GROUNDWATER RESOURCE INFORMATION PROJECT
EASTERN CAPE PROVINCE

GROUNDWATER INFORMATION SOURCE REFERENCE SHEET

SOURCE REF NR:	GC074	Own Archive	x	Copy attached	x
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A: SOURCE DESCRIPTION

District Municipality:	Amatole		Chris Hani		O.R Tambo	
	Ukhahlamba		Cacadu	x	Alfred Nzo	
Local Municipality:	Baviaans (Steytlerville)					
Institution where Information is held:	Groundwater Consulting Services					
Branch of Institution:	Rivonia					
Contact details: Contact person:	Mark Stewart					
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B: TYPE OF INFORMATION

Information format:	Hard copy	x	Data Summary		Electronic Report	
	Specify Other:					
Report / Info Title:	Scoping Report Proposed Oxidation Ponds and Ancillary Structures - Steytlerville					
Report Nr:	020.2.023		Date:	Nov-02		
Author Details:	A Lewis					
Author's Qualification:	Hydrogeologist		Govt Dept		Project Manager	X
	Engineer		Technician		Other	x
	Specify Other: Environmental Scientist					

Captured by: S. BOTHA Date: 12/03/04 Signed:

C: GEOHYDROLOGICAL CATEGORIZATION

Project Type	Source development		Feasibility Study		Sanitation Study:	
	Specify Other: SCOPING REPORT FOR PROPOSED OXIDATION PONDS					

Reference Co-ordinate:	Latitude	Longitude
	S 33° 34'10"	E 24° 26' 30"

	Yes	No	Complete	Incomplete
Lithological & Construction Logs	X			GEOLOGY & GEOTECH DISCUSSED
Hydrocensus Data	X		X 2km RADIUS	
Pump Testing Data		X		
Chemical Water Analysis Data		X		
Geohydrological Data	X			DISCUSSED BRIEFLY
Spring Data		X		
Remote Sensing Data		X		
Map Data	X			

Comments: IMPACT ASSESSMENT WITH REGARDS TO OXIDATION PONDS

Reviewed by: M. STEWART Date: 18/03/2004 Signed:

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SCOPING REPORT
PROPOSED OXIDATION PONDS AND ANCILLARY STRUCTURES

STEYTLERVILLE

NOVEMBER 2002

Prepared by:
Anita Lewis

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1. INTRODUCTION AND TERMS OF REFERENCE

Steytlerville (Baviaans Municipality) is a town of some 3500 people situated in the Klein Karoo approximately 150km west of Uitenhage and 80km east of Willowmore (Figure 1). The existing sewage disposal system of Steytlerville comprises conservancy tanks, soak-away drains as well as the bucket system. Sewage waste is disposed of in pits located within the confines of the solid waste disposal site north of the town and adjacent to the Grootrivier.

The construction of a sewage treatment plant and associated infrastructure is a scheduled activity according to the Environmental Impact Assessment (EIA) Regulation, promulgated in terms of the Environmental Conservation Act, 1989 (Act 73 of 1989). The EIA regulation requires that a consultive and inclusive process be followed, commencing with the identification of interested and affected parties and potential environmental impacts/issues (scoping level).

Groundwater Consulting Services (GCS) were approached by Uhambiso Consult to undertake a scoping study for the proposed construction of a new sewage treatment plant at Steytlerville.

The total capacity of the proposed oxidation ponds is less than 50 000m^3, as specified in Section 4.8 (b) of the General Authorisations in terms of Section 39 of the National Water Act, 1998 (Act 36 of 1998)(GN 1191, dated 8 October 1999). This implies that the water use may fall within the scope of the General Authorisations and might not require a license.

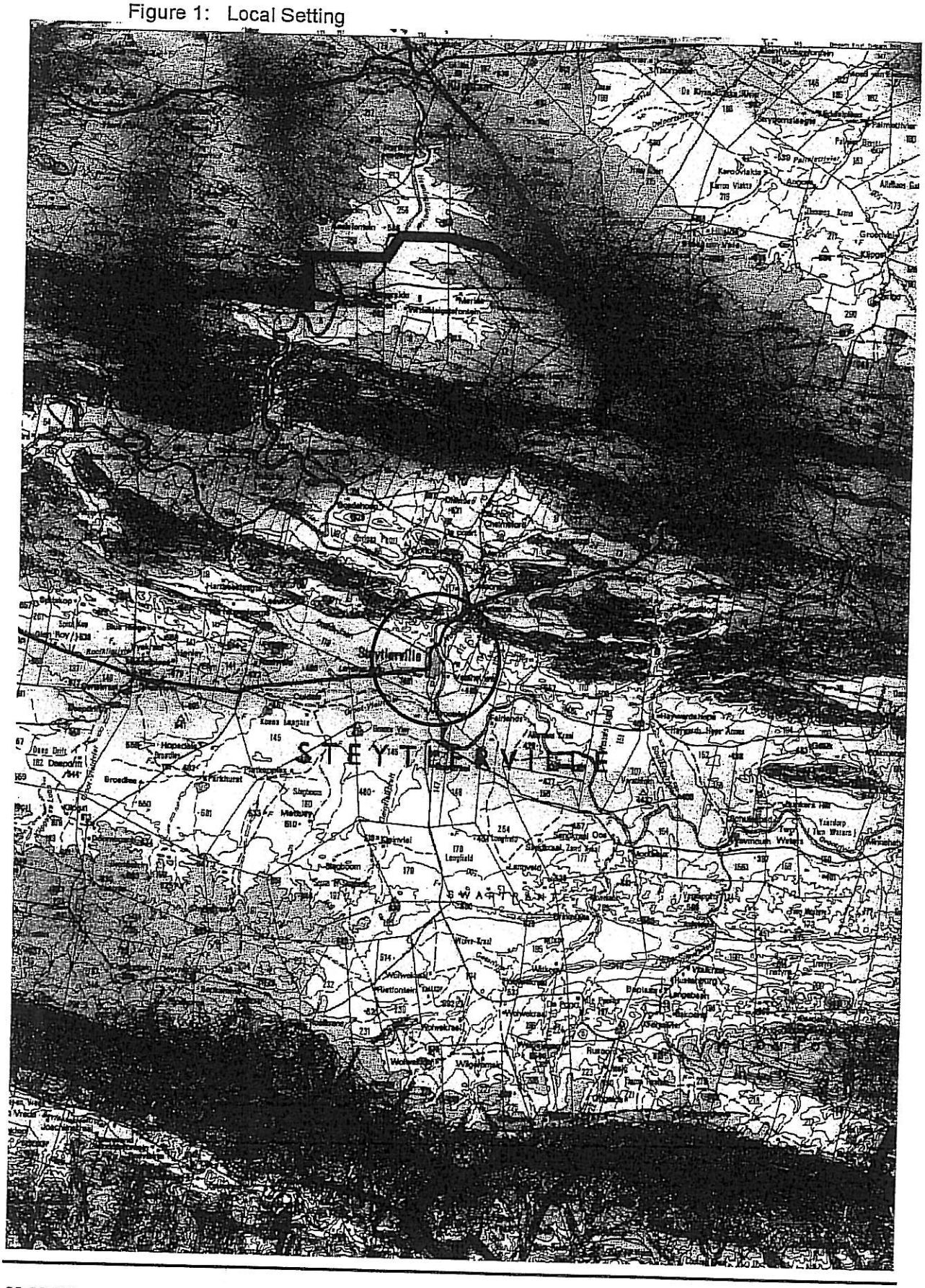
This scoping document will be submitted to DWAF and DACE for comment and will include an application for exemption from a full EIA.

2. SCOPE OF INVESTIGATION

The EIA process and terms of reference agreed with Uhambiso Consult require that GCS carry out the following activities:

- Identification of interested and affected parties who will include adjacent land owners
- Identification and documentation of the various options for locating the sewage treatment plant
- Collection of background data (climate, topography and drainage, geology, vegetation and groundwater)
- Identification of potential impacts and recommendation of mitigating measures
- Compilation of a scoping report documenting issues and concerns identified
- Advertisements
- Application to the Department of Environment and Cultural Affairs and Sport for exemptions for a full EIA

Figure 1: Local Setting



3. PROJECT DESCRIPTION

The present sewage system of Steytlerville comprises conservancy tanks (i.e. Daleview School Hostel), the bucket system and soak-a ways (the older portion of Steytlerville). The waste from the conservancy tanks and buckets are disposed of in trenches adjacent to the solid waste site situated north of the town. The present trenches are located on alluvial silts approximately 30m from the Grootrivier.

The proposed construction (see construction diagram attached as Appendix 1), comprises of 2 anaerobic ponds, 5 aerobic ponds and a storage pond. The total capacity of the proposed oxidation ponds will be 11 850m^3, with a daily disposal rate of 400m^3. The proposed oxidation ponds are located within the Grootrivier catchment, which flows into the Gamtoos River.

Final effluent is to be utilised as irrigation water for the Golden Valley sports field. Excess effluent water will be available for the Daleview Primary School sports field and adjacent farms. Only Mr Jansen van Vuuren of the farm Vaalheuwel, located east of the proposed oxidation ponds, has expressed interest in the utilisation of this water. The effluent irrigated on the sports field will have to comply with the quality requirements set out in Section 2.7 (1) and other requirements set out in Section 2.8 – 2.11 of the General Authorisations. See Appendix 5 attached. Should the irrigation practise and quality of the effluent not comply with these requirements, the water use will require a license in terms of Section 21 (e) of the National Water Act, 1998.

The sludge generated in the primary ponds will be laid out in drying trenches adjacent to the waste site. (Not indicated in the attached construction diagram). The sludge management will operate within the guidelines given in Permissible Utilisation and Disposal of Sewage Sludge, 1997 (PUDSS) and Addendum No 1 to Edition 1 (1997) of the PUDSS.

The present inflow volume of waste as determined by Uhambiso Consult is approximately 80m^3 per day. The proposed construction of 550 houses with full sewage reticulation will increase the volume of waste to approximately 400m^3 per day. The volume of waste that will be generated when the existing town is connected to the water-borne sewage system has not been taken into account.

4. SITE DESCRIPTION

4.1 Location and Land use

The proposed sewage works is located 500m south of the town and adjacent to the Grootrivier. The proposed site is located on the Steytlerville allotment (Doorchpoort 538), which is owned by the Steytlerville Municipality. A minor gravel road connects the proposed site to the gravel road connecting Steytlerville to Uitenhage

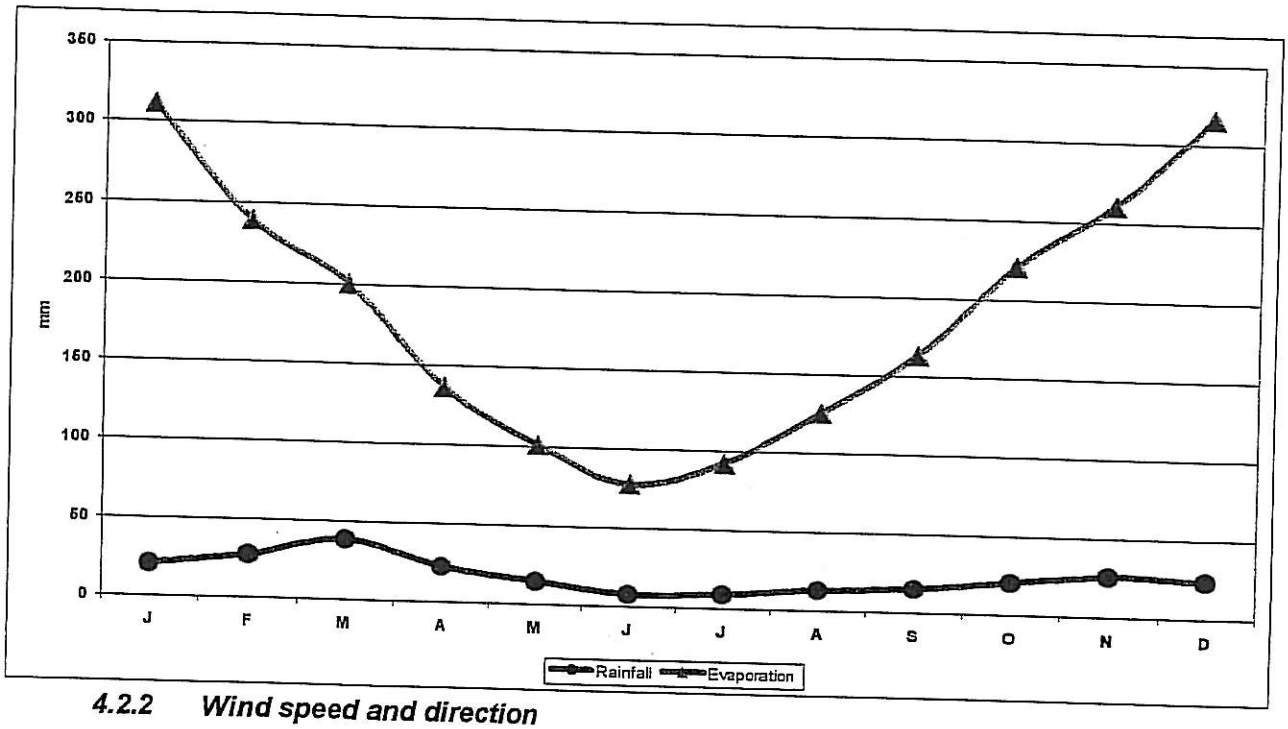
4.2 Climate

4.2.1 Rainfall and evaporation

The climate data has been obtained from the South African Weather Bureau and is included in Appendix 2. Steylterville is situated in the Klein Karoo where the regional climate is arid with hot summers and cool winters. The mean annual rainfall (March) for Steytlerville is 238mm. Precipitation occurs predominately during summer, from November to April, when the mean monthly rainfall exceeds 20mm during these months.

There is no evaporation data for Steytlerville so the records for Willowmore have been used. Evaporation in the region is extremely high, on average, 2250mm per annum. The maximum evaporation rate occurs during the period November to January when the mean is in excess of 10mm/day. The region's annual evaporation is almost 10 times higher than the annual rainfall as can be seen in the graph showing the mean average rainfall and evaporation for a 30-year period(Figure 2). Note that the evaporation figures are from Willowmore as there are no records kept for Steytlerville. Willowmore is situated approximately 80km west of Steytlerville in a similar topographic and climate setting.

Figure 2: Mean annual rainfall/evaporation (mm/month)



4.2.2 *Wind speed and direction*

There are no wind records for Steytlerville, so the data for Willowmore has been used. Appendix 2 contains the mean annual wind speed and wind direction for 30 years at Willowmore, the closest recording station. In summer (Nov – Apr) the prevailing wind is from the east and southeast with average wind speeds of 4.2 m/s and 5.1 m/s. In winter the winds are predominantly south westerly to westerly with average wind speeds of 5.2 m/s. The mean average frequency for calm periods is 42% in winter and 27% in summer.

4.2.3 *Extreme weather events*

High intensity summer thunderstorms may occur and frost is a common occurrence in winter

4.3 Geology and Soils

The proposed oxidation ponds are to be located on alluvial silts and gravels adjacent to the Grootrivier. A three (3) metre drainage donga immediately east of the site indicates that the alluvium is greater than three (3) metres. The actual thickness of the alluvium is unknown as the Grootrivier is ± 6m below flood plain level.

Eight (8) test pits were dug throughout the proposed site. The majority of pits indicated that the soils comprised mainly of fine grain silt with calcareous sandy silt approximately 1 to 1,5 meters below surface. (see Appendix 3 for test pit logs)

The underlying geology consists of shale with interbedded sandstones of the Weltevrede Formation (Witteberg Group). The Weltevrede formation consists of steeply dipping beds striking more or less east/west. No major structural features such as faults, along which seepage can migrate, occur in the vicinity of the proposed oxidation ponds.

4.4 Topography and Drainage

The proposed site is at an elevation of approximately 430m above mean sea level and is located on a relatively flat lying alluvial plain adjacent to the Grootrivier. The Grootrivier flows approximately 130m east of the proposed site. The Grootrivier flows into the Gamtoosrivier, which enters the sea between Jeffrey's Bay and Port Elizabeth.

Drainage ditches/dongas are located immediately east and west of the proposed site.

4.5 Vegetation

The veld type around the proposed sewage treatment plant comprises succulent scrub and dense acacia bush. Species noted Mesem bryathemum, Chrysocoma tenuifolia, Atriplex vestita, Lineum argunte-carinatum and Sabola glabrescens. The predominant trees are the Acacia Karoo (soet doring). This veld type has been heavily overgrazed and degraded due to poor farming practices and the site comprises of an abandoned brickfield. The conservation status is low.

4.6 Groundwater

The average depth to groundwater (i.e. groundwater levels in the alluvium) is approximately 5-6m below surface. This level is estimated from the present water level (approximately 6-7m) in the Grootrivier below the proposed site. The depth may be temporararily less when there are floodwater releases from the Beervlei dam. The yield is likely to be low from the Alluvium aquifer as the saturated thickness is unlikely to be more than a few metres. The confidence in the assumptions is low as there are no boreholes within 500m of the proposed sewage treatment plant. Groundwater from the underlying Weltevrede aquifers is generally poor as the Weltevrede formation comprise mainly of shales. The quality of groundwater in the alluvium aquifer is variable with poor quality water during periods of low flow in the Grootrivier.

Groundwater usage adjacent to the proposed site is confined to stock watering only. The town abstracts groundwater from aquifers located north and south of Steytlerville.

4.6.1 Hydrocensus and Groundwater use

A hydrocensus was undertaken to identify boreholes located within a 2 km radius of the proposed sewage disposal site. The data from the hydrocensus is summarised in Table 1, while the position of the boreholes are included in Figure 3.

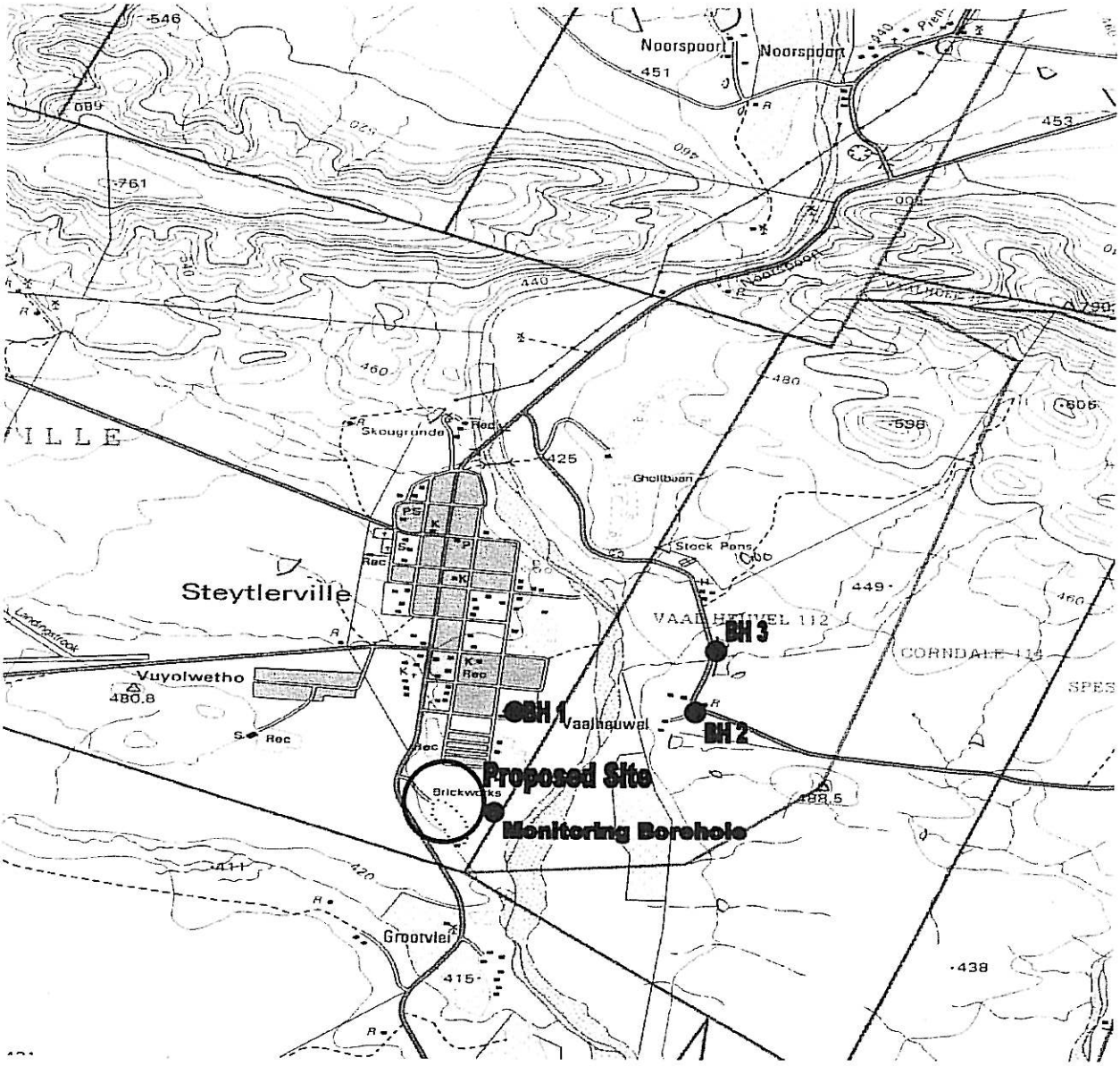
Table 1: Hydrocensus Details

Borehole No	Current Use	Owner	Equipment	SW	Yield	EC (m s/m
1	Irrigation	Daleview School	Submersible	7.2m	0.9l/s	900
2	Stock	HG Jansen van Vuuren	Windmill	10m	4,50 l/hr	892
3	Stock	HG Jansen van Vuuren	Submersible	8m	1500 l/hr	735

One borehole is located north and two boreholes northwest of the proposed site, all upstream.

The farm Grootvlei, located immediately south of the proposed site, obtains its household water supply from the municipal water supply. Water for stock watering purposes is abstracted from the Grootrivier.

Figure 3: Location of hydrocensus boreholes and proposed monitoring borehole



4.6.2 Hydrogeology

Groundwater obtained from the shale and sandstones of the Weltevrede formation is usually low yielding. The periodic elevated salinity of water in the Grootrivier has resulted in the underlying alluvium becoming more saline and is thought to have caused deterioration in the quality of groundwater in the Weltevrede formation in the vicinity of the river.

The proposed oxidation ponds are to be located on alluvial sands associated with the Grootrivier. The river is located ± 6m below the river base. Leakage generated from the ponds will migrate through the silts to the underlying alluvial aquifer and Grootrivier.

5. IDENTIFICATION OF POTENTIAL IMPACTS

5.1 Location and Land use Issues

The distance from residential areas to the proposed sewage treatment plant is about 500m. There is existing access to the area, so no new roads will need to be constructed.

- Dust and noise related to construction will impact on adjacent residents during the construction phase.
- There are no issues relating to the purchase/ lease of land, as the land on which the proposed construction will take place is owned by the Steytlerville Municipality (developer).
- There is a change in land use as the existing land use was pastoral farming and brick making.
- The nearest landowner (Mr F Opperman) is approximately 200m away. There are at present two occupied houses on his property (Hans Jacobs and Abraham Jansen). To date, Mr F Opperman could not be located.

Three alternate sites were investigated (See Figure 4.)

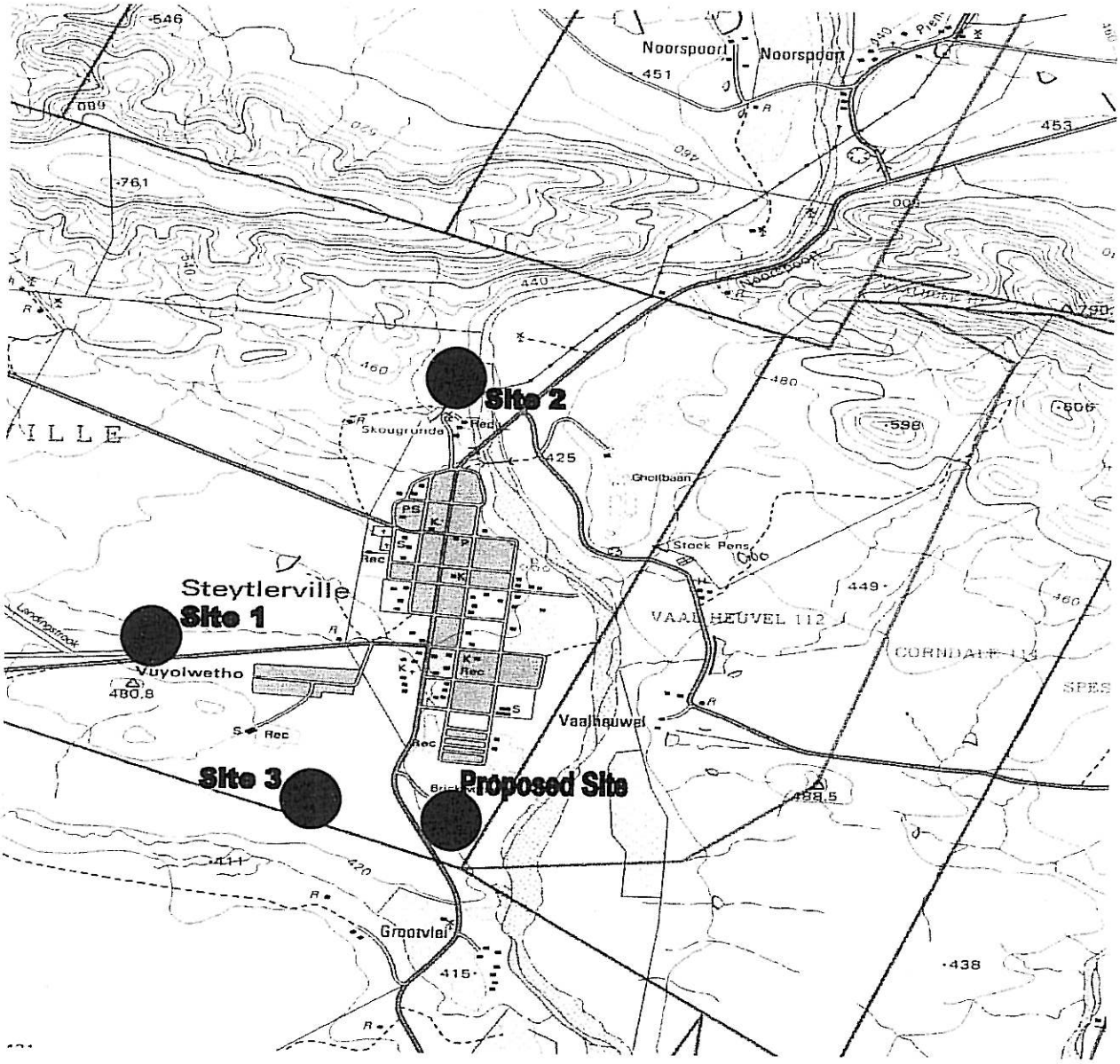
Site 1: Located west of the Town. Due to topography and gravity drainage, the sewage would have to be collected south of the town and then pumped to this site. The winter westerly wind coupled with temperature inversion would result in the odour problems.

Site 2: This is adjacent to the existing solid waste site north of the town. Due to topography the sewage would have to be collected south of the town and pumped north of the town. Seepage would occur into the alluvial aquifer above the town. There are at present groundwater users in the northern portion of town who utilise the alluvial aquifer.

Site 3: This is located south of Vuyolwetho below the school sports ground. Due to topography the sewage would have to be collected south of the town and pumped over a 30-40m ridge to this site.

All three alternative sites investigated indicated that pumping would be required. Steytlerville is a sub-economic community, which will not be able to fund a maintenance type sewage disposal works that requires pumping. The proposed site located south of the town will be gravity fed and will require a lower maintenance cost.

Figure 4: Alternative Sites



5.2 Climate Issues

- The semi-arid climate with the high evaporation rates and low rainfall will promote evaporation.
- The prevailing winds are westerly in winter and easterly in summer. Very occasionally summer winds blow from a northerly direction. Residents of Spogter-valley have expressed concerns when the summer easterly winds blow they will be affected by the odour.
- High intensity rainfall events will result excessive run off from the residential areas that could be contaminated if not diverted away from the proposed site.
- High intensity rainfall events could potentially cause the overtopping of the ponds and result in the contamination of the surrounding land and water resources.

5.3 Geological and Soil Issues

The proposed oxidation ponds will be located on silts and because of their high permeability, have potential to allow effluent seepage to leave the site and pollute the groundwater and the river.

Construction will lead to the disturbance of the soils. Construction will result in the loss of topsoil if proper stripping and stockpiling of soil material is not undertaken.

The proposed utilisation of effluent water for irrigation on the Golden Valley Sports field will result in the change in chemical character of the soil.

The disposal of sludge could impact on the soils if not managed appropriately.

5.4 Topographic and Drainage Issues

The flat topography will facilitate construction of the ponds and limit the need for major earthworks.

The Grootrivier flows approximately 130m east of the proposed site. The Grootrivier flows during high rainfall events and from periodic release of water from the upstream Beervlei flood control dam. The risk of flooding is limited because of the effect of the Beervlei dam.

5.5 Vegetation Issues

The construction footprint of the proposed sewage treatment plant will be limited to the immediate surroundings and therefore will have limited effect on the vegetation of the area.

The veld surrounding the sewage disposal site has been overgrazed in the past and has no conservation value.

The construction of the sewage disposal site will not result in the loss of sensitive or ecologically significant vegetation.

5.6 Groundwater Issues

Steytlerville abstracts its domestic water from two well fields. The northern well field is located approximately 3km north of the town and the southern well field is located 35km south of Steytlerville. Both well fields are beyond the potential impact zone of the sewage treatment plant.

Groundwater in the vicinity of the proposed site is poor because of the type of geological formation (Witteberg Shales). The main use for groundwater is stock watering. The farm Grootvlei (P Knoesen Tel: (49) 835 0450) abstracts stock water from the Grootrivier adjacent to the proposed site. Potential pollution of the underlying aquifer and river from seepage can occur due to the fact that the site is located on alluvial silts.

5.7 Social Considerations

The construction of the oxidation ponds is essential in providing the Steytlerville community with a means of disposing of its sewage, which would otherwise pose a health risk to the population

Two meetings held by Uhambiso Consult on the 27th March 2002 and 8th April 2002 respectively with the community indicated that there was no objection to the position of the proposed oxidation ponds. (See minutes attached as Appendix 4).

The present owner of the stock camp adjacent to the proposed oxidation ponds is concerned that bacterial contamination of his stock water will occur.

Residents of Spogter-valley have expressed concerns when the summer easterly winds blow they will be affected by the odour.

6. IMPACT MITIGATION MEASURES

The site, while not ideal for waste disposal because of its proximity to a river and the permeable geological formations, is counteracted by the semi-arid climate, prevailing poor quality surface water and groundwater and the upstream flood control dam (Beervlei). These later factors suggest that the pollution threat from the proposed sewage works is limited. The following mitigation measures will be implemented in order to address possible impacts on the environment.

6.1 Construction and Operational Phases

The construction and operational phases will be managed and monitored to reduce environmental impacts to surrounding areas. This would be partially achieved by fencing off the area prior to construction. Some of the objectives of managing the environmental impacts would be as follows:

6.1.1 Geology

No proposed mitigation measures

6.1.2 Topography

No proposed mitigation measures

6.1.3 Soils

Soils below the footprint area will be removed and stockpiled for later use during rehabilitation. Areas disturbed by the construction activities will be top-soiled and re-vegetated in order to reduce soil erosion.

The effluent irrigated on the sports field will have to comply with the quality requirements set out in Section 2.7 (1) and other requirements set out in Section 2.8 – 2.11 of the General Authorisations. See Appendix 5 attached. Should the irrigation practise and quality of the effluent not comply with these requirements, the water use will require a license in terms of Section 21 (e) of the National Water Act, 1998.

The sludge generated in the primary ponds will be laid out in drying trenches adjacent to the waste site. Sludge management will operate within the guidelines given in Permissible Utilisation and Disposal of Sewage Sludge, 1997 (PUDSS) and Addendum No 1 to Edition 1 (1997) of the PUDSS.

6.1.4 Vegetation

Vegetation clearing will be done in the footprint area only. The growth of alien vegetation will be controlled and removed on a regular basis.

6.1.5 Animal life

The fencing of the site will prevent animals from getting into contact with the waste. Staff will be made aware not to disturb bird life.

6.1.6 Air Quality

Dust suppression will take place during the construction phase in order to limit the possible impact on adjacent land users.

An operation protocol will be developed that will ensure the optimal functioning of the oxidation pond system and as a result limit offensive odours that could impact on adjacent land users.

6.1.7 Visual aspects

The site will be fenced of prior to construction in order to limit the visual impact on the adjacent land users.

6.1.8 Surface water

A storm water cut of trench will be constructed around the site in order to prevent contamination of clean runoff.

Working sites will be top-soiled and vegetated to prevent soil erosion.

The oxidation ponds will be designed with a freeboard of 500mm inside and 1000mm outside and will cater for a typical high intensity rainfall event. This will limit the potential for overtopping.

Overgrown vegetation in the oxidation ponds can reduce the capacity of the oxidation ponds and will be cleared on a regular basis.

In case of a spill, the Department of Water Affairs and Forestry will be notified and the surface water quality will be sampled, analysed and submitted to the DWAF Regional Office.

6.1.9 Groundwater

The proposed oxidation ponds will have a geotextile fabric and rubberised bitumen emulsion lining. A monitoring borehole will be positioned between the oxidation ponds and the river (refer to Figure 3). These boreholes will be monitored on a monthly basis and will give an indication of potential pollution originating from the oxidation ponds.

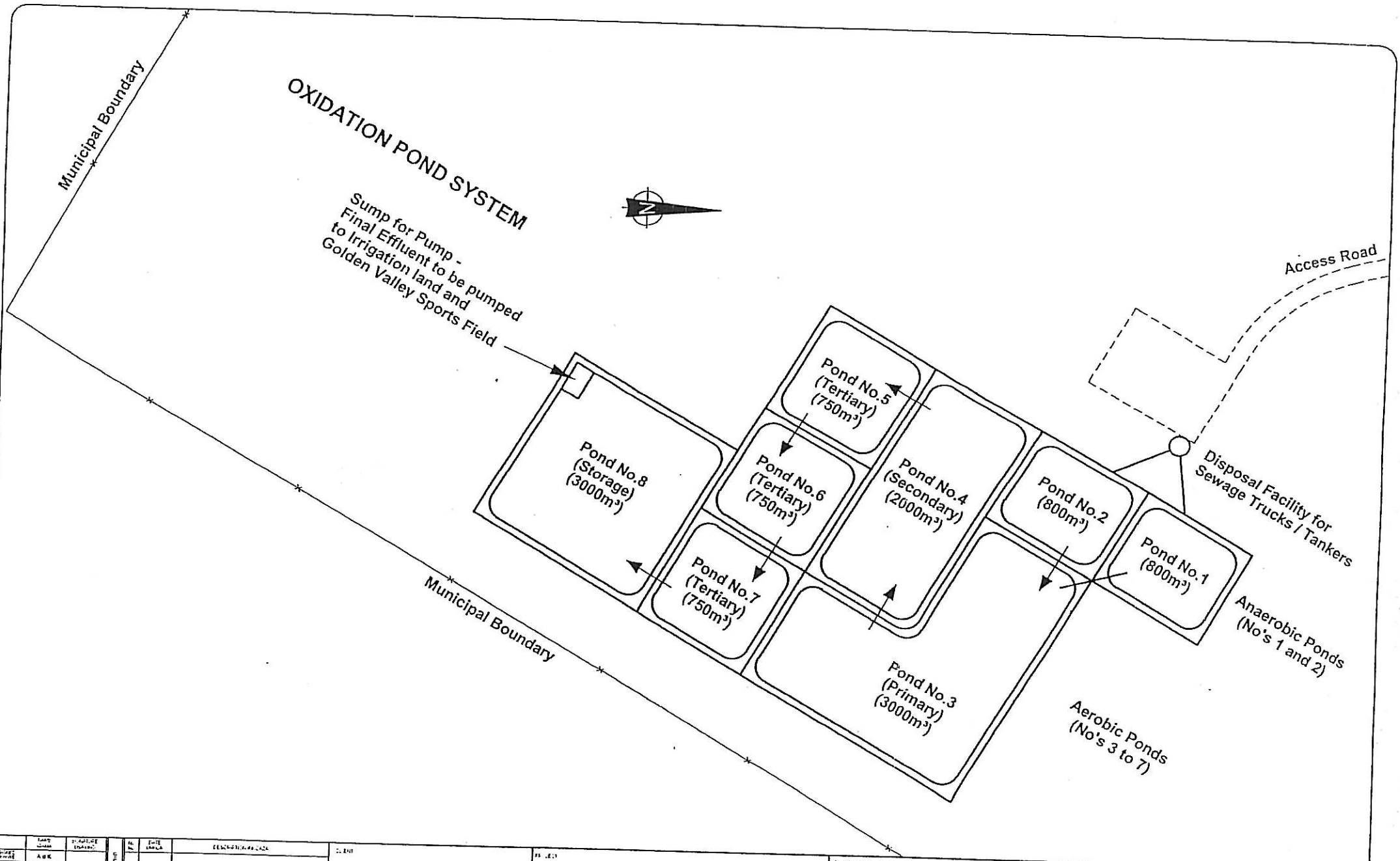
6.1.10 General

The responsible persons appointed to undertake the construction and operation will be made aware of these environmental requirements.

A management program and operational protocol will be implemented to ensure that the oxidation ponds are managed optimally in order to minimise impact on the environment.

APPENDICES

APPENDIX1
CONSTRUCTION DIAGRAM



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	July 2003						

BAVIAANS MUNICIPALITY

STEYTLERVILLE NEW
SEWAGE TREATMENT WORKS

LAYOUT PLAN

SCALE 1:1000

UHAMBISO CONSULT
RAADGEWENDE INGENIEURS EN PROJEKBESTUURDERS
CONSULTING ENGINEERS AND PROJECT MANAGERS

8018AG/02

APPENDIX 2
RAINFALL AND EVAPORATION DATA

Precipitation record for Steytlerville (ranked in decreasing order)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTOT
1984	3,4	0,0	28,1	0,0	0,0	30,0	15,0	3,2	3,5	0,0	15,0	0,0	98,2
1908	5,1	6,4	0,0	7,9	19,1	12,9	1,5	3,6	4,3	27,4	0,0	1,8	90,0
1974	*122,5*	*91,7*	*129,0*	*51,7*	*47,2*	*1,0*	*0,0*	*32,5*	*1,0*	*7,5*	*49,3*	*27,5*	*560,9*
1981	*35,6*	*26,7**	*141,3*	*6,9*	*100,7*	*9,9*	*0,0*	*26,3*	*0,0*	*51,0*	*22,6**	*93,6*	*514,6=*
1917	*20,9*	*47,3*	*86,1*	*77,5*	*1,8*	*59,5*	*26,0*	*22,9*	*20,3*	*27,4*	*38,4*	*3,0*	*431,1*
1996	*27,4*	*34,0*	*41,5*	*5,6*	*6,0*	*0,0*	*10,1*	*17,3*	*9,0*	*56,5*	*124,5*	*66,4*	*398,3*
1913	*30,3*	*124,5*	*94,4*	*9,9*	*2,0*	*6,6*	*16,0*	*3,8*	*58,1*	*29,2*	*15,5*	*0,0*	*390,3*
1902	*0,0*	*34,6*	*124,0*	*8,9*	*0,0*	*12,7*	*2,8*	*94,0*	*48,2*	*0,0*	*35,5*	*23,8*	*384,5*
1894	*10,2*	*45,8*	*126,2*	*10,7*	*10,4*	*7,7*	*0,8*	*11,9*	*9,2*	*35,2*	*1,3*	*269,4=*	*376,0=*
1977	*8,5*	*112,0*	*31,5*	*71,5*	*59,5*	*0,0*	*0,0*	*8,0*	*24,5*	*9,0*	*11,0*	*28,5*	*364,0*
1993	*17,0*	*29,5*	*12,3*	*25,6*	*8,0*	*9,5*	*0,0*	*18,0*	*92,0*	*36,6*	*42,0*	*71,0*	*361,5*
1995	*77,1*	*32,4*	*25,5*	*13,0*	*32,0*	*2,0*	*0,0*	*14,0*	*7,5*	*12,5*	*65,5*	*75,4*	*356,9*
1963	41,6	20,5	81,5	87,5	9,5	7,1	4,7	2,9	3,5	15,7	54,2	21,4	350,1
1973	0,5	34,9	67,3	50,0	17,5	4,2	6,7	24,0	4,0	25,0	7,5	96,9	338,5
1905	0,0	22,1	38,4	26,3	9,4	20,8	0,0	6,6	141,7	46,5	0,0	25,9	337,7
1971	17,6	8,2	53,5	39,9	13,2	2,9	62,7	124,7	0,0	4,7	1,2	7,5	336,1
1911	53,8	22,8	41,7	23,4	37,6	2,8	0,0	26,2*	50,3	27,5	38,8	0,0	324,9=
1979	6,0	74,2	0,0	7,0	21,8	8,3	70,3	75,0	0,6	42,5	16,9	0,0	322,6
1954	22,6	5,6	104,7	24,6	67,6	9,4	1,8	22,4	3,6	3,9	55,2	0,0	321,4
1985	44,0	64,0*	22,0	20,1*	1,7	18,7	0,0	0,0	4,0	22,8	53,9	68,1	319,3=
1989	34,5	23,5	6,5	71,0	30,7	4,5	4,0	10,0	0,0	32,5	99,5	0,0	316,7
1955	4,9	138,0	45,0	19,3	1,8	6,6	11,2	3,8	1,0	2,8	54,1	26,5	315,0
1931	20,6	2,5	42,5	7,6	0,0	2,3	37,8	4,0	0,0	74,2	32,3	85,4	309,2
1975	34,5	20,5	77,5	7,0	0,0	28,0	9,2	20,0	17,0	1,0	21,5	69,7	305,9
1956	10,2	27,0	103,0	6,7	29,2	1,1	15,1	4,5	28,9	35,5	11,5	26,5	299,2
1994	69,2	17,1	53,2	20,5	9,5	1,0	13,7	27,2	4,1	37,2	0,0	46,5	299,2
1921	17,8	46,7	34,1	50,3	17,3	19,2	3,3	10,6	1,0	59,0	108,1	367,4=	298,3
1904	90,2	60,2	36,8	9,2	7,6	0,0	2,8	11,7	20,3	43,2	0,0	15,3	297,3
1933	5,3	27,1	20,6	48,0	0,5	3,6	0,0	73,4	38,9	0,0	33,0	41,9	292,3
1943	17,2	8,1	65,5	11,9	8,8	13,5	0,0	12,9	21,3	14,4	99,8	16,6	290,0
1896	15,4	33,0	28,4	11,5	13,7	23,6	0,0	60,8	4,1	12,4	57,3	25,2	285,4
1950	12,2	5,1	61,4	18,0	14,0	0,0	5,0	36,8	37,2	10,1	50,0	33,0	282,8
1922	33,8	5,1	71,6	24,1	19,1	0,0	24,2	9,3	0,0	9,7	49,8	31,5	278,2
1907	55,9	35,5	35,0	54,8	4,3	6,4	0,5	8,1	3,8	10,7	0,0	57,8	272,8
1920	13,4	68,4	34,3	16,5	18,0	8,1	8,9	25,0	0,0	24,7	20,3	34,0	271,6
1960	7,5	0,0	54,5	15,0	15,5	5,0	0,0	23,5	0,0	48,0	46,5	52,0	267,5
1952	2,8	76,5	4,8	32,5	3,0	10,1	3,5	20,0	52,6	15,0	28,3	17,6	266,7
1932	60,4	31,0	22,9	3,0	20,6	3,0	0,0	1,5	67,2	24,7	24,7	0,0	259,0
1998	35,0	31,0	24,5	22,0	9,5	0,0	1,4	49,5	5,0	22,5	20,5	37,0	257,9
1959	0,0	65,5	38,5	73,4	15,8	0,0	4,2	14,5	0,0	19,0	12,5	13,5	256,9
1988	19,0	54,0	50,1	55,7	3,5	3,1	0,0	0,0	13,1	6,5	16,5	35,0	256,5
1914	25,6	23,4	26,5	28,0	27,4	12,0	0,0	18,8	0,0	28,7	53,4	11,4	255,2
1923	17,0	35,6	64,0	29,4	17,1	11,7	25,0	0,8	0,0	32,0	20,8	0,0	253,4
1939	7,4	86,1	21,6	10,2	5,1	7,3	91,3	8,6	33,0	3,3	16,8	290,7=	249,8=
1953	11,4	44,8	18,5	0,0	0,0	12,7	3,8	6,6	16,7	55,9	47,7	31,5	249,6
1906	7,6	5,9	33,3	19,3	40,2	1,3	2,3	1,5	21,7	41,2	10,9	62,7	247,9

1942	22,9	5,1	13,7	21,8	10,2	11,4	3,0	12,9	1,3	73,5	34,7	27,1	237,6
1916	0,0	54,8	15,2	80,6	7,6	11,0	4,8	11,4	5,6	2,1	24,1	217,2=	236,4=
1910	33,3	48,0	44,7	0,0	41,9	9,7	3,0	3,8	2,8	10,5	28,4	8,9	235,0
1898	48,6	39,7	25,2	11,5	11,7	0,0	5,6	1,1	17,7	9,6	11,4	182,1=	231,6
1934	19,5	15,1	46,7	35,5	3,6	0,0	29,8	0,0	10,4	11,7	50,3	7,7	230,3
1912	24,1	55,8	0,0	75,4	0,0	20,1	11,4	5,8	13,2	0,0	5,6	17,8	229,2
1935	6,6	3,8	15,7	32,3	66,1	31,0	15,2	11,7	16,7	2,5	18,6	8,7	228,9
1929	4,8	21,3	15,5	20,3	14,8	13,7	24,9	14,0	57,7	10,5	5,0	26,1	228,6
1948	36,4	23,9	33,4	58,6	3,1	3,8	11,9	12,2	7,1	20,1	0,0	17,8	228,3
1947	15,0	4,3	46,4	21,3	20,1	2,5	21,7	0,0	7,1	15,2	15,2	58,6	227,4
1964	10,0	19,2	23,1	37,4	0,0	24,2	0,0	15,0	53,4	14,2	16,7	13,6	226,8
1936	4,9	0,0	79,3	0,0*	3,3	2,0	11,4	0,0	7,9	38,9	48,1	29,4	225,2=
1909	24,2	10,1	43,7	20,8	37,3	0,0	4,6	0,0	8,2	10,5	20,8	42,6	222,8
1961	3,5	14,0	142,5	20,3	15,0	4,0	0,0	16,8	0,0	0,5	3,5	0,0	220,1
1983	5,3	9,5	11,5	2,4	0,0	18,0	77,1	0,0	12,4	32,5	24,0	25,7	218,4
1900	20,6	15,0	58,2	10,2	0,0	0,0	14,2	9,4	1,3	8,9	0,0	79,3	217,1
1930	14,3	36,0	23,4	15,2	5,1	7,6	8,9	9,2	7,4	34,1	5,1	49,5	215,8
1957	13,0	71,8	32,7	25,0	15,0	14,0	0,0	0,0	11,5	7,5	0,0	22,6	213,1
1965	0,7	6,2	26,5	17,6	9,4	1,7	13,3	0,6	16,5	34,0	82,4	0,0	208,9
1980	48,7	34,6	47,3	17,0*	1,0	0,0	0,5	6,9	25,8	17,5	0,0*	7,1	206,4=
1938	8,6	3,8	7,1	49,5	9,2	3,8	39,6	0,0	10,6	15,5	39,3	14,4	201,4
1897	6,6	0,0	39,6	3,0	53,4	1,8	0,0	0,0	36,3	38,3	9,9	10,4	199,3
1951	99,0	25,6	10,4	0,0	9,4	2,8	21,1	0,0	3,0*	26,2	0,0	0,0	197,5=
1997	23,5	2,6	49,0	17,1	15,2	34,0	16,0	8,0	1,0	18,0	7,5	0,0	191,9
1928	17,8	0,0	77,4	19,1	0,0	3,8	5,0	3,0	21,6	3,3	15,8	24,1	190,9
1895	37,1	34,3	12,2	25,6	5,8	0,0	2,0	0,0	11,9	16,3	16,7	26,2	188,1
1946	2,0	12,2	54,8	40,2	17,5*	3,6	13,7	7,8	9,6	14,7	0,0	8,6	184,7=
1940	0,0	61,5	41,1	0,0	2,8	0,0	23,6	0,0	29,5	14,5	10,7	0,0	183,7
1903	0,0	9,1	0,0	1,3	25,4	19,3	6,4	7,4	5,1	71,9	17,8	16,7	180,4
1992	3,0	43,5	22,0	7,5	0,0	12,5	17,0	25,5	0,0	30,5	18,5	0,0	180,0
1944	3,0	4,0	57,1	4,3	50,3	5,9	12,9	3,5	14,7	21,6	0,0	0,0	177,3
1941	40,7	24,6	4,6	38,1	0,0	13,2	0,8	10,4	0,0	21,8	2,0	20,9	177,1
1978	23,5	3,5	8,5	34,0	0,0	4,5	0,0	9,0	2,5	28,5	25,5	36,5	176,0
1976	28,0	23,2	55,5	1,2	3,8	0,5	1,2	0,0	10,0	30,7	4,5	16,8	175,4
1937	26,0	16,3	22,4	0,0	19,0	0,0	9,4	0,0	1,5	23,4	24,4	32,6	175,0
1962	26,0	22,5	20,7	15,0	3,0	3,0	3,0	24,0	0,0	5,0	42,0	7,5	171,7
1991	18,5	13,2	7,7	3,3	1,0	1,6	7,1	3,0	6,2	74,2	14,5	20,5	170,8
1918	16,7	2,5	56,4	13,2	8,4	3,8	4,8	5,6	14,7	29,7	0,0	10,3	166,1
1925	27,5	23,8	29,1	10,0	13,6	15,7	8,9	37,1	12,7	18,6	13,7	210,7=	164,4=
1972	34,1	11,1	58,0	6,6	0,0	1,0	0,5	4,1	0,0	5,0	25,6	16,5	162,5
1958	24,5	0,0	6,0	6,8	56,5	0,0	0,0	2,0	11,5	11,0	8,0	35,0	161,3
1945	8,6	43,9	11,7	19,8	18,8	14,0	17,0	0,0	5,3	10,2	5,3	3,8	158,4
1982	20,3	1,2	11,6	76,0*	0,0	11,0	0,0	0,0	17,4	16,0	3,5*	0,0	157,0=
1901	0,0	76,2	30,5	39,4	0,0	5,9	0,5	0,0	0,0	1,2	0,9	0,0	154,6
1966	43,5	16,8	38,9	4,5	6,4	2,1	0,0	1,9	15,5	3,8	20,6	0,3	154,3
1969	4,0	28,7	40,0	17,0	2,5	4,0	1,6	0,0	9,0	23,5	17,4	0,0	147,7
1968	0,0	4,1	19,5	20,5	6,9	15,5	1,6	13,9	44,3	9,6	3,5	3,9	143,3
1986	31,7	3,3	3,9	13,0	0,0	1,8	0,0	5,0	7,3	55,7	16,0	0,0	137,7

1924	21,6	26,4	18,8	6,6	1,0	0,0	0,3	2,6	30,9	0,0	0,0	26,6	134,8
1967	4,1	8,5	16,4	18,2	50,0	2,2	3,2	3,5	4,0	10,0	6,0	8,5	134,6
1990	19,0	13,0	13,6	43,0	3,5	0,0	8,5	0,9	0,0	13,1	7,1	10,2	131,9
1949	7,6	4,8	3,0	11,4	10,1	0,0	1,3	0,0	0,0	1,3	82,0	9,4	130,9
1927	2,3	6,3	31,2	5,1	9,4	0,0	17,8	1,8	0,0	1,3	8,1	43,7	127,0
1987	2,5	0,0	9,0	23,9	5,0	0,0	0,0	0,0	53,5	0,0	19,0	9,3	122,2
1893	25,1	15,3	36,6	27,6	2,3	9,6	6,6	23,2	5,0	121,3	8,9	281,5=	116,5=
1915	9,4	0,0	0,0	17,0	6,6	5,3	9,2	4,6	0,0	9,7	28,0	26,7	116,5
1970	1,5	12,7	0,0	0,0	0,0	3,7	0,0	15,4	0,0	24,9	30,5	25,4	114,1
1926	5,1	0,0	3,6	0,3	4,3	7,6	4,9	0,0	8,6	16,0	61,8	0,0	112,2
1899	3,0	14,2	34,9	0,0	4,8	11,1	0,0	3,8	0,0	0,0	15,7	87,5=	102,3=
1919	0,0	32,0	5,0	35,0	3,8	9,1	2,8	3,0	2,0	3,3	3,6	1,8	101,4
AVE	20.9	27.3	38.4	22.7	14.7	7.6	9.1	13	15.1	20.5	25.6	23.5	238.4

Evaporation record for Willowmore

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	total
1972	337.2	274	229.3	170.1	107	77.9	105.6	139.1	229.7	283.5	326.5	391.5	2671.4
1973	383.6	250.7	229.8	140.8	96.7	102.9	102.7	144	216.3	268.7	295	343.1	2574.3
1978	365.1	322.2	241.7	135.1	132.7	83.7	96.3	154.8	172.5	240.4	297.4	314.7	2556.6
1983	382.5	277.2	256	162	111.6	93.3	103.3	157.3	159.2	222.9	252.6	355.9	2533.8
1980	339	276.3	249.3	183.5	137.7	95.9	111.8	123.7	171	239.5	245.9	330.7	2504.3
1977	368.7	203.1	202.1	156.5	97.7	101.9	123.7	148.8	184	250.4	284	358.5	2479.4
1984	325.8	284.8	215.2	166.9	122.9	102.3	115.9	141.1	187.5	227.6	244.3	273.1	2407.4
1975	327.2	258.9	204.3	168.1	101	87	91.6	147.1	139.8	267.9	286.7	315.7	2395.3
1987	317.8	329.3	210.6	143.1	126.3	71.5	101	146.2	116.3	206.1	252.9	312.6	2333.7
1979	344.6	274.4 **		158.3	120.8	77.6	93.6	110.2	195.7	260.9	338	350.7	2324.8
1981	325.8	254.6	213.3	156.4	87.2	62.1	103.9	103.9	173.3	264.3	269.9	308.8	2323.5
1974	273.8	178	163.4	128.4	74.5	75.2	101.9	128.4	151.5	246.6	271	358	2150.7
1976	308.5	202.9	147.4	110.7	80.5	76.6	88.6	128.5	153	184.6	268.9	377.2	2127.4
1986	265.7	229.1	180.8	141.9	126.6	79.9	75.6	96.8	171.9	164.3	254.1	320.9	2107.6
1971	258.5	199.2	189.4	111.7	84.5	65.8	66.8	116	155.1	230.7	275.1	335	2087.8
1962	284.5	219.5	189.7	146.3	99.6	80	89.9	110.2	140.7	212.3	202.7	284.5	2059.9
1965	284.5	225.3	184.1	114.3	101.3	64.3	76.7	120.9	165.4	186.2	207	284.5	2014.5
1964	269	216.4	178.8	122.4	103.9	60.2	91.2	109.7	120.6	171.7	235.2	289.8	1968.9
1967	319	240	208.8	109	84.6	67.3	74.7	134.6	164.1 **		253.7	293.6	1949.4
1985	244.3	200.2	196	128.9	87.7	66.4	81.6	132.4	150.7	187.3	262.4	210.5	1948.4
1970 **		240.9	227.9	146.7	119.2	87	96.1	120.2	159.5	211	242.9	285	1936.4
1966	282.4	214.9	211.8	123.7	91.7	83.8	97.8	106.7	158.5	224.3	265.7 **		1861.3
1982	318.2 **		200.8	109.4	90.9	89.2	89.9	132.8	169.5	233.8	255.3 **		1689.8
1963	243.8	201.2(112.	83.8	70.9	51.3	61	104.9	131.3	158.5	203.5	284.7		1393.7
1968	309.7(252.	115.6	79.9 **		87.5	101.3	154	216.3	260.5	304.2			1319.3
1969 **		240.2	168.3	118.5	96.1	65.2	91.6	133.1	**(185.3)2	322.5			1235.5
1961	59.2	76.2	98.6	160.3	196.8	227.8	299.5						1118.4
													0
AVE	311.6	239	200.6	136.6	101.3	78	92.5	125.6	163.5	220.8	260.6	316.2	2246.3

The following codes are used :
Die volgende kodes word gebruik :

* - unreliable due to missing data or accumulation.
* - onbetroubaar agv ontbrekende data of opgaring.

= - total for year or season is unreliable due to missing data.
= - totaal vir jaar of seisoen onbetroubaar agv ontbrekende data.

YTOT - total for the year.
YTOT - totaal vir die jaar.

STOT - total for the season (July of previous year to June of present year).
STOT - totaal vir die seisoen (Julie van vorige jaar tot Junie van huidige jaar).

NB :
NB :

YTOT and STOT will only be for the months appearing on the report. This value may be incorrect if only part of a year's data is extracted.
YTOT en STOT word bereken vir die maande wat op die verslag verskyn. Hierdie waardes kan verkeerd wees as slegs 'n gedeelte van 'n jaar se data onttrek is.

MONTHLY RAINFALL (mm) FOR 1893/01/01 - 1998/12/31

MAANDELIKSE REENVAL (mm) VIR 1893/01/01 - 1998/12/31

STEYTLERVILLE - MAG 0052590 5 LAT: 3320 LON: 2420 H: 419 m

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTOT	STOT
1893	25,1	15,3	36,6	27,6	2,3	9,6	6,6	23,2	5,0	121,3	8,9	281,5=	116,5=	
1894	10,2	45,8	126,2	10,7	10,4	7,								

5								
1	11,4	1912	24,1	55,8	0,0	75,4	0,0	20,
2		5,8	13,2	0,0	5,6	17,8	229,2	318,
6	16,0	1913	30,3	124,5	94,4	9,9	2,0	6,
5		3,8	58,1	29,2	15,5	0,0	390,3	321,
0	0,0	1914	25,6	23,4	26,5	28,0	27,4	12,
5		18,8	0,0	28,7	53,4	11,4	255,2	265,
3	9,2	1915	9,4	0,0	0,0	17,0	6,6	5,
6		4,6	0,0	9,7	28,0	26,7	116,5	150,
6	11,0	1916		0,0	54,8	15,2	80,6	7,
4=		4,8	11,4	5,6	2,1	24,1	217,2=	236,
5	26,0	1917	20,9	47,3	86,1	77,5	1,8	59,
1		22,9	20,3	27,4	38,4	3,0	431,1	352,
8	4,8	1918	16,7	2,5	56,4	13,2	8,4	3,
0		5,6	14,7	29,7	0,0	10,3	166,1	239,
1	2,8	1919	0,0	32,0	5,0	35,0	3,8	9,
0		3,0	2,0	3,3	3,6	1,8	101,4	150,
1	8,9	1920	13,4	68,4	34,3	16,5	18,0	8,
2		25,0	0,0	24,7	20,3	34,0	271,6	175,
2		1921	17,8	46,7	34,1	50,3	17,3	19,
3		3,3	10,6	1,0	59,0	108,1	367,4=	298,
0	24,2	1922	33,8	5,1	71,6	24,1	19,1	0,
7=		9,3	0,0	9,7	49,8	31,5	278,2	335,
7	25,0	1923	17,0	35,6	64,0	29,4	17,1	11,
3		0,8	0,0	32,0	20,8	0,0	253,4	299,
0	0,3	1924	21,6	26,4	18,8	6,6	1,0	0,
0		2,6	30,9	0,0	0,0	26,6	134,8	153,
6	15,7	1925		27,5	23,8	29,1	10,0	13,
4=		8,9	37,1	12,7	18,6	13,7	210,7=	164,
6	4,9	1926	5,1	0,0	3,6	0,3	4,3	7,
6		0,0	8,6	16,0	61,8	0,0	112,2	127,
0	17,8	1927	2,3	6,3	31,2	5,1	9,4	0,
6		1,8	0,0	1,3	8,1	43,7	127,0	145,
8	5,0	1928	17,8	0,0	77,4	19,1	0,0	3,
8		3,0	21,6	3,3	15,8	24,1	190,9	190,

7	0,8		11,9	9,2	35,2	1,3	269,4=	376,
0=								
		1895	37,1	34,3	12,2	25,6	5,8	0,
0	2,0	0,0	11,9	16,3	16,7	26,2	188,1	173,
4=								
		1896	15,4	33,0	28,4	11,5	13,7	23,
6	0,0	60,8	4,1	12,4	57,3	25,2	285,4	198,
7								
		1897	6,6	0,0	39,6	3,0	53,4	1,
8	0,0	0,0	36,3	38,3	9,9	10,4	199,3	264,
2								
		1898	48,6	39,7	25,2	11,5	11,7	0,
0	5,6		1,1	17,7	9,6	11,4	182,1=	231,
6								
		1899	3,0	14,2		34,9	0,0	4,
8	11,1	0,0	3,8	0,0	0,0	15,7	87,5=	102,
3=								
		1900	20,6	15,0	58,2	10,2	0,0	0,
0	14,2	9,4	1,3	8,9	0,0	79,3	217,1	134,
6								
		1901	0,0	76,2	30,5	39,4	0,0	5,
9	0,5	0,0	0,0	1,2	0,9	0,0	154,6	265,
1								
		1902	0,0	34,6	124,0	8,9	0,0	12,
7	2,8	94,0	48,2	0,0	35,5	23,8	384,5	182,
8								
		1903	0,0	9,1	0,0	1,3	25,4	19,
3	6,4	7,4	5,1	71,9	17,8	16,7	180,4	259,
4								
		1904	90,2	60,2	36,8	9,2	7,6	0,
0	2,8	11,7	20,3	43,2	0,0	15,3	297,3	329,
3								
		1905	0,0	22,1	38,4	26,3	9,4	20,
8	0,0	6,6	141,7	46,5	0,0	25,9	337,7	210,
3								
		1906	7,6	5,9	33,3	19,3	40,2	1,
3	2,3	1,5	21,7	41,2	10,9	62,7	247,9	328,
3								
		1907	55,9	35,5	35,0	54,8	4,3	6,
4	0,5	8,1	3,8	10,7	0,0	57,8	272,8	332,
2								
		1908	5,1	6,4	0,0	7,9	19,1	12,
9	1,5	3,6	4,3	27,4	0,0	1,8	90,0	132,
3								
		1909	24,2	10,1	43,7	20,8	37,3	0,
0	4,6	0,0	8,2	10,5	20,8	42,6	222,8	174,
7								
		1910	33,3	48,0	44,7	0,0	41,9	9,
7	3,0	3,8	2,8	10,5	28,4	8,9	235,0	264,
3								
		1911	53,8	22,8	41,7	23,4	37,6	2,
8	0,0	26,2*	50,3	27,5	38,8	0,0	324,9=	239,

7	24,9	1929 14,0	4,8 57,7	21,3 10,5	15,5 5,0	20,3 26,1	14,8 228,6	13, 163,
2								
6	8,9	1930 9,2	14,3 7,4	36,0 34,1	23,4 5,1	15,2 49,5	5,1 215,8	7, 239,
8								
3	37,8	1931 4,0	20,6 0,0	2,5 74,2	42,5 32,3	7,6 85,4	0,0 309,2	2, 189,
7								
0	0,0	1932 1,5	60,4 67,2	31,0 24,7	22,9 24,7	3,0 0,0	20,6 259,0	3, 374,
6								
6	0,0	1933 73,4	5,3 38,9	27,1 0,0	20,6 33,0	48,0 41,9	0,5 292,3	3, 223,
2								
0	29,8	1934 0,0	19,5 10,4	15,1 11,7	46,7 50,3	35,5 7,7	3,6 230,3	0, 307,
6								
0	15,2	1935 11,7	6,6 16,7	3,8 2,5	15,7 18,6	32,3 8,7	66,1 228,9	31, 265,
4								
0	11,4	1936 0,0	4,9 7,9	0,0 38,9	79,3 48,1	0,0* 29,4	3,3 225,2=	2, 162,
9								
0	9,4	1937 0,0	26,0 1,5	16,3 23,4	22,4 24,4	0,0 32,6	19,0 175,0	0, 219,
4								
8	39,6	1938 0,0	8,6 10,6	3,8 15,5	7,1 39,3	49,5 14,4	9,2 201,4	3, 173,
3								
1	7,3	1939 91,3	7,4 8,6	86,1 33,0	21,6 3,3	16,8	10,2 290,7=	5, 249,
8=								
0	23,6	1940 0,0	0,0 29,5	61,5 14,5	41,1 10,7	0,0 0,0	2,8 183,7	0, 265,
7								
2	0,8	1941 10,4	40,7 0,0	24,6 21,8	4,6 2,0	38,1 20,9	0,0 177,1	13, 199,
5								
4	3,0	1942 12,9	22,9 1,3	5,1 73,5	13,7 34,7	21,8 27,1	10,2 237,6	11, 141,
0								
5	0,0	1943 12,9	17,2 21,3	8,1 14,4	65,5 99,8	11,9 16,6	8,8 290,0	13, 277,
5								
9	12,9	1944 3,5	3,0 14,7	4,0 21,6	57,1 0,0	4,3 0,0	50,3 177,3	5, 289,
6								
0	17,0	1945 0,0	8,6 5,3	43,9 10,2	11,7 5,3	19,8 3,8	18,8 158,4	14, 169,
5								
		1946	2,0	12,2	54,8	40,2	17,5*	3,

69	13,7	7,8	9,6	14,7	0,0	8,6	184,7=	171,
50	21,7	1947 0,0	15,0 7,1	4,3 15,2	46,4 15,2	21,3 58,6	20,1 227,4	2, 164,
80	11,9	1948 12,2	36,4 7,1	23,9 20,1	33,4 0,0	58,6 17,8	3,1 228,3	3, 277,
00	1,3	1949 0,0	7,6 0,0	4,8 1,3	3,0 82,0	11,4 9,4	10,1 130,9	0, 106,
07	5,0	1950 36,8	12,2 37,2	5,1 10,1	61,4 50,0	18,0 33,0	14,0 282,8	0, 204,
83	21,1	1951 0,0	99,0 3,0*	25,6 26,2	10,4 0,0	0,0 0,0	9,4 197,5=	2, 319,
10	3,5	1952 20,0	2,8 52,6	76,5 15,0	4,8 28,3	32,5 17,6	3,0 266,7	10, 180,
74	3,8	1953 6,6	11,4 16,7	44,8 55,9	18,5 47,7	0,0 31,5	0,0 249,6	12, 224,
47	1,8	1954 22,4	22,6 3,6	5,6 3,9	104,7 55,2	24,6 0,0	67,6 321,4	9, 396,
65	11,2	1955 3,8	4,9 1,0	138,0 2,8	45,0 54,1	19,3 26,5	1,8 315,0	6, 302,
16	15,1	1956 4,5	10,2 28,9	27,0 35,5	103,0 11,5	6,7 26,5	29,2 299,2	1, 276,
05	0,0	1957 0,0	13,0 11,5	71,8 7,5	32,7 0,0	25,0 22,6	15,0 213,1	14, 293,
04	0,0	1958 2,0	24,5 11,5	0,0 11,0	6,0 8,0	6,8 35,0	56,5 161,3	0, 135,
07	4,2	1959 14,5	0,0 0,0	65,5 19,0	38,5 12,5	73,4 13,5	15,8 256,9	0, 260,
02	0,0	1960 23,5	7,5 0,0	0,0 48,0	54,5 46,5	15,0 52,0	15,5 267,5	5, 161,
03	0,0	1961 16,8	3,5 0,0	14,0 0,5	142,5 3,5	20,3 0,0	15,0 220,1	4, 369,
00	3,0	1962 24,0	26,0 0,0	22,5 5,0	20,7 42,0	15,0 7,5	3,0 171,7	3, 111,
1	4,7	1963 2,9	41,6 3,5	20,5 15,7	81,5 54,2	87,5 21,4	9,5 350,1	7, 329,

2								
23	0,0	1964 15,0	10,0 53,4	19,2 14,2	23,1 16,7	37,4 13,6	0,0 226,8	24, 216,.
70	13,3	1965 0,6	0,7 16,5	6,2 34,0	26,5 82,4	17,6 0,0	9,4 208,9	1, 175,
10	0,0	1966 1,9	43,5 15,5	16,8 3,8	38,9 20,6	4,5 0,3	6,4 154,3	2, 259,
25	3,2	1967 3,5	4,1 4,0	8,5 10,0	16,4 6,0	18,2 8,5	50,0 134,6	2, 141,
57	1,6	1968 13,9	0,0 44,3	4,1 9,6	19,5 3,5	20,5 3,9	6,9 143,3	15, 101,
00	1,6	1969 0,0	4,0 9,0	28,7 23,5	40,0 17,4	17,0 0,0	2,5 147,7	4, 173,
74	0,0	1970 15,4	1,5 0,0	12,7 24,9	0,0 30,5	0,0 25,4	0,0 114,1	3, 69,
95	62,7	1971 124,7	17,6 0,0	8,2 4,7	53,5 1,2	39,9 7,5	13,2 336,1	2, 231,
06	0,5	1972 4,1	34,1 0,0	11,1 5,0	58,0 25,6	6,6 16,5	0,0 162,5	1, 311,
21	6,7	1973 24,0	0,5 4,0	34,9 25,0	67,3 7,5	50,0 96,9	17,5 338,5	4, 226,
02	0,0	1974 32,5	122,5 1,0	91,7 7,5	129,0 49,3	51,7 27,5	47,2 560,9	1, 607,
03	9,2	1975 20,0	34,5 17,0	20,5 1,0	77,5 21,5	7,0 69,7	0,0 305,9	28, 285,
56	1,2	1976 0,0	28,0 10,0	23,2 30,7	55,5 4,5	1,2 16,8	3,8 175,4	0, 250,
02	0,0	1977 8,0	8,5 24,5	112,0 9,0	31,5 11,0	71,5 28,5	59,5 364,0	0, 346,
50	0,0	1978 9,0	23,5 2,5	3,5 28,5	8,5 25,5	34,0 36,5	0,0 176,0	4, 155,
33	70,3	1979 75,0	6,0 0,6	74,2 42,5	0,0 16,9	7,0 0,0	21,8 322,6	8, 219,
09	0,5	1980 6,9	48,7 25,8	34,6 17,5	47,3 0,0*	17,0* 7,1	1,0 206,4=	0, 353,

9		1981	35,6	26,7*	141,3	6,9	100,7	9,
9	0,0	26,3	0,0	51,0	22,6*	93,6	514,6=	378,
0		1982	20,3	1,2	11,6	76,0*	0,0	11,
6	0,0	0,0	17,4	16,0	3,5*	0,0	157,0=	313,
0		1983	5,3	9,5	11,5	2,4	0,0	18,
6	77,1	0,0	12,4	32,5	24,0	25,7	218,4	83,
0		1984	3,4	0,0	28,1	0,0	0,0	30,
2	15,0	3,2	3,5	0,0	15,0	0,0	98,2	233,
7		1985	44,0	64,0*	22,0	20,1*	1,7	18,
2	0,0	0,0	4,0	22,8	53,9	68,1	319,3=	207,
8		1986	31,7	3,3	3,9	13,0	0,0	1,
5	0,0	5,0	7,3	55,7	16,0	0,0	137,7	202,
0		1987	2,5	0,0	9,0	23,9	5,0	0,
4	0,0	0,0	53,5	0,0	19,0	9,3	122,2	124,
1		1988	19,0	54,0	50,1	55,7	3,5	3,
2	0,0	0,0	13,1	6,5	16,5	35,0	256,5	267,
5		1989	34,5	23,5	6,5	71,0	30,7	4,
8	4,0	10,0	0,0	32,5	99,5	0,0	316,7	241,
0		1990	19,0	13,0	13,6	43,0	3,5	0,
1	8,5	0,9	0,0	13,1	7,1	10,2	131,9	238,
6		1991	18,5	13,2	7,7	3,3	1,0	1,
1	7,1	3,0	6,2	74,2	14,5	20,5	170,8	85,
5		1992	3,0	43,5	22,0	7,5	0,0	12,
0	17,0	25,5	0,0	30,5	18,5	0,0	180,0	214,
5		1993	17,0	29,5	12,3	25,6	8,0	9,
4	0,0	18,0	92,0	36,6	42,0	71,0	361,5	193,
0		1994	69,2	17,1	53,2	20,5	9,5	1,
1	13,7	27,2	4,1	37,2	0,0	46,5	299,2	430,
0		1995	77,1	32,4	25,5	13,0	32,0	2,
7	0,0	14,0	7,5	12,5	65,5	75,4	356,9	310,
0		1996	27,4	34,0	41,5	5,6	6,0	0,
4	10,1	17,3	9,0	56,5	124,5	66,4	398,3	289,
0		1997	23,5	2,6	49,0	17,1	15,2	34,
2	16,0	8,0	1,0	18,0	7,5	0,0	191,9	425,
		1998	35,0	31,0	24,5	22,0	9,5	0,

0 5	1,4	49,5	5,0	22,5	20,5	37,0	257,9	172,

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1972	337.2	274	229.3	170.1	107	77.9	105.6	139.1
1973	383.6	250.7	229.8	140.8	96.7	102.9	102.7	144
1978	365.1	322.2	241.7	135.1	132.7	83.7	96.3	154.8
1983	382.5	277.2	256	162	111.6	93.3	103.3	157.3
1980	339	276.3	249.3	183.5	137.7	95.9	111.8	123.7
1977	368.7	203.1	202.1	156.5	97.7	101.9	123.7	148.8
1984	325.8	284.8	215.2	166.9	122.9	102.3	115.9	141.1
1975	327.2	258.9	204.3	168.1	101	87	91.6	147.1
1987	317.8	329.3	210.6	143.1	126.3	71.5	101	146.2
1979	344.6	274.4 **		158.3	120.8	77.6	93.6	110.2
1981	325.8	254.6	213.3	156.4	87.2	62.1	103.9	103.9
1974	273.8	178	163.4	128.4	74.5	75.2	101.9	128.4
1976	308.5	202.9	147.4	110.7	80.5	76.6	88.6	128.5
1986	265.7	229.1	180.8	141.9	126.6	79.9	75.6	96.8
1971	258.5	199.2	189.4	111.7	84.5	65.8	66.8	116
1962	284.5	219.5	189.7	146.3	99.6	80	89.9	110.2
1965	284.5	225.3	184.1	114.3	101.3	64.3	76.7	120.9
1964	269	216.4	178.8	122.4	103.9	60.2	91.2	109.7
1967	319	240	208.8	109	84.6	67.3	74.7	134.6
1985	244.3	200.2	196	128.9	87.7	66.4	81.6	132.4
1970 **		240.9	227.9	146.7	119.2	87	96.1	120.2
1966	282.4	214.9	211.8	123.7	91.7	83.8	97.8	106.7
1982	318.2 **		200.8	109.4	90.9	89.2	89.9	132.8
1963	243.8	201.2(112.	83.8	70.9	51.3	61	104.9	131.3
1968	309.7(252.	115.6	79.9 **		87.5	101.3	154	216.3
1969 **		240.2	168.3	118.5	96.1	65.2	91.6	133.1
1961	59.2	76.2	98.6	160.3	196.8	227.8	299.5	
AVE	311.6	239	200.6	136.6	101.3	78	92.5	125.6

YEAR AVE : 2246

SEP	OCT	NOV	DEC	total
229.7	283.5	326.5	391.5	2671.4
216.3	268.7	295	343.1	2574.3
172.5	240.4	297.4	314.7	2556.6
159.2	222.9	252.6	355.9	2533.8
171	239.5	245.9	330.7	2504.3
184	250.4	284	358.5	2479.4
187.5	227.6	244.3	273.1	2407.4
139.8	267.9	286.7	315.7	2395.3
116.3	206.1	252.9	312.6	2333.7
195.7	260.9	338	350.7	2324.8
173.3	264.3	269.9	308.8	2323.5
151.5	246.6	271	358	2150.7
153	184.6	268.9	377.2	2127.4
171.9	164.3	254.1	320.9	2107.6
155.1	230.7	275.1	335	2087.8
140.7	212.3	202.7	284.5	2059.9
165.4	186.2	207	284.5	2014.5
120.6	171.7	235.2	289.8	1968.9
164.1 **		253.7	293.6	1949.4
150.7	187.3	262.4	210.5	1948.4
159.5	211	242.9	285	1936.4
158.5	224.3	265.7 **		1861.3
169.5	233.8	255.3 **		1689.8
158.5	203.5	284.7		1393.7
260.5	304.2			1319.3
**(185.3)25	322.5			1235.5
				1118.4
				0
163.5	220.8	260.6	316.2	2246.3

APPENDIX 3
TEST PIT LOGS

GCS
GROUNDWATER CONSULTING SERVICES
WATER, ENVIRONMENTAL & EARTH SCIENCES CONSULTANTS

Our Ref.:
Your Ref:

22 October 2002

1 Camdeboo Street Graaf Reinette
P O Box 322 Graaf Reinette 6280
(049) 892 5598
peterw@groundwaterconsulting.com

Uhambiso Consult (Pty)
P O Box 2464
GEORGE
6530

Attention: Andrè de Kok

TEST PITS – PROPOSED STEYTLERVILLE SEWAGE WORKS

Andrè

Please find attached test pit logs. The sketch of the test pit positions is not to scale.

Kind regards

PI Welman
GCS
Hydrogeologist

[illegible]
[illegible]
CAPE TOWN
PO BOX 328 PLUMSTEAD 7801
TEL: +27(0)21 762 2550
FAX: +27(0)21 762 0811
[illegible]
[illegible]
[illegible]
JOHANNESBURG
PO BOX 810 GILLITTS 3603
TEL: +27(0)31 765 2020
FAX: +27(0)31 765 8204
[illegible]
[illegible]
[illegible]

STEYTLERVILLE PROPOSED SEWAGE SITE TEST PITS

TEST PIT 1

0.00 – 0.10	Brown Silty Soil, Root Zone
0.10 – 1.27	Reddish brown, fine grained, sandy silt
1.27 – 2.95	Brown, fine-grained silt
2.5 – 3.35	Brown, fine grained clay silt, bottom 60cm moist.

TEST PIT 2

0.00 – 0.55	Brown, fine-grained silt with small calcrete nodules, donkey skeleton at 0.45metres
0.55 – 1.40	Reddish brown, fine grained sandy silt with calcrete nodules
1.40 – 3.3	brown, fine-grained silt

TEST PIT 3

0.00 – 0.10	Brown fine-grained silty soil, Root Zone
0.10 – 0.65	Reddish Brown, fine-grained sandy silt with calcareous nodules
0.65 – 3.44	Brown fine grained silt

TEST PIT 4

0.00 – 0.22	Brown fine-grained silty soil. Root Zone
0.22 – 0.95	Reddish brown sandy silt with calcareous nodules
0.95 – 3.15	Brown fine-grained silt

TEST PIT 5

0.00 – 0.26	Brown silty soil. Root Zone
0.26 – 1.05	Brown fine grained silt
1.05 – 2.15	Reddish brown calcareous sandy silt
2.15 – 3.05	Brown fine-grained silt

TEST PIT 6

0.00 – 0.35	Brown silty soil. Root Zone
0.35 – 0.71	Reddish brown, calcareous sandy silt
0.71 – 1.15	Brown, fine grained silt
1.15 – 1.43	Reddish brown, calcareous sandy silt
1.43 – 3.33	Brown, fine-grained silt

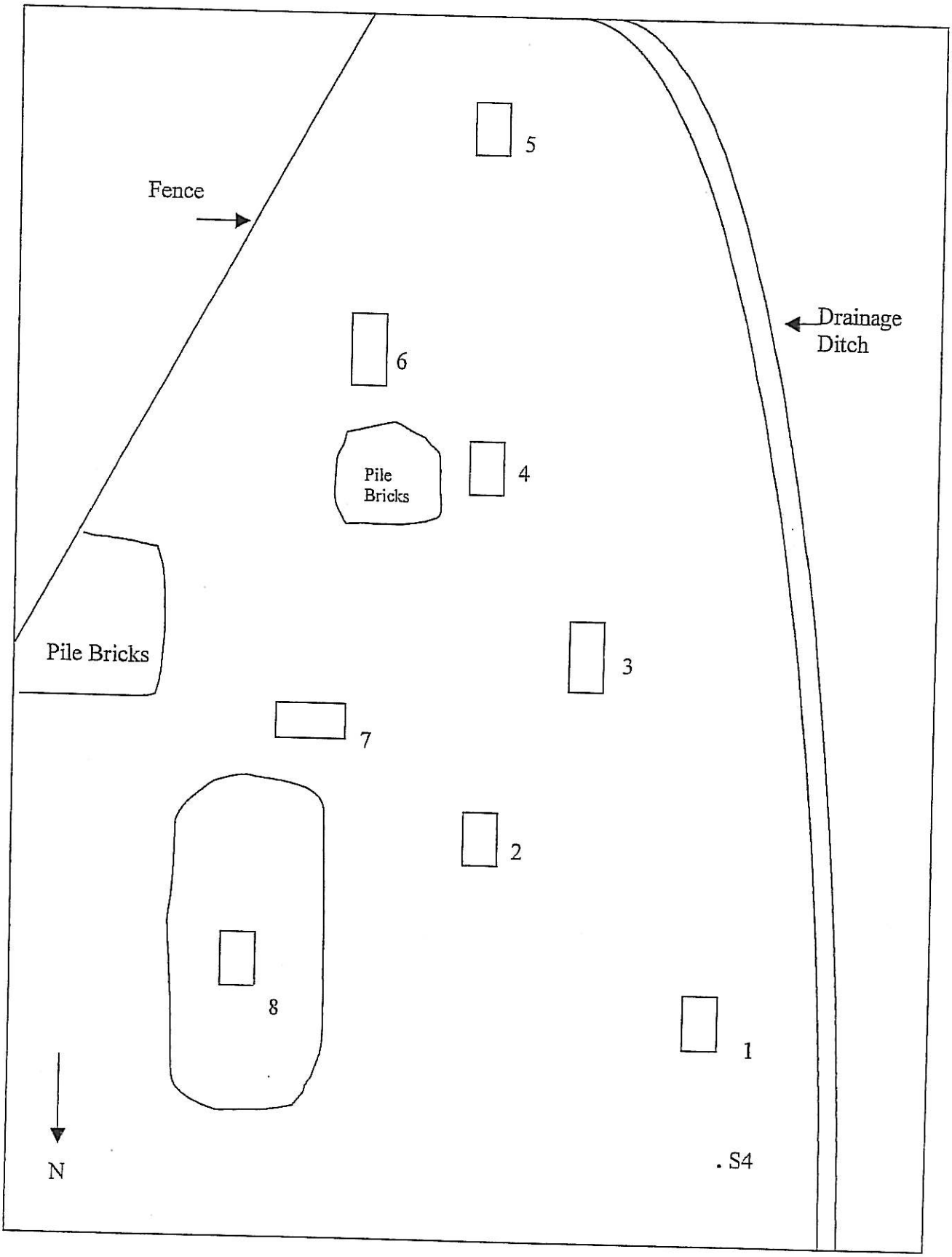
TEST PIT 7

0.00 – 0.45	Brown fine-grained silt, Root Zone
0.45 – 1.40	Reddish brown, calcareous sandy silt
1.40 – 3.40	Brown fine-grained silt

TEST PIT 8 (Inside borrow pit ± 1.3m deep)

0.00 – 0.05	Brown fine-grained silt. Root Zone
0.05 – 3.35	Brown fine-grained silt with salt deposits. Moist from 1.65 – 3.35m

SKETCH PLAN



APPENDIX 4
PUBLIC PARTICIPATION

ENVIRONMENTAL IMPACT ASSESSMENT (SCOPING LEVEL)

PROPOSED CONSTRUCTION OF OXYDATION PONDS AND ANCILLARY STRUCTURES STEYTLERVILLE MUNICIPALITY

The Steytlerville Municipality, together with the consultants Uhambiso Consult and Groundwater Consulting Services, are applying for a license from the Department of Water Affairs and Forestry for the construction of oxidation ponds and ancillary structures south of the town and authorization from the Department of Environmental and Cultural Affairs and Sport in terms of the EIA regulations (GN No. R.1182 and GN No.1183 of 5 September 1997).

In terms of Section 21 of the Environment Conservation Act, the construction of oxidation ponds and ancillary structures is a scheduled process that could have detrimental impact on the environment. A scoping report identifying potential environmental impacts of the construction has been completed by Groundwater Consulting Services' (GCS). A copy of the scoping report is available for your information at the Steytlerville Municipal offices (Martin Lötter - Town Clerk, Steytlerville; telephone 049-8350022).

Please address any comment or objections you may have to the proposed construction of the oxidation ponds and ancillary structures to Ian Welman (Groundwater Consulting Services); tel: 049-9825598 or fax: 049-8925598or e-mail: peterw@groundwaterconsulting.com within 2 weeks of the date of the newspaper this notice appears in. Your comments will be incorporated in the scoping report and forwarded to the regional offices of the relevant authorities.

All written comments are to be addressed to:

Ian Welman
Groundwater Consulting Services
P.O. Box 322,
Graaff Reinet
6280

Reference. 7147 BG/5/ADK/ms
Inquiries to: A S de Kock
Date: 19 April 2002

MINUTES

MINUTES OF MEETING NO. 2 HELD ON 18 APRIL 2002 AT 14:00 AT THE TOWN HALL, STEYTLERVILLE TO DISCUSS MATTERS REGARDING THE PROPOSED NEW RAPID LAND DEVELOPMENT PROJECT AS WELL AS THE PROPOSED NEW SEWAGE TREATMENT WORKS

PROJECT INFORMATION

Project No.:
7147 BG

Project Description:
Steytlerville : 392 sites

Funding Programme:
Project Linked Housing Subsidy Scheme: Rapid Land Development Programme

Funding Agency:
Department of Housing and Local Government

Developer:
Baviaans Municipality

Consulting Engineers:
Uhambiso Consult (Pty)Ltd.

Town Planners:
Urban Dynamics Inc.

		ACTION BY
1.	WELCOME	
	Mr A. de Kock, Uhambiso Consult welcomed everybody present. Mr.N. Hartzenberg opened the meeting with a prayer.	
	Present - see list attached	
	Mr. R. van Gend of Urban Dynamics was introduced to the meeting	

2. PROPOSED NEW RAPID LAND DEVELOPMENT PROJECT (HOUSING)

Mr. A de Kock briefly summarized the discussions at the last meeting held on 27/03/2002 as per the minutes.

Investigations and site visits to possible development areas in Golden Valley were undertaken and A de Kock / R van Gend reported as follows:

• Area No.1 -	Erven adjacent to previous clinic in Golden Valley. (erven 134,136, 138, 140, 144, 146 – Victoria Street) Owner : Department of Public Works. Technical and town planning point of view – development is possible – availability and cost to be determined.	Mun. Uhambiso Urban Dyn.
• Area No.2 -	Erven west of River Street. Floodline of Groot River is problematic and these erven are not recommended for development.	
• Area No.3 -	Private Block of Erven. (erven 650, 271, 273, 275, 279, 281, 283, - Hayward / Bosman / Philpott / River Streets) Ownership to be determined and negotiations between owners and municipality required. Technical and town planning development is possible – availability and cost to be determined.	Mun. Uhambiso Urban Dyn.
• Area No. 4 -	Erven south of Daleview School. (erven 427, 429, 422, 424, 426, 428, 430, 433, 434 – Bosman / Madeliefie / Vygie Streets. Owner: Municipality. Technical and town planning point of view development is possible. Storm water drainage needs careful consideration.	
• Area No. 5 -	Erven south of Vygie Street (Squatter Camp) – erven 451, 452, 453, 454. Owner: Municipality. Technical and town planning point of view development is not preferable due to the closeness of the proposed new sewage works at the brick-fields. One row of erven adjacent to Vygie Street – same as north of Vygie Street is only possibility.	Uhambiso Urban Dyn.

After input by various role – players it was agreed that the following process will be followed:

- Availability and costs for the different areas in Golden Valley to be determined. — Municipality & Consultants
- Proposals to be submitted at a follow-up meeting on Thursday 2 May 2002.
- Beneficiaries / Applicants to be informed of choices and their preferences to be recorded.
- Development / Layout Plan to be finalized after beneficiaries / applicants have been consulted.

The list of applicants (492 No) was made available to parties after the meeting.
The names of the 392 beneficiaries for the project to be finalized. — Mun.

3. PROPOSED NEW SEWAGE TREATMENT WORKS

Mr. A. de Kock briefly summarized the discussions at the last meeting held on 27/03/2002 as per the minutes.

No further comments were received from the various role players and the general consensus is that site No.2 at the brick-fields is preferred.

The project will be in two phases. An amount of R300 000,00 is allocated for phase 1. Uhambiso Consult is appointed as consulting engineers for phase 1 – other consultants for phase 2.

The programme for phase 1 is as follows:

Step 1 - Environmental Impact Assessment

Step 2 - Call for Tenders (possibly July 2002)

Step 3 - Construction

4. NEXT MEETING

A next meeting is scheduled for Thursday 02 May at 14:00.

Minuted by
A. DE KOCK
Uhambiso Consult (Pty) Ltd

Attendance Register

A. de Kock	Uhambiso Consult
R. van Gend	Urban Dynamics
B. Skosana	Uhambiso Consult
N. Nappies	Baviaans Municipality
E. Loock	Baviaans Municipality
P. Daniels	ANC
W. Japhta	D.A
S. Mpondo	ANC Youth League
X. Mhamha	ANC Youth League
H. Simons	UNEWU
J. Philander	D.A
L. Philander	D.A
A. Festus	Police Forum
P. Rossouw	ANC
S. Simons	D.A
F. Arries	SAMWU
L. Fischer	ANC Women League
Me Mkhuwa	ANC Women League
J. Solomon	
S. Oliphant	
D.B. Vaaltyn	SANCO
W. Hartzenberg	SANCO
G. Joseph	D.A
Mr Potgieter	
Mrs Potgieter	

Reference. 7147 BG/5/ADK/ms

Inquiries to: A S de Kock

Date. 28 March 2002

MINUTES

MINUTES OF MEETING HELD ON 27 MARCH 2002 AT 14:00 AT THE TOWN HALL, STEYTLERVILLE TO DISCUSS MATTERS REGARDING THE PROPOSD NEW RAPID LAND DEVELOPMENT PROJECT AS WELL AS THE PROPOSED NEW SEWAGE TREATMENT WORKS

PROJECT INFORMATION

Project No.:
7147 BG

Project Description:
Steytlerville : 392 sites

Funding Programme:
Project Linked Housing Subsidy Scheme: Rapid Land Development Programme

Funding Agency:
Department of Housing and Local Government

Developer:
Baviaans Municipality

Consultant:
Uhambiso Consult (Pty)Ltd.

		ACTION BY
1.	WELCOME	
	Mr A. de Kock, Uhambiso Consult welcomed everybody present and apologies for any inconvenience caused by the postponement of the previous week's meeting. Mr J. M. Golozana opended the meeting with a prayer.	
	Present - see list attached	
2.	PROPOSED NEW RAPID LAND DEVELOPMENT PROJECT (HOUSING)	
	Approval was received from the Development of Housing that 392 sites were approved for Steytlerville under the Rapid Land Development Program.	

The development of 392 sites will consist of the installation of civil services only (phase 1) – water, sewage disposal and roads. The building of top structures will be under a separate phase and when further funding is available.

The layout plan as submitted to the Department of Housing includes for Areas F, G and H.

After discussion and input by various role-players it was resolved that undeveloped areas in Golden Valley should also be considered for inclusion in the layout plan. Proposals in this regard will be presented at a follow-up meeting. Uhambiso

The beneficiaries for the 392 sites need to be confirmed. Application forms to be submitted to the Department of Housing to determine if beneficiaries qualify according to the guidelines for subsidies.

The waiting list of 492 applicants as submitted in November 1999 to the Department of Housing will be the starting point for the identification of beneficiaries. Copies of the list will be supplied at the next meeting. Uhambiso

3. PROPOSED NEW SEWAGE TREATMENT WORKS (OXIDATION PONDS)

Three possible sites are identified for the establishment of a new sewage treatment works namely

Site No. 1 - At the present solid waste disposal site north of the town.
Site No. 2 - At the present brickmaking fields in the southern eastern corner of the municipal commage.
Site No. 3 - At the existing air field / strip adjacent to Willowmore road west of the town.

The pros and cons of the various sites were discussed and can be summarized as follows:

Site No. 1: Far from development areas (± 4km), Otherside of River, Pumpstation and pump pipeline are needed.
Site No. 2: Close to development areas, only minimum distance of 500 metre from Golden Valley, sewage can gravitate from development areas, maintenance and operational costs are lower.
Site No. 3: Far from development areas (± 4km), Pumpstation and pumpline require, Further development of town in western direction can be a problem in future, maintenance and operational costs (electricity) are higher.

The general opinion of the meeting was that Site No 2 is more suitable but will be further discussed at the next meeting.

4. NEXT MEETING

A next meeting was scheduled for Tuesday 23 April at 14:00.

A representative of the Baviaans Municipality should attend the meeting.

Minuted by
A. DE KOCK
Uhambiso Consult (Pty) Ltd

Steytlerville Housing / Sewage Works

Attendance Register 27/03/2002

A. de Koch Uhambiso Consult

W. UITMAKER (DA-STEYTLERVILLE)

W. Jacobus DA. Steytlerville

A. NONKONANDI - ADVICE OFFICE

M. MKUMA - ANCWL

G. VERMAAK (DA-STEYTLERVILLE)

M.A. POTGIETER (DA-STEYTLERVILLE)

I. PHILANDER (DA-Steytlerville)

G. JOSEPH (DA-STEYTLERVILLE)

P. DANIELS (A.N.C local BRANCH)

J. Solomons (unemployed Committee)

J.M Gelozana (unemployed " " 3

N. HARTZENBERG (SANCO)

L. Fisher (A.N.C local BRANCH)

J. B. SKOSANA UHAMBISO (CONSULT

G.S. Spogter OLD AGE GROUPS

APPENDIX 5:
GENERAL AUTHORISATIONS