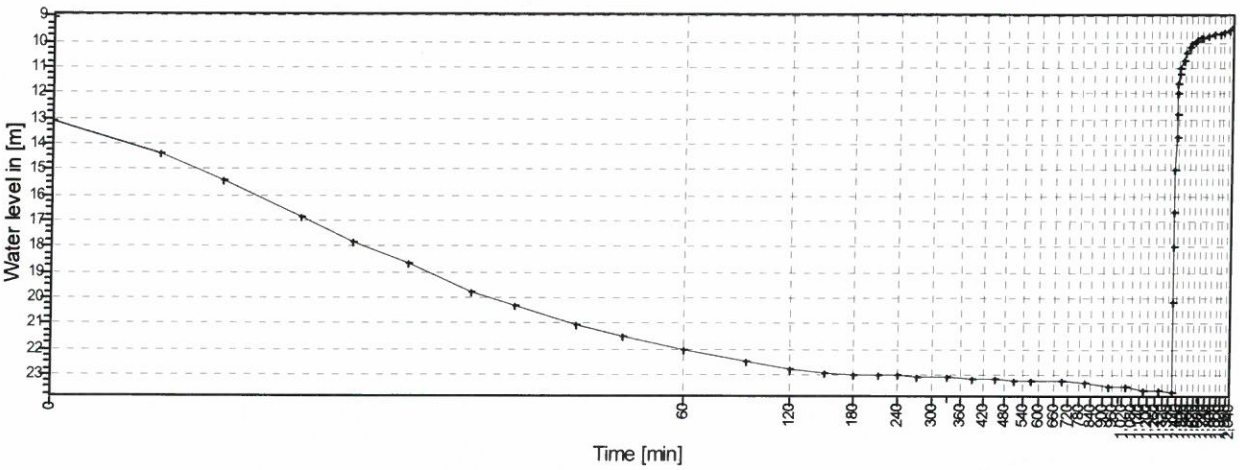
Latitude [°]	32.944740	**Alt. No. 1:**		**Diam. [mm]:**		**Water lev. [m]:**	9.06
Longitude [°]	24.686670	**Alt. No. 2:**		**Depth [m]:**	127.00	**Piezometer:**	0
Altitude [m]:	403.00	**Rep. inst.:**	SRK	**Col. ht. [mm]:**		**Date WL meas.:**	20081009

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Multirate Test



Constant Rate Test



PUMPING TEST:

Rep. Inst.	Meth. tested	Depth to intake [m]	Starting Date	Time	Ending Date	Time	Transmis. [m²/d]	Storativ.	Rec. abs. [l/s]
SRK	Step test	100.00	20081009	0950	20081009	1450			
SRK	Constant rate test	100.00	20081009	1600	20081011	0200	10.1	0.001	0.60

TESTING DETAILS:

Description	Time start.	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recov. [m]	%	Rec. Dur. [min]	Trans. [m²/d]	Perm. [m/d]	Storat.	Q/st
STEP 1	0950	60	100.00	0.60	6.02							0.10
STEP 2	1050	60	100.00	0.81	9.32							0.09
STEP 3	1150	60	100.00	1.22	15.24							0.08
STEP 4	1250	60	100.00	2.02	38.80	0.84	98	60				0.05
CD	1600	1440	100.00	1.02	14.60	0.32	95	720	10.1		0.001	0.07

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

PUMPING TEST REPORT

Date compiled: 1/20/2009

BASIC SITE INFORMATION:

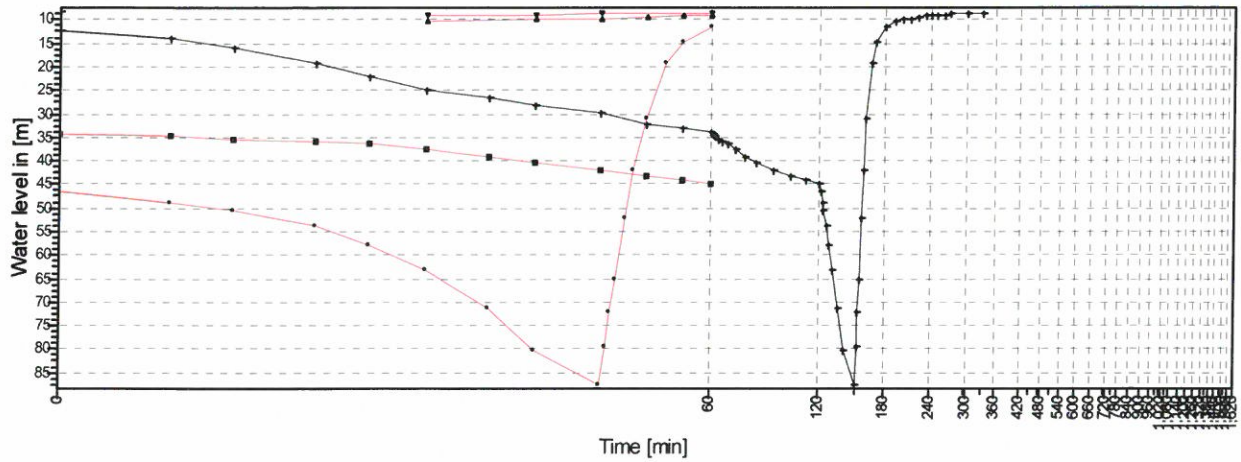
Site Identifier: 3224DCS0010 **Number:** EC/N24/100 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

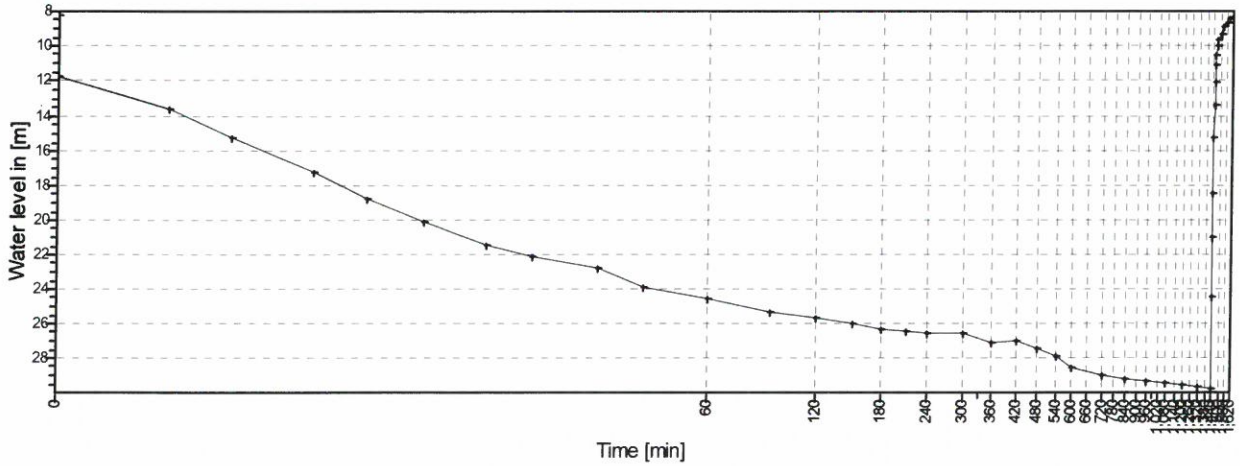
Latitude [°]	32.948670	**Alt. No. 1:**		**Diam. [mm]:**	305	**Water lev. [m]:**	8.20
Longitude [°]	24.672570	**Alt. No. 2:**		**Depth [m]:**	254.00	**Piezometer:**	0
Altitude [m]:	701.00	**Rep. inst.:**	SRK	**Col. ht. [mm]:**		**Date WL meas.:**	20081014

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Multirate Test



Constant Rate Test



PUMPING TEST:

Rep. Inst.	Meth. tested	Depth to intake [m]	Starting Date	Time	Ending Date	Time	Transmis. [m²/d]	Storativ.	Rec. abs. [l/s]
SRK	Step test	100.00	20081013	1515	20081013	2045			
SRK	Constant rate test	8.20	20081014	0840	20081015	1140	4.8	0.001	0.50

TESTING DETAILS:

Description	Time start.	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recov. [m]	%	Rec. Dur. [min]	Trans. [m²/d]	Perm. [m/d]	Storat.	Q/st
STEP 1	1515	60	100.00	1.67	25.64							0.07
STEP 2	1615	60	100.00	2.04	36.77							0.06
STEP 3	1715	60	100.00	2.95	79.39	0.32	99	180				0.04
CD	0840	1440	100.00	1.29	21.54	0.09	100	180	4.8		0.001	0.06

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

PUMPING TEST REPORT

Date compiled: 1/20/2009

BASIC SITE INFORMATION:

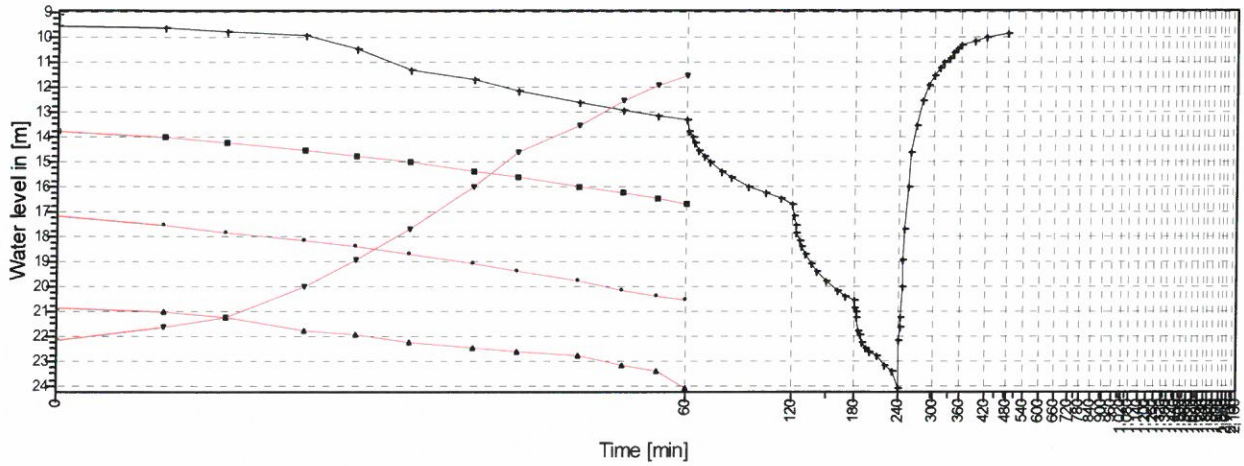
Site Identifier: 3224DCS0011 **Number:** EC/N24/101 **Site type:** Borehole

Distr./Farm No.: TOWN **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

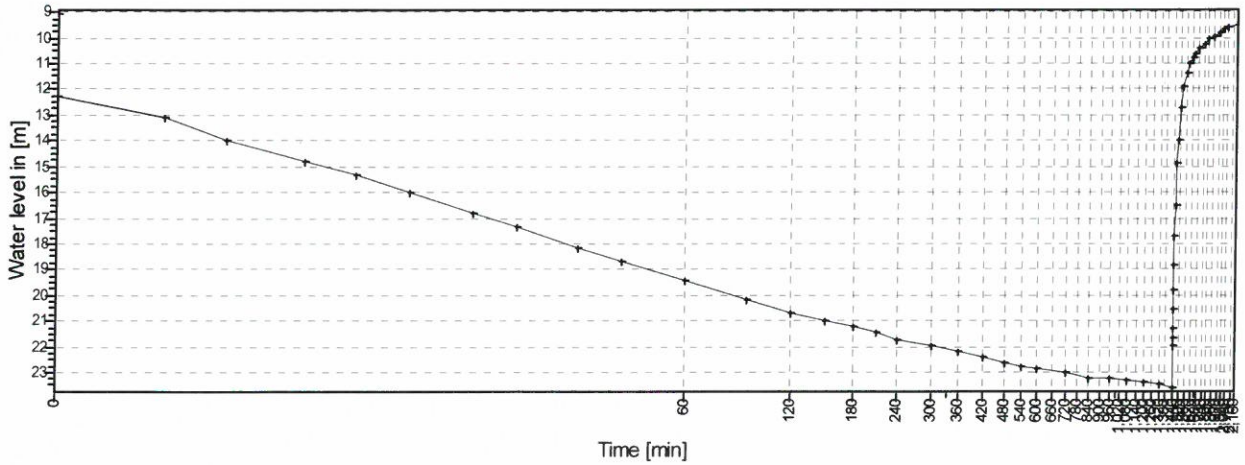
Latitude [°]	32.944350	**Alt. No. 1:**		**Diam. [mm]:**	165	**Water lev. [m]:**	9.06
Longitude [°]	24.686240	**Alt. No. 2:**		**Depth [m]:**	130.00	**Piezometer:**	0
Altitude [m]:		**Rep. inst.:**	SRK	**Col. ht. [mm]:**	0.01	**Date WL meas.:**	20081011

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Multirate Test



Constant Rate Test



PUMPING TEST:

Rep. Inst.	Meth. tested	Depth to intake [m]	Starting Date	Time	Ending Date	Time	Transmis. [m²/d]	Storativ.	Rec. abs. [l/s]
SRK	Step test	100.00	20081011	1226	20081011	2026			
SRK	Constant rate test	100.00	20081011	2100	20081013	0900	33.3	0.001	1.80

TESTING DETAILS:

Description	Time start.	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recov. [m]	%	Rec. Dur. [min]	Trans. [m²/d]	Perm. [m/d]	Storat.	Q/st
STEP 1	1226	60	100.00	1.94	4.26							0.46
STEP 2	1326	60	100.00	3.01	7.61							0.40
STEP 3	1426	60	100.00	4.11	11.49							0.36
STEP 4	1526	60	100.00	5.25	15.00	0.76	95	240				0.35
CD	2100	1440	100.00	4.05	14.53	0.46	97	720	33.3		0.001	0.28

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

APPENDIX 5: WATER QUALITY

CHEMISTRY REPORT

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0001 ***Number:*** EC/N24/091 ***Site type:*** Borehole

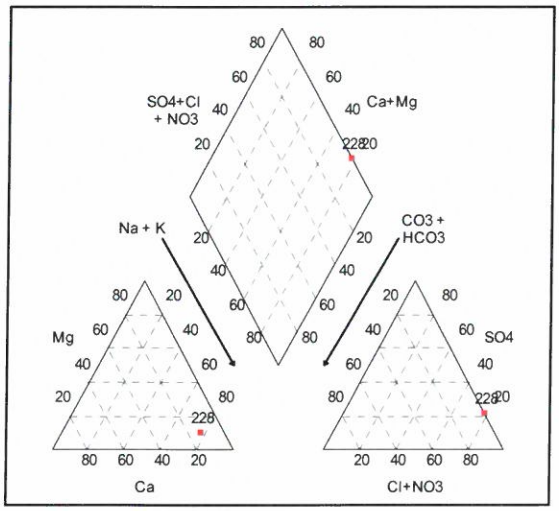
Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

Region Type: District Council ***Region Descr.:*** CACADU

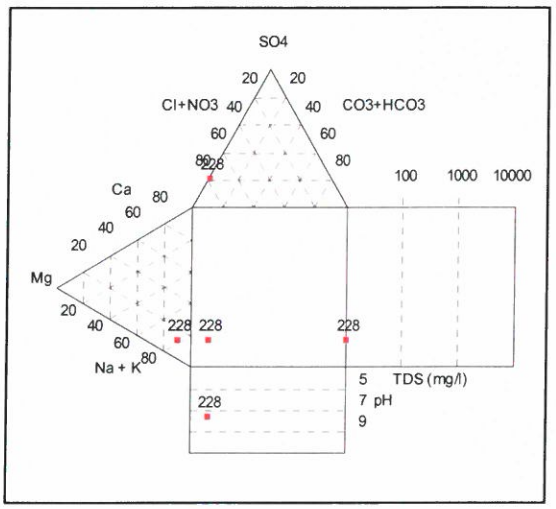
Latitude [°]:	32.947060	***Reg./BB.:***		***Topo-set.:***		***Depth [m]:***	115.00
Longitude [°]:	24.653500	***G-Nr.:***		***Site status:***	Unused	***Col. ht. [m]:***	0.34
Altitude [m]:	407.00			***Site purp.:***	Production (water supply)	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Piper Diagram



Durov Diagram



SAMPLE INFORMATION:

Chem. ref.	***Sample***	***Meth. sampled***	***Sample Type***	***Date sampl.***	***Time samp.***	***Time pump.***	***Depth sampl. [m]***	***Date analysed***	***Laboratory***
228	EC/N24/091	Pump	Drinking water	20081124	0600		63	20081201	TALBOT

MAIN PARAMETERS: *EC mS/m*

Chem. ref. nr.	***pH***	***TDS***	***Ca***	***Mg***	***Na***	***K***	***P. Alk.***	***T. Alk.***	***P. Acid.***	***M. Acid.***
228	7.6	190 †	47	23	327 †	3.1				

Chem. ref. nr.	***Si***	***Cl***	***SO4***	***NO3 as N***	***F***	***CO3***	***HCO3***	***Al***	***Mn***	***Fe***
228		310 †	117	0.21	1.08 †				0.46 †	0.24 †

ADDITIONAL PARAMETERS:

Chem. ref. nr.	***NH4 as N***	***NO2 as N***	***PO4***	***S***	***CN***	***B***	***As***	***Sb***	***Bi***	***Cu***	***Pb***
228							0.002				

Chem. ref. nr.	***Zn***	***Cr***	***Ni***	***Ti***	***Hg***	***Mo***	***Co***	***Ba***	***Sr***	***Cd***
228										0.001

ORGANIC PARAMETERS:

Chem. ref. nr.	***COD***	***Cl2***	***DOC***	***TOC***	***DO***	***BOD***	***H2S***	***Phenols***	***Tot. Oil***	***Soap***	***Kjeldl-N***
228											

BACTERIOLOGICAL PARAMETERS:

Chem. ref. nr.	***E.Coli***	***Faec. co***	***Som. Col***	***Total Co***	***Faec. St***	***SPC***	***Prot. Pa***	***Ent. Vir***	***TVO***
228	0	0		2					

PHYSICAL PROPERTIES AND ISOTOPES:

Chem. ref. nr.	***Colour***	***Odour***	***Taste***	***S. Grav. MBAS***	***Temp.***	***Turb.***	***Susp. So***	***C14***	***H2***	***H3***	***O18***
228						8.1 ‡					

Bact. param. in counts/100ml
Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit
‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit
¡ Value exceeds minimim allowable limit

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

CHEMISTRY REPORT

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0004 **Number:** EC/N24/094 **Site type:** Borehole

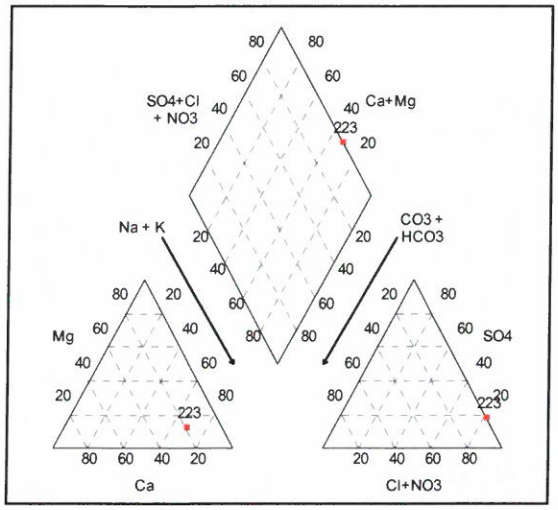
Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

Region Type: District Council **Region Descr.:** 378515 DWAF FEAS JANSENVILLE

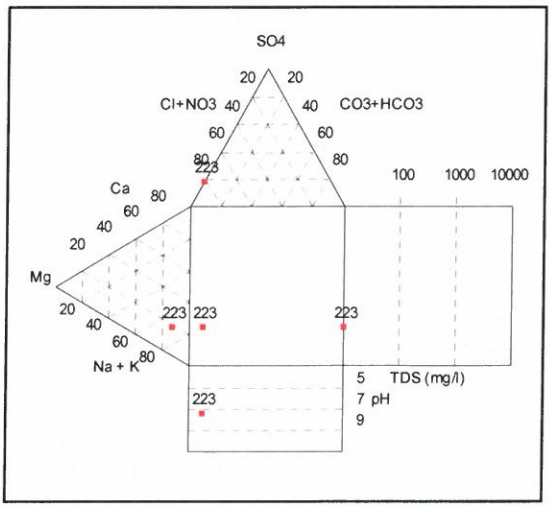
Latitude [°]:	32.949100	**Reg./BB.:**		**Topo-set.:**	Flat surface, plain	**Depth [m]:**	183.00
Longitude [°]:	24.661900	**G-Nr.:**		**Site status:**	Unused	**Col. ht. [m]:**	0.50
Altitude [m]:	400.00			**Site purp.:**	Production (water supply)	**Diam. [mm]:**	169
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Domestic - all purposes	**Drain. reg.:**	N24
Coord. meth.:	Global Positioning System			**Equipment:**	No equipment	**Rep. inst.:**	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Piper Diagram



Durov Diagram



SAMPLE INFORMATION:

Chem. ref.	Sample	Meth. sampled	Sample Type	Date sampl.	Time samp.	Time pump.	Depth sampl. [m]	Date analysed	Laboratory
223	EC/N24/094	Pump	Drinking water	20080928	1300		69	20081008	TALBOT

MAIN PARAMETERS: EC mS/m

Chem. ref. nr.	pH		TDS	Ca	Mg	Na	K	P. Alk.	T. Alk.	P. Acid.	M. Acid.
223	7.4	172 †		59	25	249 †	2.8				

Chem. ref. nr.	Si	Cl	SO4	NO3 as N	F	CO3	HCO3	Al	Mn	Fe
223		282 †	86.8	0.28	1.59 ‡				0.62 †	0.03

ADDITIONAL PARAMETERS:

Chem. ref. nr.	NH4 as N	NO2 as N	PO4	S	CN	B	As	Sb	Bi	Cu	Pb
223							0.002				

Chem. ref. nr.	Zn	Cr	Ni	Ti	Hg	Mo	Co	Ba	Sr	Cd
223										

ORGANIC PARAMETERS:

Chem. ref. nr.	COD	Cl2	DOC	TOC	DO	BOD	H2S	Phenols	Tot.	Oil	Soap	Kjeldl-N
223												

BACTERIOLOGICAL PARAMETERS:

Chem. ref. nr.	E.Coli	Faec. co	Som. Col	Total Co	Faec. St	SPC	Prot. Pa	Ent. Vir	TVO
223									

PHYSICAL PROPERTIES AND ISOTOPES:

Chem. ref. nr.	Colour	Odour	Taste	S. Grav. MBAS	Temp.	Turb.	Susp. So	C14	H2	H3	O18
223						1.4 †					

CALCULATED PARAMETERS:

Chem. ref. nr.	sum TDS	TDS-EC*7	Cations	Anions	Ion-bal	CaCO3	Ca Hard.	Mg Hard.	Aggr-Ind	Langel.	CRT	SAR
223	704.10	1204.00	15.90	9.87	23.43	250.03		102.90				6.85

Bact. param. in counts/100ml
Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit
‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit
¡ Value exceeds minimim allowable limit

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

CHEMISTRY REPORT

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0005 ***Number:*** EC/N24/095 ***Site type:*** Borehole

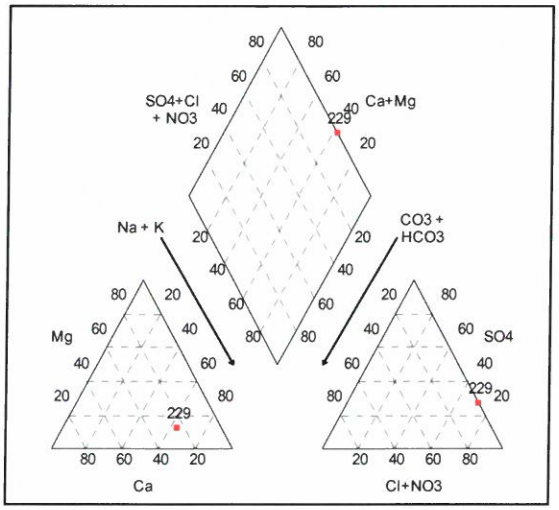
Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

Region Type: District Council ***Region Descr.:*** CACADU

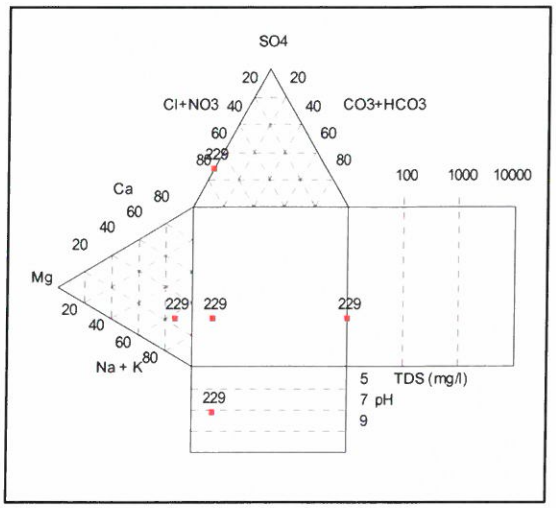
Latitude [°]:	32.945320	***Reg./BB.:***		***Topo-set.:***	In or along river	***Depth [m]:***	100.00
Longitude [°]:	24.657000	***G-Nr.:***		***Site status:***	Unused	***Col. ht. [m]:***	0.50
Altitude [m]:	408.00			***Site purp.:***	Production (water supply)	***Diam. [mm]:***	169
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Domestic - all purposes	***Drain. reg.:***	N24
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Piper Diagram



Durov Diagram



SAMPLE INFORMATION:

Chem. ref.	*Sample*	*Meth. sampled*	*Sample Type*	*Date sampl.*	*Time samp.*	*Time pump.*	*Depth sampl. [m]*	*Date analysed*	*Laboratory*
229	EC/N24/095	Pump	Drinking water	20081124	0000		69	20081124	TALBOT

MAIN PARAMETERS: *EC mS/m*

Chem. ref. nr.	*pH*		*TDS*	*Ca*	*Mg*	*Na*	*K*	*P. Alk.*	*T. Alk.*	*P. Acid.*	*M. Acid.*
229	7.3	207 †		97	33	293 †	3.5				

Chem. ref. nr.	*Si*	*Cl*	*SO4*	*NO3 as N*	*F*	*CO3*	*HCO3*	*Al*	*Mn*	*Fe*
229		250	132	0.34	0.99				0.33 †	0.18 †

ADDITIONAL PARAMETERS:

Chem. ref. nr.	*NH4 as N*	*NO2 as N*	*PO4*	*S*	*CN*	*B*	*As*	*Sb*	*Bi*	*Cu*	*Pb*
229							0.002				

Chem. ref. nr.	*Zn*	*Cr*	*Ni*	*Ti*	*Hg*	*Mo*	*Co*	*Ba*	*Sr*	*Cd*
229										0.001

ORGANIC PARAMETERS:

Chem. ref. nr.	*COD*	*Cl2*	*DOC*	*TOC*	*DO*	*BOD*	*H2S*	*Phenols*	*Tot. Oil*	*Soap*	*Kjeldl-N*
229											

BACTERIOLOGICAL PARAMETERS:

Chem. ref. nr.	*E.Coli*	*Faec. co*	*Som. Col*	*Total Co*	*Faec. St*	*SPC*	*Prot. Pa*	*Ent. Vir*	*TVO*
229	0	0		4					

PHYSICAL PROPERTIES AND ISOTOPES:

Chem. ref. nr.	*Colour*	*Odour*	*Taste*	*S. Grav. MBAS*	*Temp.*	*Turb.*	*Susp. So*	*C14*	*H2*	*H3*	*O18*
229						5.8 ‡					

Bact. param. in counts/100ml
Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit
‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit
¡ Value exceeds minimim allowable limit

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

CHEMISTRY REPORT

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0007 **Number:** EC/N24/097 **Site type:** Borehole

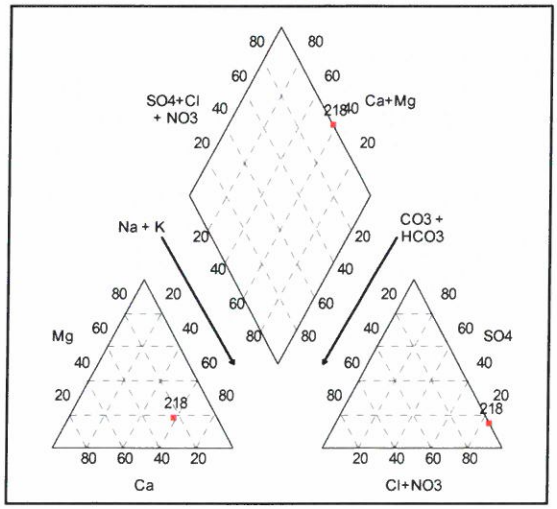
Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

Region Type: District Council **Region Descr.:** CACADU

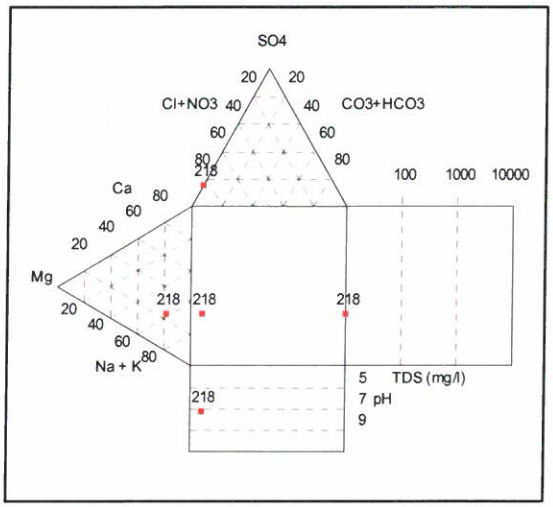
Latitude [°]:	32.949190	**Reg./BB.:**	**Topo-set.:**	In or along river	**Depth [m]:** 150.00
Longitude [°]:	24.671940	**G-Nr.:**	**Site status:**	Unused	**Col. ht. [m]:** 0.50
Altitude [m]:	403.00		**Site purp.:**	Production (water supply)	**Diam. [mm]:** 217
Coord. acc.:	Accurate to within 10 units		**Use applic.:**	Domestic - all purposes	**Drain. reg.:** N24
Coord. meth.:	Global Positioning System		**Equipment:**	No equipment	**Rep. inst.:** SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Piper Diagram



Durov Diagram



SAMPLE INFORMATION:

Chem. ref.	Sample	Meth. sampled	Sample Type	Date sampl.	Time samp.	Time pump.	Depth sampl. [m]	Date analysed	Laboratory
218	EC/N24/097	Pump	Drinking water	20080906	0000		51	20080915	TALBOT

MAIN PARAMETERS: EC mS/m

Chem. ref. nr.	pH	TDS	Ca	Mg	Na	K	P. Alk.	T. Alk.	P. Acid.	M. Acid.
218	7.3	442 ‡	208 ‡	99 †	590 ‡	4.4				

Chem. ref. nr.	Si	Cl	SO4	NO3 as N	F	CO3	HCO3	Al	Mn	Fe
218		995 ‡	245 †	1.09	0.96					0.3 †

ADDITIONAL PARAMETERS:

Chem. ref. nr.	NH4 as N	NO2 as N	PO4	S	CN	B	As	Sb	Bi	Cu	Pb
218							0.002				

Chem. ref. nr.	Zn	Cr	Ni	Ti	Hg	Mo	Co	Ba	Sr	Cd
218										

ORGANIC PARAMETERS:

Chem. ref. nr.	COD	Cl2	DOC	TOC	DO	BOD	H2S	Phenols	Tot. Oil	Soap	Kjeldl-N
218											

BACTERIOLOGICAL PARAMETERS:

Chem. ref. nr.	E.Coli	Faec. co	Som. Col	Total Co	Faec. St	SPC	Prot. Pa	Ent. Vir	TVO
218	0	0		0					

PHYSICAL PROPERTIES AND ISOTOPES:

Chem. ref. nr.	Colour	Odour	Taste	S. Grav. MBAS	Temp.	Turb.	Susp. So	C14	H2	H3	O18
218						0.7					

CALCULATED PARAMETERS:

Chem. ref. nr.	sum TDS	TDS-EC*7	Cations	Anions	Ion-bal	CaCO3	Ca Hard.	Mg Hard.	Aggr-Ind	Langel.	CRT	SAR
218	2144.13	3094.00	44.30	33.30	14.18	926.15		407.48				8.43

Bact. param. in counts/100ml
Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit
‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit
¡ Value exceeds minimim allowable limit

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

CHEMISTRY REPORT

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0008 **Number:** EC/N24/098 **Site type:** Borehole

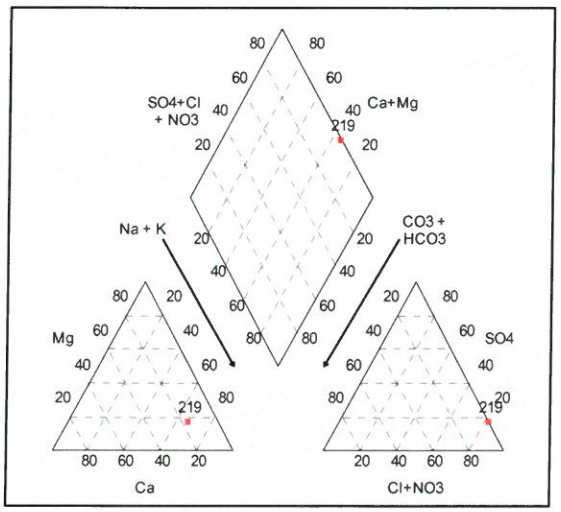
Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

Region Type: District Council **Region Descr.:** CACADU

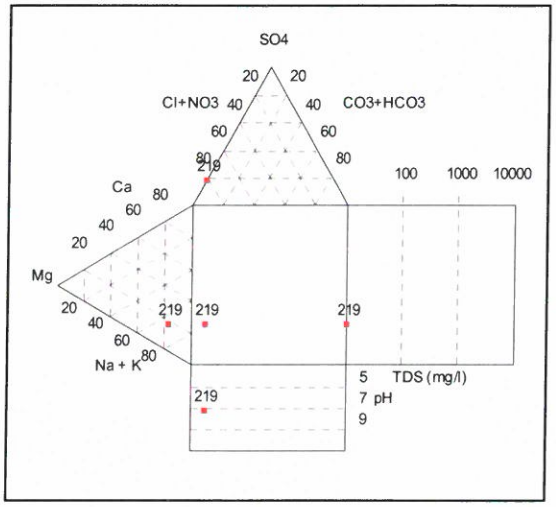
Latitude [°]:	32.949400	**Reg./BB.:**		**Topo-set.:**		**Depth [m]:**	141.00
Longitude [°]:	24.671300	**G-Nr.:**		**Site status:**	Unused	**Col. ht. [m]:**	0.50
Altitude [m]:	415.00			**Site purp.:**	Production (water supply)	**Diam. [mm]:**	216
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Domestic - all purposes	**Drain. reg.:**	N24
Coord. meth.:	Global Positioning System			**Equipment:**	No equipment	**Rep. inst.:**	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Piper Diagram



Durov Diagram



SAMPLE INFORMATION:

Chem. ref.	Sample	Meth. sampled	Sample Type	Date sampl.	Time samp.	Time pump.	Depth sampl. [m]	Date analysed	Laboratory
219	EC/N24/098	Pump	Drinking water	20080908	0000		69	20080915	TALBOT

MAIN PARAMETERS: EC mS/m

Chem. ref. nr.	pH	TDS	Ca	Mg	Na	K	P. Alk.	T. Alk.	P. Acid.	M. Acid.
219	7.3	424 ‡	147	93 †	645 ‡	4.3				

Chem. ref. nr.	Si	Cl	SO4	NO3 as N	F	CO3	HCO3	Al	Mn	Fe
219		890 ‡	264 †	1.32	1.14 †					

ADDITIONAL PARAMETERS:

Chem. ref. nr.	NH4 as N	NO2 as N	PO4	S	CN	B	As	Sb	Bi	Cu	Pb
219							0.002				

Chem. ref. nr.	Zn	Cr	Ni	Ti	Hg	Mo	Co	Ba	Sr	Cd
219										

ORGANIC PARAMETERS:

Chem. ref. nr.	COD	Cl2	DOC	TOC	DO	BOD	H2S	Phenols	Tot.	Oil	Soap	Kjeldl-N
219												

BACTERIOLOGICAL PARAMETERS:

Chem. ref. nr.	E.Coli	Faec. co	Som. Col	Total Co	Faec. St	SPC	Prot. Pa	Ent. Vir	TVO
219	0	0		0					

PHYSICAL PROPERTIES AND ISOTOPES:

Chem. ref. nr.	Colour	Odour	Taste	S. Grav.	MBAS	Temp.	Turb.	Susp. So	C14	H2	H3	O18
219							1.6 †					

CALCULATED PARAMETERS:

Chem. ref. nr.	sum TDS	TDS-EC*7	Cations	Anions	Ion-bal	CaCO3	Ca Hard.	Mg Hard.	Aggr-Ind	Langel.	CRT	SAR
219	2045.92	2968.00	43.15	30.76	16.77	749.27		382.79				10.25

Bact. param. in counts/100ml
Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit
‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit
¡ Value exceeds minimim allowable limit

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

CHEMISTRY REPORT

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0009 ***Number:*** EC/N24/099 ***Site type:*** Borehole

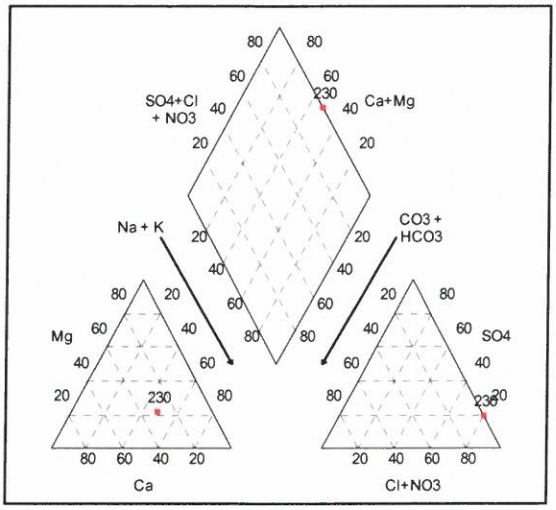
Distr./Farm No.: JANSENV ***Site Name/Des.:*** 378515 DWAF FEAS JANSENVILLE

Region Type: District Council ***Region Descr.:*** CACADU

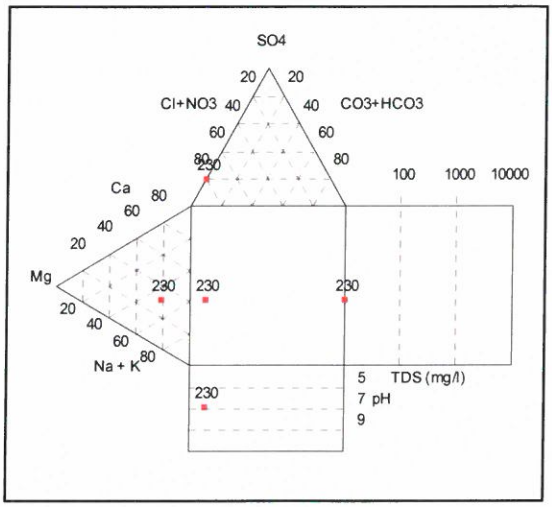
Latitude [°]:	32.944740	***Reg./BB.:***	***Topo-set.:***		***Depth [m]:*** 127.00
Longitude [°]:	24.686670	***G-Nr.:***	***Site status:***	Unused	***Col. ht. [m]:***
Altitude [m]:	403.00		***Site purp.:***	Production (water supply)	***Diam. [mm]:***
Coord. acc.:	Accurate to within 10 units		***Use applic.:***	Domestic - all purposes	***Drain. reg.:*** N24
Coord. meth.:	Global Positioning System		***Equipment:***	No equipment	***Rep. inst.:*** SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Piper Diagram



Durov Diagram



SAMPLE INFORMATION:

Chem. ref.	***Sample***	***Meth. sampled***	***Sample Type***	***Date sampl.***	***Time samp.***	***Time pump.***	***Depth sampl. [m]***	***Date analysed***	***Laboratory***
230	EC/N24/099	Pump	Drinking water	20081011	0000		100	20081022	TALBOT

MAIN PARAMETERS: *EC mS/m*

Chem. ref. nr.	***pH***		***TDS***	***Ca***	***Mg***	***Na***	***K***	***P. Alk.***	***T. Alk.***	***P. Acid.***	***M. Acid.***
230	6.8	241 †		137	58	239 †	3.4				

Chem. ref. nr.	***Si***	***Cl***	***SO4***	***NO3 as N***	***F***	***CO3***	***HCO3***	***Al***	***Mn***	***Fe***
230		390 †	137	11.2 †	1.28 †				0.36 †	0.04

ADDITIONAL PARAMETERS:

Chem. ref. nr.	***NH4 as N***	***NO2 as N***	***PO4***	***S***	***CN***	***B***	***As***	***Sb***	***Bi***	***Cu***	***Pb***
230							0.002				

Chem. ref. nr.	***Zn***	***Cr***	***Ni***	***Ti***	***Hg***	***Mo***	***Co***	***Ba***	***Sr***	***Cd***
230										

ORGANIC PARAMETERS:

Chem. ref. nr.	***COD***	***Cl2***	***DOC***	***TOC***	***DO***	***BOD***	***H2S***	***Phenols***	***Tot. Oil***	***Soap***	***Kjeldl-N***

BACTERIOLOGICAL PARAMETERS:

Chem. ref. nr.	***E.Coli***	***Faec. co***	***Som. Col***	***Total Co***	***Faec. St***	***SPC***	***Prot. Pa***	***Ent. Vir***	***TVO***

PHYSICAL PROPERTIES AND ISOTOPES:

Chem. ref. nr.	***Colour***	***Odour***	***Taste***	***S. Grav. MBAS***	***Temp.***	***Turb.***	***Susp. So***	***C14***	***H2***	***H3***	***O18***
230						201 ‡					

Bact. param. in counts/100ml
Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit
‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit
¡ Value exceeds minimim allowable limit

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

CHEMISTRY REPORT

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0010 **Number:** EC/N24/100 **Site type:** Borehole

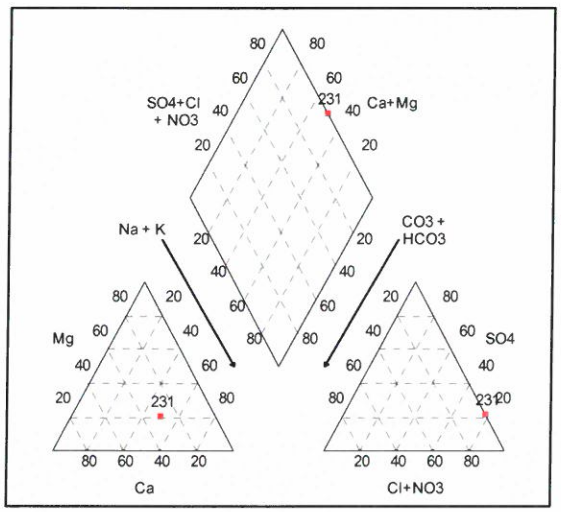
Distr./Farm No.: JANSENV **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

Region Type: District Council **Region Descr.:** CACADU

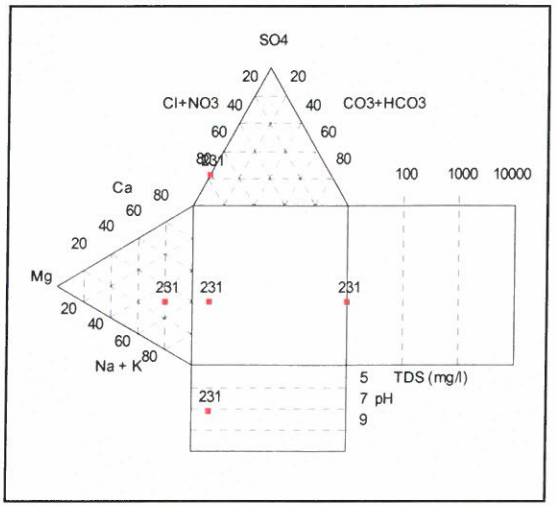
Latitude [°]:	32.948670	**Reg./BB.:**		**Topo-set.:**	Flat surface, plain	**Depth [m]:**	254.00
Longitude [°]:	24.672570	**G-Nr.:**		**Site status:**	Unused	**Col. ht. [m]:**	
Altitude [m]:	701.00			**Site purp.:**	Production (water supply)	**Diam. [mm]:**	305
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Domestic - all purposes	**Drain. reg.:**	N24
Coord. meth.:	Global Positioning System			**Equipment:**	No equipment	**Rep. inst.:**	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Piper Diagram



Durov Diagram



SAMPLE INFORMATION:

Chem. ref.	Sample	Meth. sampled	Sample Type	Date sampl.	Time samp.	Time pump.	Depth sampl. [m]	Date analysed	Laboratory
231	EC/N24/100	Pump	Drinking water	20081011	0000		100	20081022	TALBOT

MAIN PARAMETERS: EC mS/m

Chem. ref. nr.	pH	TDS	Ca	Mg	Na	K	P. Alk.	T. Alk.	P. Acid.	M. Acid.
231	7.3	568 ‡	330 ‡	135 ‡	621 ‡	5				

Chem. ref. nr.	Si	Cl	SO4	NO3 as N	F	CO3	HCO3	Al	Mn	Fe
231		1055 ‡	410 †	2.57	0.95				0.31 †	0.03

ADDITIONAL PARAMETERS:

Chem. ref. nr.	NH4 as N	NO2 as N	PO4	S	CN	B	As	Sb	Bi	Cu	Pb
231							0.002				

Chem. ref. nr.	Zn	Cr	Ni	Ti	Hg	Mo	Co	Ba	Sr	Cd
231										

ORGANIC PARAMETERS:

Chem. ref. nr.	COD	Cl2	DOC	TOC	DO	BOD	H2S	Phenols	Tot. Oil	Soap	Kjeldl-N

BACTERIOLOGICAL PARAMETERS:

Chem. ref. nr.	E.Coli	Faec. co	Som. Col	Total Co	Faec. St	SPC	Prot. Pa	Ent. Vir	TVO

PHYSICAL PROPERTIES AND ISOTOPES:

Chem. ref. nr.	Colour	Odour	Taste	S. Grav. MBAS	Temp.	Turb.	Susp. So	C14	H2	H3	O18
231						2.8 †					

RARE PARAMETERS:

Chem. ref. nr.	Li	Ce	Au	Ag	Pt	Te	Tl	W	V	U	Se	Be	Br	I

Bact. param. in counts/100ml
Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit
‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit
¡ Value exceeds minimim allowable limit

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

CHEMISTRY REPORT

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0011 **Number:** EC/N24/101 **Site type:** Borehole

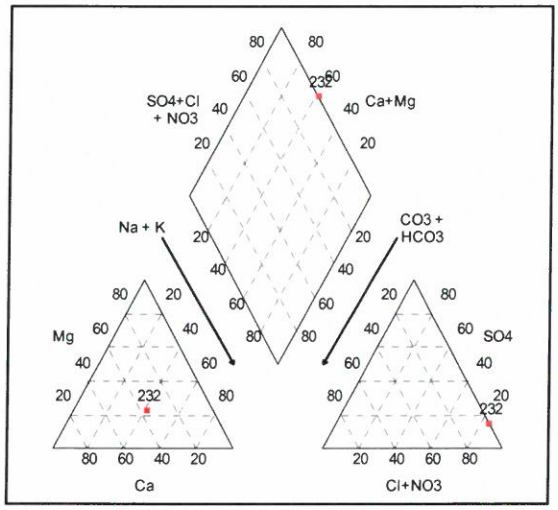
Distr./Farm No.: TOWN **Site Name/Des.:** 378515 DWAF FEAS JANSENVILLE

Region Type: District Council **Region Descr.:** CACADU

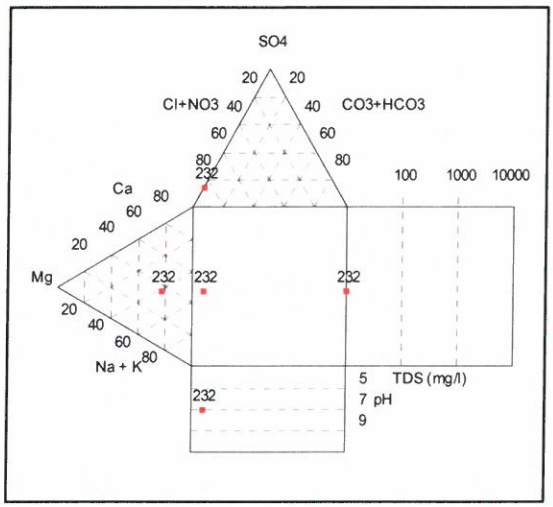
Latitude [°]:	32.944350	**Reg./BB.:**		**Topo-set.:**		**Depth [m]:**	130.00
Longitude [°]:	24.686240	**G-Nr.:**		**Site status:**	Unused	**Col. ht. [m]:**	0.01
Altitude [m]:				**Site purp.:**	Production (water supply)	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Domestic - all purposes	**Drain. reg.:**	N24
Coord. meth.:	Global Positioning System			**Equipment:**	No equipment	**Rep. inst.:**	SRK

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

Piper Diagram



Durov Diagram



SAMPLE INFORMATION:

Chem. ref.	Sample	Meth. sampled	Sample Type	Date sampl.	Time samp.	Time pump.	Depth sampl. [m]	Date analysed	Laboratory
232	EC/N24/101	Pump	Drinking water	20081011	0000		100	20081011	TALBOT

MAIN PARAMETERS: EC mS/m

Chem. ref. nr.	pH		TDS	Ca	Mg	Na	K	P. Alk.	T. Alk.	P. Acid.	M. Acid.
232	7.1	310 ‡		207 ‡	79 †	270 †	4.1				

Chem. ref. nr.	Si	Cl	SO4	NO3 as N	F	CO3	HCO3	Al	Mn	Fe
232		620 ‡	161	20.5 ‡	0.87				0.39 †	0.03

ADDITIONAL PARAMETERS:

Chem. ref. nr.	NH4 as N	NO2 as N	PO4	S	CN	B	As	Sb	Bi	Cu	Pb
232							0.002				

Chem. ref. nr.	Zn	Cr	Ni	Ti	Hg	Mo	Co	Ba	Sr	Cd
232										

ORGANIC PARAMETERS:

Chem. ref. nr.	COD	Cl2	DOC	TOC	DO	BOD	H2S	Phenols	Tot.	Oil	Soap	Kjeldl-N

BACTERIOLOGICAL PARAMETERS:

Chem. ref. nr.	E.Coli	Faec. co	Som. Col	Total Co	Faec. St	SPC	Prot. Pa	Ent. Vir	TVO

PHYSICAL PROPERTIES AND ISOTOPES:

Chem. ref. nr.	Colour	Odour	Taste	MBAS	S. Grav.	Temp.	Turb.	Susp. So	C14	H2	H3	O18
232							1.6 †					

RARE PARAMETERS:

Chem. ref. nr.	Li	Ce	Au	Ag	Pt	Te	Tl	W	V	U	Se	Be	Br	I

Bact. param. in counts/100ml
Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit
‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit
¡ Value exceeds minimim allowable limit

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

PROJECT NAME JANSENVILLE
PROJECT NUMBER 378515

SRK Consulting
Engineers and Scientists

Element	Unit	SAMPLE ID	EC/N24/050		EC/N24/053		EC/N24/069		EC/N24/094		EC/N24/097		EC/N24/098		Classification system				
			Value	Result	Value	Result	Value	Result	Value	Result	Value	Result	Value	Result	Ideal Class 0	Good Class 1	Marginal Class 2	Poor Class 3	Un-acceptable Class 4
Alkalinity	mg/l																		
Ammonia (as N)	mg/l		0.76	Ideal	0.73	Ideal	0.59	Ideal	0.43	Ideal		Not Analysed		Not Analysed	<1	1 - 2	2 - 10	> 10	
Arsenic (as As)	mg/l			Not Analysed		Not Analysed		Not Analysed	0.002	Ideal	0.002	Ideal	0.002	Ideal	< 0.010	0.01 - 0.05	0.05 - 0.2	0.2 - 2	> 2
Cadmium (Cd)	mg/l			Not Analysed		Not Analysed		Not Analysed		Not Analysed		Not Analysed		Not Analysed	< 0.003	0.003 - 0.005	0.005 - 0.02	0.02 - 0.05	> 0.05
Calcium (as Ca)	mg/l		490	Poor	580	Poor	300	Marginal	59	Ideal		Not Analysed		Not Analysed	0 - 80	80 - 150	150 - 300	> 300	
Calsium hardness (as CaCO3)	mg/l		474		1448		749												
Chloride (as Cl)	mg/l		2124	Unacceptable	3274	Unacceptable	1475	Unacceptable	282	Marginal	995	Poor	890	Poor	< 100	100 - 200	200 - 600	600 - 1200	> 1200
E-Coli ***	No/100 ml			Not Analysed		Not Analysed		Not Analysed		Not Analysed	0.00	Ideal	0.00	Ideal	0		1	> 1	
Electrical Conductivity	mg/l		740	Unacceptable	1000	Unacceptable	637	Unacceptable	172	Marginal	442	Poor	424	Poor	< 70	70 - 150	150 - 370	370 - 520	> 520
Faecal Coliforms	No/100 ml		210.00	Unacceptable	6.00	Marginal	0.00	Ideal		Not Analysed	0.00	Ideal	0.00	Ideal	0	0 - 1	1 - 10	10 - 100	> 100
Fluoride (as F)	mg/l		1.22	Marginal	1.27	Marginal	1.18	Marginal	1.59	Poor	0.96	Good	1.14	Marginal	< 0.7	0.7 - 1.0	1.0 - 1.5	1.5 - 3.5	> 3.5
Free Chlorine (as Cl_2)	mg/l			Not Analysed		Not Analysed		Not Analysed		Not Analysed		Not Analysed		Not Analysed	0.3 - 0.6	(0.2 - 0.3) (0.6 - 0.8)	(0.1 - 0.2) (0.8 - 1.0)	(0.05 - 0.1) (1.0 - 1.5)	(<0.05) (>1.5)
Iron (as Fe)	mg/l		0.11	Ideal	0.05	Ideal	0.06	Ideal	0.03	Ideal	0.3	Ideal	0.29	Ideal	< 0.5	0.5 - 1.0	1 - 5	5 - 10	> 10
Lead (as Pb)	mg/l		0.05	Ideal	0.05	Ideal	0.05	Ideal		Not Analysed		Not Analysed		Not Analysed	< 10	10 - 50	50 - 100	100 - 300	> 300
Magnesium (as Mg)	mg/l		190	Marginal	390	Poor	173	Marginal	25	Ideal	99	Good	93	Good	< 70	70 - 100	100 - 200	200 - 400	> 400
Magnesium hardness (as CaCO3)	mg/l		712		1606		712												
Manganese (Mn)	mg/l			Not Analysed		Not Analysed		Not Analysed	0.62	Marginal	1.06	Marginal	0.18	Good	< 0.1	0.1 - 0.4	0.4 - 4	4 - 10	> 10
Nitrate (as N)	mg/l		0.46	Ideal	19.2	Marginal	28.8	Poor	0.28	Ideal	1.09	Ideal	1.32	Ideal	< 6	6 - 10	10 - 20	20 - 40	> 40
pH	Units		7.1	Ideal	6.8	Ideal	7	Ideal	7.4	Ideal	7.3	Ideal	7.3	Ideal	5 - 9.5	(4.5 - 5) (9.5 - 10)	(4 - 4.5) (10 - 10.5)	(3 - 4) (10.5 - 11)	(<3) (>11)
Potassium (as K)	mg/l		5.8	Ideal	18	Ideal	7.5	Ideal	2.8	Ideal	4.4	Ideal	4.3	Ideal	< 25	25 - 50	50 - 100	100 - 500	> 500
Sodium (as Na)	mg/l		890	Poor	1100	Unacceptable	910	Poor	249	Marginal	590	Poor	645	Poor	< 100	100 - 200	200 - 400	400 - 1000	> 1000
Sulphate (as SO4)	mg/l		797	Poor	1050	Unacceptable	626	Poor	86.8	Ideal	245	Good	264	Good	< 200	200 - 400	400 - 600	600 - 1000	> 1000
Total Coliforms	No/100 ml		7000.00	Unacceptable	29000.00	Unacceptable	0.00	Ideal		Not Analysed	0.00	Ideal	0.00	Ideal	0	0 - 10	10 - 100	100 - 1000	> 1000
Total Count	No/100 ml																		
Total Dissolved solids	mg/l		5568	Unacceptable	8452	Unacceptable	4828	Unacceptable		Not Analysed		Not Analysed		Not Analysed	< 450	450 - 1000	1000 - 2400	2400 - 3400	> 3400
Total Hardness	mg/l		1186	Poor	3054	Poor	1461	Poor	250	Good	927	Poor	750	Poor	< 200	200 - 300	300 - 600	> 600	
Turbidity	NTU		38.3	Poor	1.2	Marginal	5.2	Marginal	1.4	Marginal	0.7	Good	1.6	Marginal	< 0.1	0.1 - 1	1 - 20	20 - 50	> 50
Recommended Class									Poor		Poor		Poor						

NOTES	Above analysis is based on "Quality of Domestic Water Supplies - Volume 1: Assessment Guide, second edition 1998" published jointly by: * The Department of Water Affairs and Forestry, * The Department of Health, * Water Research Commission *** E-Coli analysis according to the SABS 241 Gudeline (Edition 5, 2001)
IDEAL - Class 0	Ideal water quality-suitable for lifetime use.
GOOD - Class 1	Good water quality-suitable for use, rare instances of negative effects.
MARGINAL - Class 2	Marginal water quality-conditionally acceptable. Negative effects may occur in some sensitive groups.
POOR - Class 3	Poor water quality-unsuitable for use without treatment. Chronic effects may occur.
UNACCEPTABLE - Class 4	Dangerous water quality-totally unsuitable for use. Acure effects may occur.

PROJECT NAME JANSENVILLE
PROJECT NUMBER 378515

SRK Consulting
Engineers and Scientists

SAMPLE ID		EC/N24/099		EC/N24/100		EC/N24/101		EC/N24/091		EC/N24/095				Classification system				
Element	***Unit***	**Value**	**Result**	**Value**	**Result**	**Value**	**Result**	**Value**	**Result**	**Value**	**Result**	**Value**	**Result**	**Ideal Class 0**	**Good Class 1**	**Marginal Class 2**	**Poor Class 3**	**Un-acceptable Class 4**
Alkalinity	mg/l																	
Ammonia (as N)	mg/l	1.08	Good	0.14	Ideal	0.08	Ideal		Not Analysed		Not Analysed		Not Analysed	<1	1 - 2	2 - 10	> 10	
Arsenic (as As)	mg/l	0.002	Ideal	0.002	Not Analysed	0.002	Ideal	0.002	Ideal	0.002	Ideal		Not Analysed	< 0.010	0.01 - 0.05	0.05 - 0.2	0.2 - 2	> 2
Cadmium (Cd)	mg/l		Not Analysed		Not Analysed		Not Analysed	0.001	Ideal	0.001	Ideal		Not Analysed	< 0.003	0.003 - 0.005	0.005 - 0.02	0.02 - 0.05	> 0.05
Calcium (as Ca)	mg/l	137	Good	330	Poor	207	Marginal	47	Ideal	97	Good		Not Analysed	0 - 80	80 - 150	150 - 300	> 300	
Calsium hardness (as CaCO3)	mg/l																	
Chloride (as Cl)	mg/l	390	Marginal	1055	Unacceptable	620	Poor	310	Marginal	250	Marginal		Not Analysed	< 100	100 - 200	200 - 600	600 - 1200	> 1200
E-Coli ***	No/100 ml		Not Analysed		Not Analysed		Not Analysed	0.00	Ideal	0.00	Ideal		Not Analysed	0		1	> 1	
Electrical Conductivity	mg/l	241	Marginal	568	Unacceptable	310	Marginal	190	Marginal	207	Marginal		Not Analysed	< 70	70 - 150	150 - 370	370 - 520	> 520
Faecal Coliforms	No/100 ml		Not Analysed		Marginal		Not Analysed	0.00	Ideal	0.00	Ideal		Not Analysed	0	0 - 1	1 - 10	10 - 100	> 100
Fluoride (as F)	mg/l	1.28	Marginal	0.95	Marginal	0.87	Good	1.08	Marginal	0.99	Good		Not Analysed	< 0.7	0.7 - 1.0	1.0 - 1.5	1.5 - 3.5	> 3.5
Free Chlorine (as Cl_2)	mg/l		Not Analysed		Not Analysed		Not Analysed		Not Analysed		Not Analysed		Not Analysed	0.3 - 0.6	(0.2 - 0.3) (0.6 - 0.8)	(0.1 - 0.2) (0.8 - 1.0)	(0.05 - 0.1) (1.0 - 1.5)	(<0.05) (>1.5)
Iron (as Fe)	mg/l	0.04	Ideal	0.03	Ideal	0.03	Ideal	0.24	Ideal	0.18	Ideal		Not Analysed	< 0.5	0.5 - 1.0	1 - 5	5 - 10	> 10
Lead (as Pb)	mg/l		Not Analysed		Ideal		Not Analysed		Not Analysed		Not Analysed		Not Analysed	< 10	10 - 50	50 - 100	100 - 300	> 300
Magnesium (as Mg)	mg/l	58	Ideal	135	Poor	79	Good	23	Ideal	33	Ideal		Not Anlysed	< 70	70 - 100	100 - 200	200 - 400	> 400
Magnesium hardness (as CaCO3)	mg/l																	
Manganese (Mn)	mg/l	0.36	Good	0.31	Not Analysed	0.39	Good	0.46	Marginal	0.33	Good		Not Analysed	< 0.1	0.1 - 0.4	0.4 - 4	4 - 10	> 10
Nitrate (as N)	mg/l	11.2	Marginal	2.57	Marginal	20.5	Poor	0.21	Ideal	0.34	Ideal		Not Analysed	< 6	6 - 10	10 - 20	20 - 40	> 40
pH	Units	6.8	Ideal	7.3	Ideal	7.1	Ideal	7.6	Ideal	7.3	Ideal		Not Analysed	5 - 9.5	(4.5 - 5) (9.5 - 10)	(4 - 4.5) (10 - 10.5)	(3 - 4) (10.5 - 11)	(<3) (>11)
Potassium (as K)	mg/l	3.4	Ideal	5	Ideal	4.1	Ideal	3.1	Ideal	3.5	Ideal		Not Analysed	< 25	25 - 50	50 - 100	100 - 500	> 500
Sodium (as Na)	mg/l	239	Marginal	621	Unacceptable	270	Marginal	327	Marginal	293	Marginal		Not Analysed	< 100	100 - 200	200 - 400	400 - 1000	> 1000
Sulphate (as SO4)	mg/l	137	Ideal	410	Unacceptable	161	Ideal	117	Ideal	132	Ideal		Not Analysed	< 200	200 - 400	400 - 600	600 - 1000	> 1000
Total Coliforms	No/100 ml		Not Analysed		Unacceptable		Not Analysed	2.00	Good	4.00	Good		Not Analysed	0	0 - 10	10 - 100	100 - 1000	> 1000
Total Count	No/100 ml																	
Total Dissolved solids	mg/l		Not Analysed		Unacceptable		Not Analysed		Not Analysed		Not Analysed		Not Analysed	< 450	450 - 1000	1000 - 2400	2400 - 3400	> 3400
Total Hardness	mg/l	581	Marginal	1380	Poor	842	Poor	212	Good	378	Marginal		Not Analysed	< 200	200 - 300	300 - 600	> 600	
Turbidity	NTU	201	Unacceptable	2.8	Marginal	1.6	Marginal	8.1	Marginal	5.8	Marginal		Not Analysed	< 0.1	0.1 - 1	1 - 20	20 - 50	> 50
Recommended Class		Marginal		Unacceptable		Poor		Marginal		Marginal								

NOTES	Above analysis is based on "Quality of Domestic Water Supplies - Volume 1: Assessment Guide, second edition 1998" published jointly by: * The Department of Water Affairs and Forestry, * The Department of Health, * Water Research Commission *** E-Coli analysis according to the SABS 241 Gudeline (Edition 5, 2001)
IDEAL - Class 0	Ideal water quality-suitable for lifetime use.
GOOD - Class 1	Good water quality-suitable for use, rare instances of negative effects.
MARGINAL - Class 2	Marginal water quality-conditionally acceptable. Negative effects may occur in some sensitive groups.
POOR - Class 3	Poor water quality-unsuitable for use without treatment. Chronic effects may occur.
UNACCEPTABLE - Class 4	Dangerous water quality-totally unsuitable for use. Acure effects may occur.

APPENDIX 6: MANAGEMENT RECOMMENDATIONS

MANAGEMENT RECOMMENDATIONS

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0001 **Number:** EC/N24/091 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Descr.:** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.947060	**Alt. No. 1:**		**Diam. [mm]:**	165	**Water lev. [m]:**	8.80
Longitude [°]:	24.653500	**Alt. No. 2:**		**Depth [m]:**	115.00	**WL status:**	Static
Altitude [m]:	407.00	**Rep. inst.:**	SRK	**Col. ht. [m]:**	0.34	**Date WL meas.:**	20081123

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

EXISTING EQUIPMENT:

Pump:

Type of Inst.: **Pulley Diam. [mm]:**

Manufacturer: **Depth to Intk. [m]:**

Engine:

Manufacturer: **Power Rating [kW]**

Type of Power: **Pulley Diam. [mm]:**

USE APPLICATION:

Site Status: Unused

Purpose: Production (water supply)

Consumer: Urban

Application: Domestic - all purposes

WATER CHEMISTRY:

Sample No.: EC/N24/091 **Date sampled:** 20081124 **Depth sampl. [m]:** 63.00 **Comment:**

Main Parameters:						Calculated Parameters:		Bacteriol. Parameters:	
pH:	7.6	**Na:**	327 †	**Cl:**	310 †	**Langel.:**		**E.Coli:**	0
EC: [mS/m]	190 †	**K:**	3.1	**NO3 as N:**	0.21	**Aggr-Ind:**		**Faec. co:**	0
TDS:		**Si:**		**SO4:**	117	**Ion-bal:**	24.46 ‡	**Total Co:**	2
T. Alk.:		**Al:**		**F:**	1.08 †	**CaCO3:**	211.86	**SPC:**	
Ca:	47	**Fe:**	0.24 †						
Mg:	23	**Mn:**	0.46 †						

Concentrations in [mg/l]; Bact. param. in counts/100ml; Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit ‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit ¡ Value exceeds minimim allowable limit

AQUIFER INFORMATION:

Depth to Top [m]	Depth to Bot. [m]	Yield[l/s]	Method meas.	Aquifer type	Comment
14.00	14.00	0.55	Volumetric		
22.00	22.00	0.80	Volumetric		FINAL YIELD 2.3 L/S

CASING DETAILS:

Depth to Top [m]	to Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Type of openings	Openings [mm]: Length	Width	Hor. Dist.	Vert. Dist.
0.00	2.00	177	Steel	4	Plain casing				
2.00	16.00	177	Steel	4	Perforated or slotted				
0.00	10.40	140	PVC		Plain casing				
10.40	22.00	140	PVC		Perforated or slotted				
22.00	27.80	140	PVC		Plain casing				
27.80	33.60	140	PVC		Perforated or slotted				
33.60	39.40	140	PVC		Plain casing				
39.40	45.20	140	PVC		Perforated or slotted				
45.20	51.00	140	PVC		Plain casing				
51.00	56.80	140	PVC		Perforated or slotted				
56.80	80.00	140	PVC		Plain casing				

TESTING DETAILS:

Description	Date	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recovery [m]	%	[min]	T [m²/d]	Storage	Comment
STEP 1	20081123	60	63.00	0.99	2.22						
STEP 2	20081123	60	63.00	1.60	3.97						
STEP 3	20081123	60	63.00	2.00	5.64						
STEP 4	20081123	60	63.00	3.16	9.55	0.49	95	240			
CD	20081123	1440	63.00	3.15	13.26	0.42	96	720	15.6	0.001	

RECOMMENDATIONS:

Prior.	Rec. equipm.	Depth to intk. [m]	Type of power	Duty cyc. [hrs]	Disch. rate [l/s]	Water quality	Dyn. water level [m]	Crit. water level [m]
1	Submersible pump	40.00	Electric motor	24	1.00	MARGINAL	12.60	24.00

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

Note: Shallow water strikes, borehole will be susceptible to dewatering. Water quality can be classed as Marginal and may require treatment - further assessment needed.

2		12	1.40	14.10	12.00

Note:

3		8	1.70	15.00

Note:

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0004 **Number:** EC/N24/094 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Descr.:** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.949100	**Alt. No. 1:**		**Diam. [mm]:**	169	**Water lev. [m]:**	11.20
Longitude [°]:	24.661900	**Alt. No. 2:**		**Depth [m]:**	183.00	**WL status:**	Static
Altitude [m]:	400.00	**Rep. inst.:**	SRK	**Col. ht. [m]:**	0.50	**Date WL meas.:**	20080926

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

EXISTING EQUIPMENT:

Pump:

Type of Inst.:	**Pulley Diam. [mm]:**
Manufacturer:	**Depth to Intk. [m]:**

Engine:

Manufacturer:	**Power Rating [kW]**
Type of Power:	**Pulley Diam. [mm]:**

USE APPLICATION:

Site Status: Unused
Purpose: Production (water supply)
Consumer: Urban
Application: Domestic - all purposes

WATER CHEMISTRY:

Sample No.: EC/N24/094 **Date sampled:** 20080928 **Depth sampl. [m]:** 69.00 **Comment:**

Main Parameters:						Calculated Parameters:		Bacteriol. Parameters:
pH:	7.4	**Na:**	249 †	**Cl:**	282 †	**Langel.:**		**E.Coli:**
EC: [mS/m]	172 †	**K:**	2.8	**NO3 as N:**	0.28	**Aggr-Ind:**		**Faec. co:**
TDS:		**Si:**		**SO4:**	86.8	**Ion-bal:**	23.43 ‡	**Total Co:**
T. Alk.:		**Al:**		**F:**	1.59 ‡	**CaCO3:**	250.03	**SPC:**
Ca:	59	**Fe:**	0.03					
Mg:	25	**Mn:**	0.62 †					

Concentrations in [mg/l]; Bact. param. in counts/100ml; Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit ‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit ¡ Value exceeds minimim allowable limit

AQUIFER INFORMATION:

Depth to Top [m]	Depth to Bot. [m]	Yield[l/s]	Method meas.	Aquifer type	Comment
14.00	14.00	0.88	Volumetric		
37.00	55.00	3.50	Volumetric		FINAL YIELD 4.4 L/S

CASING DETAILS:

Depth to Top [m]	to Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Type of openings	Openings [mm]: Length	Width	Hor. Dist.	Vert. Dist.
0.00	9.00	165	Steel	4	Plain casing				
0.00	10.40	140	PVC		Plain casing				
10.40	16.20	140	PVC		Perforated or slotted				
16.20	22.00	140	PVC		Plain casing				
22.00	27.80	140	PVC		Perforated or slotted				
27.80	56.80	140	PVC		Plain casing				
56.80	62.60	140	PVC		Perforated or slotted				
62.60	80.00	140	PVC		Plain casing				

TESTING DETAILS:

Description	Date	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recovery [m]	%	[min]	T [m²/d]	Storage	Comment
STEP 1	20080920	60	69.00	2.16	2.64						
STEP 2	20080920	60	69.00	3.20	5.72						
STEP 3	20080920	60	69.00	3.74	9.47						
STEP 4	20080920	60	69.00	4.82	17.85						
STEP 5	20080920	60	69.00	6.57	28.97	0.69	98	150			
CD	20080926	2880	69.00	3.53	22.99	1.45	94	2880	4.8	0.001	

RECOMMENDATIONS:

Prior.	Rec. equipm.	Depth to intk. [m]	Type of power	Duty cyc. [hrs]	Disch. rate [l/s]	Water quality	Dyn. water level [m]	Crit. water level [m]
1	Submersible pump	70.00	Electric motor	24	1.00	POOR	16.40	36.00

Note: The water is classed as Poor, mainly due to marginally high Fluoride values.

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

2	12	1.40	17.60

Note:

3	8	1.70	18.10

Note:

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0005 **Number:** EC/N24/095 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Descr.:** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.945320	**Alt. No. 1:**		**Diam. [mm]:**	169	**Water lev. [m]:**	10.80
Longitude [°]:	24.657000	**Alt. No. 2:**		**Depth [m]:**	100.00	**WL status:**	Static
Altitude [m]:	408.00	**Rep. inst.:**	SRK	**Col. ht. [m]:**	0.50	**Date WL meas.:**	20081126

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

EXISTING EQUIPMENT:

Pump:

Type of Inst.: **Pulley Diam. [mm]:**

Manufacturer: **Depth to Intk. [m]:**

Engine:

Manufacturer: **Power Rating [kW]**

Type of Power: **Pulley Diam. [mm]:**

USE APPLICATION:

Site Status: Unused

Purpose: Production (water supply)

Consumer: Urban

Application: Domestic - all purposes

WATER CHEMISTRY:

Sample No.: EC/N24/095 **Date sampled:** 20081124 **Depth sampl. [m]:** 69.00 **Comment:**

Main Parameters:						Calculated Parameters:		Bacteriol. Parameters:	
pH:	7.3	**Na:**	293 †	**Cl:**	250	**Langel.:**		**E.Coli:**	0
EC: [mS/m]	207 †	**K:**	3.5	**NO3 as N:**	0.34	**Aggr-Ind:**		**Faec. co:**	0
TDS:		**Si:**		**SO4:**	132	**Ion-bal:**	34.73 ‡	**Total Co:**	4
T. Alk.:		**Al:**		**F:**	0.99	**CaCO3:**	377.74	**SPC:**	
Ca:	97	**Fe:**	0.18 †						
Mg:	33	**Mn:**	0.33 †						

Concentrations in [mg/l]; Bact. param. in counts/100ml; Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit ‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit ¡ Value exceeds minimim allowable limit

AQUIFER INFORMATION:

Depth to Top [m]	Depth to Bot. [m]	Yield[l/s]	Method meas.	Aquifer type	Comment
13.00	13.00	0.08	Volumetric		
39.00	39.00	0.79	Volumetric		
69.00	69.00	2.08	Volumetric		

CASING DETAILS:

Depth to Top [m]	to Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Type of openings	Openings [mm]: Length	Width	Hor. Dist.	Vert. Dist.
0.30	12.00	165	Steel	4	Plain casing				
0.00	5.40	140	PVC		Plain casing				
5.40	17.00	140	PVC		Perforated or slotted				
17.00	34.40	140	PVC		Plain casing				
34.40	46.00	140	PVC		Perforated or slotted				
46.00	63.40	140	PVC		Plain casing				
63.40	75.00	140	PVC		Perforated or slotted				

TESTING DETAILS:

Description	Date	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recovery [m]	%	[min]	T [m²/d]	Storage	Comment
STEP 1	20081125	60	69.00	1.00	2.06						
STEP 2	20081125	60	69.00	1.52	6.11						
STEP 3	20081125	60	69.00	2.33	14.32						
STEP 4	20081125	60	69.00	3.16	24.69						
STEP 5	20081125	60	69.00	4.12	38.34	0.47	99	180			
CD	20081126	1440	69.00	2.02	17.71	0.42	98	720	5.5	0.001	

RECOMMENDATIONS:

Prior.	Rec. equipm.	Depth to intk. [m]	Type of power	Duty cyc. [hrs]	Disch. rate [l/s]	Water quality	Dyn. water level [m]	Crit. water level [m]
1	Submersible pump	75.00	Electric motor	24	0.70	MARGINAL	16.60	30.00

Note: Water quality is classed as Marginal. Marginal water should be re-assessed by a qualified health body.

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

2	12	1.00	18.40
Note:			
3	8	1.20	19.50
Note:			

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0007 **Number:** EC/N24/097 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Descr.:** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.949190	**Alt. No. 1:**		**Diam. [mm]:**	217	**Water lev. [m]:**	0
Longitude [°]:	24.671940	**Alt. No. 2:**		**Depth [m]:**	150.00	**WL status:**	Static
Altitude [m]:	403.00	**Rep. inst.:**	SRK	**Col. ht. [m]:**	0.50	**Date WL meas.:**	20080905

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

EXISTING EQUIPMENT:

Pump:

Type of Inst.: **Pulley Diam. [mm]:**

Manufacturer: **Depth to Intk. [m]:**

Engine:

Manufacturer: **Power Rating [kW]**

Type of Power: **Pulley Diam. [mm]:**

USE APPLICATION:

Site Status: Unused

Purpose: Production (water supply)

Consumer: Urban

Application: Domestic - all purposes

WATER CHEMISTRY:

Sample No.: EC/N24/097 **Date sampled:** 20080906 **Depth sampl. [m]:** 51.00 **Comment:**

Main Parameters:						Calculated Parameters:		Bacteriol. Parameters:	
pH:	7.3	**Na:**	590 ‡	**Cl:**	995 ‡	**Langel.:**		**E.Coli:**	0
EC: [mS/m]	442 ‡	**K:**	4.4	**NO3 as N:**	1.09	**Aggr-Ind:**		**Faec. co:**	0
TDS:		**Si:**		**SO4:**	245 †	**Ion-bal:**	14.18 ‡	**Total Co:**	0
T. Alk.:		**Al:**		**F:**	0.96	**CaCO3:**	926.15	**SPC:**	
Ca:	208 ‡	**Fe:**	0.3 †						
Mg:	99 †	**Mn:**							

Concentrations in [mg/l]; Bact. param. in counts/100ml; Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit ‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit ¡ Value exceeds minimim allowable limit

AQUIFER INFORMATION:

Depth to Top [m]	Depth to Bot. [m]	Yield[l/s]	Method meas.	Aquifer type	Comment
24.00	24.00	1.84	Volumetric		FINAL YIELD 1.84 L/S

CASING DETAILS:

Depth to Top [m]	to Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Type of openings	Openings [mm]: Length	Width	Hor. Dist.	Vert. Dist.
0.00	12.00	165	Steel	4	Plain casing				
0.00	10.40	140	PVC		Plain casing				
10.40	16.20	140	PVC		Perforated or slotted				
16.20	22.00	140	PVC		Plain casing				
22.00	33.60	140	PVC		Perforated or slotted				
33.60	45.20	140	PVC		Plain casing				
45.20	62.60	140	PVC		Perforated or slotted				
62.60	80.00	140	PVC		Plain casing				

TESTING DETAILS:

Description	Date	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recovery [m]	%	[min]	T [m²/d]	Storage	Comment
STEP 1	20080904	60	51.00	0.81	2.77						
STEP 2	20080904	60	51.00	1.00	4.32						
STEP 3	20080904	60	51.00	1.52	6.87						
STEP 4	20080904	60	51.00	2.42	11.09						
STEP 5	20080904	60	51.00	3.08	14.30	0.68	95	60			
CD	20080905	1440	51.00	2.04	11.39	0.10	99	120	21.7	0.001	

RECOMMENDATIONS:

Prior.	Rec. equipm.	Depth to intk. [m]	Type of power	Duty cyc. [hrs]	Disch. rate [l/s]	Water quality	Dyn. water level [m]	Crit. water level [m]
1	Submersible pump	50.00	Electric motor	24	1.00	POOR	5.60	12.00

Note: Water strikes very shallow and borehole therefore susceptible to dewatering. Close monitoring is necessary. Water quality is classed as Poor (Chloride, Sodium, etc.)

2				12	1.40		7.70

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

Note:

3	8	1.70	9.10

Note:

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0008 **Number:** EC/N24/098 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Descr.:** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.949400	**Alt. No. 1:**		**Diam. [mm]:**	216	**Water lev. [m]:**	8.75
Longitude [°]:	24.671300	**Alt. No. 2:**		**Depth [m]:**	141.00	**WL status:**	Static
Altitude [m]:	415.00	**Rep. inst.:**	SRK	**Col. ht. [m]:**	0.50	**Date WL meas.:**	20080908

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

EXISTING EQUIPMENT:

Pump:

Type of Inst.: **Pulley Diam. [mm]:**

Manufacturer: **Depth to Intk. [m]:**

Engine:

Manufacturer: **Power Rating [kW]**

Type of Power: **Pulley Diam. [mm]:**

USE APPLICATION:

Site Status: Unused

Purpose: Production (water supply)

Consumer: Urban

Application: Domestic - all purposes

WATER CHEMISTRY:

Sample No.: EC/N24/098 **Date sampled:** 20080908 **Depth sampl. [m]:** 69.00 **Comment:**

Main Parameters:						Calculated Parameters:		Bacteriol. Parameters:	
pH:	7.3	**Na:**	645 ‡	**Cl:**	890 ‡	**Langel.:**		**E.Coli:**	0
EC: [mS/m]	424 ‡	**K:**	4.3	**NO3 as N:**	1.32	**Aggr-Ind:**		**Faec. co:**	0
TDS:		**Si:**		**SO4:**	264 †	**Ion-bal:**	16.77 ‡	**Total Co:**	0
T. Alk.:		**Al:**		**F:**	1.14 †	**CaCO3:**	749.27	**SPC:**	
Ca:	147	**Fe:**							
Mg:	93 †	**Mn:**							

Concentrations in [mg/l]; Bact. param. in counts/100ml; Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit ‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit ¡ Value exceeds minimim allowable limit

AQUIFER INFORMATION:

Depth to Top [m]	Depth to Bot. [m]	Yield[l/s]	Method meas.	Aquifer type	Comment
13.00	13.00	0.47	Volumetric		
62.00	62.00	1.26	Volumetric		FINAL YIELD 1.26 L/S

CASING DETAILS:

Depth to Top [m]	to Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Type of openings	Openings [mm]: Length	Width	Hor. Dist.	Vert. Dist.
0.00	12.00	165	Steel	4	Plain casing				
0.00	10.00	140	PVC		Plain casing				
10.00	21.60	140	PVC		Perforated or slotted				
21.60	39.00	140	PVC		Plain casing				
39.00	68.40	140	PVC		Perforated or slotted				
68.40	80.00	140	PVC		Plain casing				

TESTING DETAILS:

Description	Date	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recovery [m]	%	[min]	T [m²/d]	Storage	Comment
STEP 1	20080907	60	69.00	0.72	1.09						
STEP 2	20080907	60	69.00	0.91	1.50						
STEP 3	20080907	60	69.00	1.22	4.22						
STEP 4	20080907	60	69.00	2.10	14.43	0.37	97	5			
CD	20080908	1440	69.00	1.51	9.01	0.25	97	5	9	0.001	

RECOMMENDATIONS:

Prior.	Rec. equipm.	Depth to intk. [m]	Type of power	Duty cyc. [hrs]	Disch. rate [l/s]	Water quality	Dyn. water level [m]	Crit. water level [m]
1	Submersible pump	40.00	Electric motor	24	0.50	POOR	11.70	15.00

Note: Water quality classed as Poor, mainly due to Chloride and Sodium. Water strikes are shallow and therefore the borehole is at risk dewatering.

2				12	0.70		12.60	

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

Note:

3	8	0.90	13.10

Note:

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0009 **Number:** EC/N24/099 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Descr.:** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.944740	**Alt. No. 1:**		**Diam. [mm]:**		**Water lev. [m]:**	9.06
Longitude [°]:	24.686670	**Alt. No. 2:**		**Depth [m]:**	127.00	**WL status:**	Static
Altitude [m]:	403.00	**Rep. inst.:**	SRK	**Col. ht. [m]:**		**Date WL meas.:**	20081009

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

EXISTING EQUIPMENT:

Pump:

Type of Inst.: **Pulley Diam. [mm]:**

Manufacturer: **Depth to Intk. [m]:**

Engine:

Manufacturer: **Power Rating [kW]**

Type of Power: **Pulley Diam. [mm]:**

USE APPLICATION:

Site Status: Unused

Purpose: Production (water supply)

Consumer: Urban

Application: Domestic - all purposes

WATER CHEMISTRY:

Sample No.: EC/N24/099 **Date sampled:** 20081011 **Depth sampl. [m]:** 100.00 **Comment:**

Main Parameters:						Calculated Parameters:		Bacteriol. Parameters:
pH:	6.8	**Na:**	239 †	**Cl:**	390 †	**Langel.:**		**E.Coli:**
EC: [mS/m]	241 †	**K:**	3.4	**NO3 as N:**	11.2 †	**Aggr-Ind:**		**Faec. co:**
TDS:		**Si:**		**SO4:**	137	**Ion-bal:**	20.02 ‡	**Total Co:**
T. Alk.:		**Al:**		**F:**	1.28 †	**CaCO3:**	580.37	**SPC:**
Ca:	137	**Fe:**	0.04					
Mg:	58	**Mn:**	0.36 †					

Concentrations in [mg/l]; Bact. param. in counts/100ml; Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit ‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit ¡ Value exceeds minimim allowable limit

AQUIFER INFORMATION:

Depth to Top [m]	Depth to Bot. [m]	Yield[l/s]	Method meas.	Aquifer type	Comment
36.00	36.00	0.23	Volumetric		
103.00	103.00	0.47	Volumetric		
109.00	109.00	1.26	Volumetric		

CASING DETAILS:

Depth to Top [m]	to Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Type of openings	Openings [mm]: Length	Width	Hor. Dist.	Vert. Dist.
0.00	6.00	165	Steel	4	Plain casing				
0.00	38.40	140	PVC		Plain casing				
38.40	61.60	140	PVC		Perforated or slotted				
61.60	90.60	140	PVC		Plain casing				
90.60	108.00	140	PVC		Perforated or slotted				
108.00	125.40	140	PVC		Plain casing				

TESTING DETAILS:

Description	Date	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recovery [m]	%	[min]	T [m²/d]	Storage	Comment
STEP 1	20081009	60	100.00	0.60	6.02						
STEP 2	20081009	60	100.00	0.81	9.32						
STEP 3	20081009	60	100.00	1.22	15.24						
STEP 4	20081009	60	100.00	2.02	38.80	0.84	98	60			
CD	20081009	1440	100.00	1.02	14.60	0.32	95	720	10.1	0.001	

RECOMMENDATIONS:

Prior.	Rec. equipm.	Depth to intk. [m]	Type of power	Duty cyc. [hrs]	Disch. rate [l/s]	Water quality	Dyn. water level [m]	Crit. water level [m]
1	Submersible pump	50.00	Electric motor	24	0.60	MARGINAL	17.60	25.00

Note:

2				12	0.80		20.90	

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

Note:

3	8	1.00	23.40

Note:

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0010 **Number:** EC/N24/100 **Site type:** Borehole

Distr./Farm No.: JANSENV **Site Name/Descr.:** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.948670	**Alt. No. 1:**		**Diam. [mm]:**	305	**Water lev. [m]:**	8.20
Longitude [°]:	24.672570	**Alt. No. 2:**		**Depth [m]:**	254.00	**WL status:**	Static
Altitude [m]:	701.00	**Rep. inst.:**	SRK	**Col. ht. [m]:**		**Date WL meas.:**	20081014

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

EXISTING EQUIPMENT:

Pump:

Type of Inst.: **Pulley Diam. [mm]:**

Manufacturer: **Depth to Intk. [m]:**

Engine:

Manufacturer: **Power Rating [kW]**

Type of Power: **Pulley Diam. [mm]:**

USE APPLICATION:

Site Status: Unused

Purpose: Production (water supply)

Consumer: Urban

Application: Domestic - all purposes

WATER CHEMISTRY:

Sample No.: EC/N24/100 **Date sampled:** 20081011 **Depth sampl. [m]:** 100.00 **Comment:**

Main Parameters:						Calculated Parameters:		Bacteriol. Parameters:
pH:	7.3	**Na:**	621 ‡	**Cl:**	1055 ‡	**Langel.:**		**E.Coli:**
EC: [mS/m]	568 ‡	**K:**	5	**NO3 as N:**	2.57	**Aggr-Ind:**		**Faec. co:**
TDS:		**Si:**		**SO4:**	410 †	**Ion-bal:**	17.35 ‡	**Total Co:**
T. Alk.:		**Al:**		**F:**	0.95	**CaCO3:**	1378.61	**SPC:**
Ca:	330 ‡	**Fe:**	0.03					
Mg:	135 ‡	**Mn:**	0.31 †					

Concentrations in [mg/l]; Bact. param. in counts/100ml; Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit ‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit ¡ Value exceeds minimim allowable limit

AQUIFER INFORMATION:

Depth to Top [m]	Depth to Bot. [m]	Yield[l/s]	Method meas.	Aquifer type	Comment
32.00	32.00	0.10	Volumetric		
38.00	38.00	0.22	Volumetric		
76.00	76.00	0.47	Volumetric		
86.00	86.00	1.26	Volumetric		
123.00	123.00	1.84	Volumetric		

CASING DETAILS:

Depth to Top [m]	to Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Type of openings	Openings [mm]: Length	Width	Hor. Dist.	Vert. Dist.
0.00	10.00	220	Steel	7	Plain casing				
0.00	28.60	165	PVC		Plain casing				
28.60	45.70	165	PVC		Perforated or slotted				
45.70	74.20	165	PVC		Plain casing				
74.20	91.40	165	PVC		Perforated or slotted				
91.40	97.10	165	PVC		Plain casing				
97.10	103.00	165	PVC		Perforated or slotted				

TESTING DETAILS:

Description	Date	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recovery [m]	%	[min]	T [m²/d]	Storage	Comment
STEP 1	20081013	60	100.00	1.67	25.64						
STEP 2	20081013	60	100.00	2.04	36.77						
STEP 3	20081013	60	100.00	2.95	79.39	0.32	99	180			
CD	20081014	1440	100.00	1.29	21.54	0.09	100	180	4.8	0.001	

RECOMMENDATIONS:

Prior.	Rec. equipm.	Depth to intk. [m]	Type of power	Duty cyc. [hrs]	Disch. rate [l/s]	Water quality	Dyn. water level [m]	Crit. water level [m]
1	Submersible pump	80.00	Electric motor	24	0.50	UNACCEPTABLE	16.50	30.00

Note: Water quality is classed as unacceptable. Very high Chloride values.

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

2	12	0.70	19.60

Note:

3	8	0.90	20.80

Note:

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

BASIC SITE INFORMATION:

Site Identifier: 3224DCS0011 **Number:** EC/N24/101 **Site type:** Borehole

Distr./Farm No.: TOWN **Site Name/Descr.:** 378515 DWAF FEAS JANSENVILLE

Latitude [°]:	32.944350	**Alt. No. 1:**		**Diam. [mm]:**	165	**Water lev. [m]:**	9.06
Longitude [°]:	24.686240	**Alt. No. 2:**		**Depth [m]:**	130.00	**WL status:**	Static
Altitude [m]:		**Rep. inst.:**	SRK	**Col. ht. [m]:**	0.01	**Date WL meas.:**	20081011

Coordinate System: Geographic Decimal Degrees (Longitude/Latitude), WGS 1984

EXISTING EQUIPMENT:

Pump:

Type of Inst.: **Pulley Diam. [mm]:**

Manufacturer: **Depth to Intk. [m]:**

Engine:

Manufacturer: **Power Rating [kW]**

Type of Power: **Pulley Diam. [mm]:**

USE APPLICATION:

Site Status: Unused

Purpose: Production (water supply)

Consumer: Urban

Application: Domestic - all purposes

WATER CHEMISTRY:

Sample No.: EC/N24/101 **Date sampled:** 20081011 **Depth sampl. [m]:** 100.00 **Comment:**

Main Parameters:						Calculated Parameters:		Bacteriol. Parameters:
pH:	7.1	**Na:**	270 †	**Cl:**	620 ‡	**Langel.:**		**E.Coli:**
EC: [mS/m]	310 ‡	**K:**	4.1	**NO3 as N:**	20.5 ‡	**Aggr-Ind:**		**Faec. co:**
TDS:		**Si:**		**SO4:**	161	**Ion-bal:**	12.40 ‡	**Total Co:**
T. Alk.:		**Al:**		**F:**	0.87	**CaCO3:**	841.39	**SPC:**
Ca:	207 ‡	**Fe:**	0.03					
Mg:	79 †	**Mn:**	0.39 †					

Concentrations in [mg/l]; Bact. param. in counts/100ml; Chemistry Standard: SABS for human consumption
† Value exceeds recommended maximum limit ‡ Value exceeds maximum allowable limit
! Value exceeds recommended minimum limit ¡ Value exceeds minimim allowable limit

AQUIFER INFORMATION:

Depth to Top [m]	Depth to Bot. [m]	Yield[l/s]	Method meas.	Aquifer type	Comment
31.00	31.00	0.01	Volumetric		
56.00	56.00	0.09	Volumetric		
60.00	60.00	1.35	Volumetric		
75.00	75.00	4.76	Volumetric		

CASING DETAILS:

Depth to Top [m]	to Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Type of openings	Openings [mm]: Length	Width	Hor. Dist.	Vert. Dist.
0.00	29.00	165	Steel		Plain casing				
29.00	95.20	165	Steel		Perforated or slotted				
95.20	124.20	165	Steel		Plain casing				
124.20	130.00	165	Steel		Perforated or slotted				
0.00	5.00	273	Steel	7	Screen				

TESTING DETAILS:

Description	Date	Durat. [min]	Depth to intk. [m]	Disch. rate[l/s]	Drawd. [m]	Recovery [m]	%	[min]	T [m²/d]	Storage	Comment
STEP 1	20081011	60	100.00	1.94	4.26						
STEP 2	20081011	60	100.00	3.01	7.61						
STEP 3	20081011	60	100.00	4.11	11.49						
STEP 4	20081011	60	100.00	5.25	15.00	0.76	95	240			
CD	20081011	1440	100.00	4.05	14.53	0.46	97	720	33.3	0.001	

RECOMMENDATIONS:

Prior.	Rec. equipm.	Depth to intk. [m]	Type of power	Duty cyc. [hrs]	Disch. rate [l/s]	Water quality	Dyn. water level [m]	Crit. water level [m]
1	Submersible pump	80.00	Electric motor	24	1.80	POOR	15.50	40.00

Note: The water has a high Nitrate value, classifying the water as Poor. Chloride is also high.

2				12	2.50		17.80

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

MANAGEMENT RECOMMENDATIONS

Note:

3		8	3.10	19.30

Note:

SRK Consulting Engineers & Scientists
Oakwood House, Palm Square
Bonza Bay Rd.
Beacon Bay, East London
Tel: 043 748 6292 Fax: 043 748 1811

SRK Report Distribution Record

Complete this form and include it as the final page for each copy of the report produced.

Report No.	378515
Copy No.	1

Name/Title	Company	Copy	Date	Authorised by
Mr. H Goossens	Department of Water Affairs and Forestry	1	5 June 2008	G Nel
SRK Consulting	Library Copy	2	5 June 2008	G Nel

Approval Signature: