DEPARTMENT: WATER AFFAIRS

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THE CLASSIFICATION OF SIGNIFICANT WATER RESOURCES IN THE OLIFANTS-DOORN WATER MANAGEMENT AREA

OLIFANTS-DOORN WMA CLASSIFICATION PHASE 3A – GROUNDWATER TECHNICAL REPORT

APRIL 2012

This report should be read in conjunction with the final project report:

Department of Water Affairs, South Africa, April 2012. Final project report for the Classification of significant water resources in the Olifants-Doorn WMA. Belcher A and Grobler D, April 2012. Report number: RDM/WMA17/00/CON/CLA/0111.

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1. INTRODUCTION

Groundwater is an important component of the hydrological resources of the Olifants - Doorn Water Management Area (WMA) (Map 1, Appendix A). Geological and hydrogeological conditions vary considerably. The main implication of this variability across the WMA is that groundwater quantity and quality also varies significantly. In certain areas groundwater is an important component of the total water resources budget, whilst in other regions its occurrence is very limited. Consequently the role groundwater plays in the socio-economic and ecological sectors also varies.

There is no shortage of literature on the Olifants-Doorn WMA. Good information regarding groundwater is contained within the Internal Strategic Perspective for the Olifants-Doorn WMA (DWAF, 2005a). It discusses the geohydrological setting in some detail, even at the tertiary catchment sub-area level. Although a Catchment Management Strategy has not been finalised for the Olifants-Doorn WMA the draft version provides useful information. In addition the development of the National Water Resources Classification System (NWRCS) was developed and tested in the Olifants-Doorn WMA (DWAF, 2007). A list of literature with specific reference to groundwater resource classification includes: Parsons and Associates (2000); GEOSS (2003); SRK (2006); GEOSS (2006); Southern Waters (2006); DWAF (2007) and C.A.P.E. (2009).

This report addresses the actual classification of groundwater resources. A lot of spatial variability exists with regard to groundwater especially as for 78% of the WMA the groundwater occurs within a fractured rock aquifer setting. However this variability is lost to a degree as the groundwater classification is per Quaternary Catchment. It is acknowledged that the groundwater flow is controlled to a large extent by the geological and hydrogeological conditions and not by the surface topography. Quaternary Catchments are defined according to topographical variation and features. Nonetheless the analysis has been completed on a Quaternary Catchment basis as this facilitates and simplifies the integration of the classification process with the other disciplines.

2. TERMS OF REFERENCE

The Terms of Reference for this specialist study have been to address the groundwater component of Water Resources Classification of the Olifants-Doorn WMA. The 7-step classification process is to be followed and the latest available data is to be used.

3. GROUNDWATER SETTING

3.1 Geology

Map 2 (Appendix A) and Table 1 summarises the geology of the Olifants-Doorn WMA. The geological description is taken mainly from SRK (2006). The nature and composition

(lithology) of each of the different stratigraphic units is considered. Hydrogeological characteristics, with regard to the permeability of the unit and its classification as an aquifer, aquitard or aquiclude, are also included. The geology of the Olifants-Doorn WMA is dominated by metamorphic rocks of the Nama Group in the north and sedimentary rocks of the Cape Supergroup in the southern and south-western parts. In the northern and north-eastern parts, the rocks of the pre-Cape Van Rhynsdorp Group, the sedimentary rocks of the lower Karoo Supergroup as well as intrusive Karoo dolerites are dominant. Various metamorphic rocks (i.e. quartzites, granulite and schists), augen gneisses as well as mafic gneisses of the Garies and Bitterfontein Subgroups (Okiep Group) are overlain by sediments of the Nama Group in the north-western portion of the WMA near Nuwerus. Tertiary to Recent sediments occurs along the major river courses and extensively along the coast (including north-west of the town of Graafwater).

The main characteristics of each of the main aquifers as well as the status quo of groundwater abstraction and exploitation potential in the Olifants-Doring WMA, are summarised in Table 1.

Table 1.Stratigraphy of the Olifants-Doorn WMA (SRK, 2006)

Lithostratigraphic Unit			Era	Characteristics	Hydrogeological Significance
Sandveld Group			Cenzoic		
Karoo Dolerite (north-east)			Mesozoic		Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
Karoo Group	Beaufort Group		Mesozoic	6000m alternating arenaceous and argillaceous sediments	Localised significance as aquifer systems.
	Ecca Group		Paleozoic	Dark grey shale and inter-bedded sandstone	Middle to upper thin sandstone strata may have greater hydrogeological significance
	Dwyka Group			Tillite	Aquiclude
Cape Supergroup	Wittenberg Group		Paleozoic	Alternating sand-stone and shale	Marginal hydrogeological significance
	Bokkeveld Group			Alternating sand-stone and shale	Little significance, else regolith aquifer
	Table Mountain Group	Nardouw Subgroup		1100m to 810m alternating sand-stone and shale with lenses of quartzite	Top aquifer of TMG-2. Confined above by lowermost shale unit of Bokkeveld Group
		Cederberg Shale Formation		50m to 120m shale	Top confining layer for lower aquifer system (TMG-1)
		Pakhuis Formation		40m	Major fractured rock/secondary aquifer system. Middle aquifer (TMG-1)
		Peninsula Formation		1800m to 2150m sandstone	
		Graafwater Formation		Sandstone	
		Piekenierskloof Formation		Conglomeratic base, followed by 800m coarse sandstone	Basal aquifer unit (TMG-1)
Klipheuvel Group			Paleozoic	Lower conglomeratic formation and an upper mudstone formation of approx 2000m	Aquitard of limited hydrogeological significance
Van Rhynsdorp Group (north-west)			Paleozoic	A sucession of shallow sediments deposited on a tidal plain	Impermeable aquiclude
Malmesbury Group (south)			Namibian		Impermeable aquiclude

3.2 Groundwater

With regard to the geohydrological setting (Map 3, Appendix A) the description that follows is based on the 1:500 000 Hydrogeological Map Series of Department of Water Affairs (DWA). The four aquifer types and associated extent (expressed as a percentage) within the Olifants-Doorn WMA are:

- Fractured (78 %)
- Intergranular and fractured (20 %)
- Intergranular (1 %)
- Karst (1 %).

The percentage of the total WMA for each aquifer type and associated sub-divisions is given in Table 2. The total area of the WMA is approximately 56 742 km^2.

Table 2.Aquifer types and percentage of the O-D WMA

Aquifer type and yield	Total Area (km^2)	% of Area of WMA
Fractured 0.0 - 0.1 ℓ/s	947.6	1.7
Fractured 0.1 - 0.5 ℓ/s	18584.0	32.8
Fractured 0.5 - 2.0 ℓ/s	18414.5	32.5
Fractured 2.0 - 5.0 ℓ/s	5975.9	10.5
Fractured > 5.0 ℓ/s	188.9	0.3
Intergranular 0.1 - 0.5 ℓ/s	267.1	0.5
Intergranular 2.0 - 5.0 ℓ/s	198.5	0.4
Intergranular> 5.0 ℓ/s	157.7	0.3
Intergranular and fractured 0.0 - 0.1 ℓ/s	1227.1	2.2
Intergranular and fractured 0.1 - 0.5 ℓ/s	9685.2	17.1
Intergranular and fractured 0.5 - 2.0 ℓ/s	335.8	0.6
Karst 0.5 - 2.0 ℓ/s	482.9	0.9
Karst > 5.0 ℓ/s	276.8	0.5

This table reflects that fractured aquifers are widely distributed across the WMA with the most typical borehole yield being between 0.1 ℓ/s and 2.0 ℓ/s.

3.3 Recharge

Groundwater recharge (Map 4, Appendix A) is an important component of hydrogeological characterisation as it has a major influence on groundwater quantity (especially if aquifer transmissivity and storage is favourable) and groundwater quality. Across the Olifants-Doorn WMA groundwater recharge ranges from 0 mm/a to 245 mm/a. The highest groundwater recharge occurs in the Upper Olifants sub-area, especially in the Winterhoek mountain area. Significant recharge also occurs in the Koue Bokkeveld, eastern Doring, and easternSandveld sub-areas. For the remaining areas groundwater recharge is quite limited.

3.4 Groundwater / Surface water interaction

Regarding groundwater/surface water interaction (Map 5, Appendix A) the range in contribution of groundwater supplying river base flow is from 0.0 to 20.4 Mm^3/a (per Quaternary Catchment). The highest base flow contribution areas are the same as areas of highest groundwater recharge. It must be noted, however, that in the other areas groundwater still plays a significant role in maintaining river base flow, although on a much smaller scale, i.e. smaller volumes and more limited in extent.

3.5 Groundwater quality (EC)

Groundwater quality (Map 6, Appendix A) varies greatly across the WMA and this is a function of many factors but mainly geology and recharge. The groundwater quality is good in the Koue Bokkeveld, Olifants, eastern Sandveld and western Doring sub-areas. Groundwater quality (as indicated by Electrical Conductivity (EC)) is very poor in the western part of the Knersvlakte sub-area.

3.6 Groundwater dependent ecosystems

Based on national scale mapping of Groundwater Dependent Ecosystems (GDEs) (Map 7, Appendix A) in the Sandveld sub-area groundwater plays a significant role in sustaining ecosystems, whilst there are many river riparian zones throughout the WMA where the probability of GDEs occurring is high.

3.7 Groundwater importance (ecological and socio-economic)

Groundwater importance varies across the WMA. If groundwater importance is categorised according to:

a) socio-economic importance and
b) ecological importance,

then all groundwater components mentioned above need to be taken into account as well as groundwater use by the private, commercial and municipal sectors. Groundwater importance is relevant to this project as, when defining target management classes, as it is important to know whether groundwater needs to be considered and to what degree or whether it does not need to be taken into account at all.

4. CLASSIFICATION

4.1 Introduction

The classification of water resources includes consideration of all components of the hydrological system (surface water, wetlands, estuaries and groundwater) as well as the outcome of the catchment visioning process. The class of a resource is to be set by water

resource managers, technical specialists and stakeholders in a catchment. In addition to water-related technical issues, consideration is also given to social and economic factors during the catchment visioning and public participation processes.

There is a seven-step process (Table 3) for determining the class of water resource, before which the Geohydrological Response Units (GRUs) need to be defined and then classified. However, for the scale of the project and for the practical implementation of the target management classes, it is proposed quaternary catchments are the GRUs. Once this classification per quaternary catchment is completed, discussion with the project team will be held on the linkage between groundwater and surface water nodes will take place. The methodology for identifying these nodes is well described in the report by DWAF (2007).

Table 3. Seven steps for determining the class of a water resource

Steps	Description
1	Delineate the units of analysis & describe the status quo of the water resource
2	Link the socio-economic & ecological value & condition of the water resource
3	Quantify the ecological water requirements & changes in non-water quality ecosystem goods, services & attributes
4	Determine an ecologically sustainable base configuration scenario
5	Evaluate scenarios within the IWRM process
6	Evaluate scenarios with stakeholders
7	Gazette the class configuration

To determine the class of a water resource, reference conditions must be identified and present status assessed (referred to as the present ecological status (PES)). Assigned to each unit is a single PES, comprising classification according to:

- sustainable use, level(s) of stress and
- level of usage or contamination.

The level of stress is based on the volume of groundwater abstracted compared to the volume recharged.

Once the single PES has been assigned to each resource unit, then the groundwater resource category can be determined (Table 4).

Table 4. Terminology and classes used during the classification process.

Cat	Present Status Category (PES)	Desired Status Category*
A	Unmodified natural	Highly sensitive systems, negligible risk allowed
B	Largely natural	Sensitive systems, small risk allowed
C	Moderately modified	Moderately sensitive systems, moderate risk allowed
D	Largely modified	Resilient systems, large risk allowed
E	Seriously modified	
F	Critically modified	

Water Resource Category	Management Class*
Natural	Excellent
Good	Good
Fair	Fair
Poor	

** only considered during public participation and catchment visioning processes*

For this project the groundwater classification categories assigned per Quaternary Catchment are listed in Table 5. The classes are:

- **Excellent** (Class 1): where the water resource is minimally used and the overall ecological condition is minimally altered from its pre-development condition;
- **Good** (Class 2): where the water resource is used moderately and the overall ecological condition is moderately altered from its pre-development condition;
- **Fair** (Class 3): where the water resource is heavily used and the overall ecological condition is significantly altered from its pre-development condition.

Table 5. Management Classes and descriptions

Class	Where the water resource is:	Where the pre-development ecological condition is:
1	Minimally used	Minimally altered
2	Moderately used	Moderately altered
3	Significantly used	Significantly altered

SRK (2006) completed a Reserve determination study for the entire O-D WMA, excluding catchments G30, E10 and F60. Regarding the Sandveld Table 6 lists the classes defined for the G30 catchments.

Table 6.Groundwater usage and classification of six of the Sandveld catchments.

Catchment	Recharge (Mm^3/a)	Groundwater Usage (Mm^3/a)	Ratio of usage/Area ($Mm^3/ha/a$)	Stress Index (%)	Present Status Category	Water Resource Category
G30B	15.62	0.49	8	3.1	A	Natural
G30C	8.48	2.78	79	32.8	C	Good
G30D	12.38	4.00	75	32.3	C	Good
G30E	4.45	2.90	82	65.2	D	Fair
G30F	13.80	14.03	180	101.7	F	Poor
G30G	11.06	6.74	104	60.9	D	Fair

The E10 Quaternary Catchments have been classified however at the time of writing this report the E10 report had not yet been released by the Water Research Commission.

Regarding the catchments that had not been studied in detail before the following approach was taken:

- The classification process as outlined in the GRDM training manual (FETWater, 2004) was used to complete the classification of the Quaternary Catchments that have not been classified (i.e. F60).
- Following the GRDM approach all the previous classifications were checked.

4.2 Methodology

The basis used for the groundwater classification was to calculate the groundwater stress index. The groundwater stress index takes into account groundwater abstraction and groundwater recharge (i.e. abstraction/recharge). Table 7 lists the groundwater stress index classes and then also the linkage to Present Status Category (FETWater, 2004).

Table 7: Groundwater stress index classes

Stress Index (abstraction / recharge)	Description	Present Status Category (PES)
< 0.05	Unstressed or low levels of stress	A
0.05 – 0.20		B
0.20 – 0.40	Moderate levels of stress	C
0.40 – 0.65		D
0.65 – 0.95	Stressed	E
> 0.95	Critically stressed	F

The groundwater recharge values were obtained from the Groundwater Resources Assessment Phase II project (GRAII) per Quaternary Catchment. The groundwater abstraction values were also obtained from the GRAII project work (DWAF, 2005).

Once the single PES has been assigned to each resource unit, then the groundwater resource category was determined (Table 4).

A summary page has been generated per Quaternary Catchment (Appendix B). This Quaternary Catchment summary page includes:

- The catchment identity;
- The Present Status Category (A – F);
- The Desired Water Resource Category (A-F);
- The management class (Excellent/Good/Fair);
- The catchment size (km^2);
- The total amount of groundwater recharge occurring annually (Mm^3/a);
- The volume of groundwater abstracted annually (Mm^3/a)(the sub-division of that groundwater use is also included (i.e. rural use; mining; agriculture – irrigation; agriculture – livestock; industry and aquaculture;
- The groundwater balance (i.e. recharge – abstraction) (Mm^3/a);
- The groundwater stress index (abstraction / recharge);
- The surface water EWR low flow requirement (Mm^3/a);
- The volume of groundwater remaining for allocation (i.e. use) (Mm^3/a);
- An indication if a Groundwater Reserve has been calculated;
- The aquifer type and yield for the catchment;
- The groundwater quality for the catchment; and
- The geological setting of the catchment.

Included in the summary page there is a short discussion on:

- the risk to groundwater,
- assumptions and constraints;
- the levels of confidence associated with the classification;
- the implications of using more/less water;
- a brief discussion regarding groundwater "hot spots"; and
- relevant previous work.

It is anticipated that as more work is completed within the WMA various components of the Classification algorithm will become more accurate and improved. The Water Resources Classification System is dynamic and as management interventions are carried out the classification categories need to be recalculated and improvements can be assessed and documented.

5. RESULTS

The summary of each Quaternary catchment is provided in Appendix B. It is acknowledged that with regard to groundwater classification the approach is somewhat subjective, however the GRDM process has been followed (FETWater, 2004). The "Groundwater Stress Index" does not take into account environmental requirements. To address this issue in this project the surface water low flow Ecological Water Requirements (EWR) were taken into account. The EWR were obtained through a detailed and iterative process to ensure optimal functioning of the WMA. Thus for each Quaternary Catchment the additional groundwater available for use (i.e. for allocation) was calculated by using the following equation (all units in Mm^3/a):

Groundwater available for use = Recharge – (Total Use + surface water EWRlow flow requirement)

The Tables listed in Section 4 were then used for obtaining the applicable classes.The Quaternary Catchment that are already in a deficit (after taking surface water low flow EWR into account) are listed belowin ascending order:

Quat. Catch.	**Gwater available for use (-ve = a deficit (Mm^3/a))**
E21H	-7.37
E21G	-4.53
E32E	-2.70
E32B	-2.56
G30F	-1.28
E23F	-1.15
E24G	-1.04
E23K	-0.59
E24E	-0.37
E22G	-0.29
E24H	-0.27

E23J	-0.25
E24K	-0.08
E31C	-0.08
E31G	-0.07
E33A	-0.06
E31D	-0.05
E31H	-0.04
E31E	-0.03
E31F	-0.03.

Thus of the 88 Quaternary Catchments in the Olifants-Doorn WMA there are 20 in a state of insufficient groundwater being available to meet the surface water EWR low flow requirements. The information above must be taken into account when considering groundwater use license applications. However it is very important that temporal variability with regard to climatic conditions and spatial variability with regard to geohydrological settings are carefully considered as part of the groundwater use license applications. The Quaternary summaries are included in Appendix C.

6. DISCUSSION

A process has been followed whereby the groundwater stress index and groundwater availability was calculated for each Quaternary Catchment. The main data used was from the DWAF (2005) work, however if more recent work was completed this was included in the analysis. The agriculture use of groundwater was also assessed using Google Earth to estimate the extent of irrigated areas. In some catchments groundwater abstraction was reported for irrigation, yet there were no evidence of any agricultural activity in the catchment. In these situations the classifications were adjusted. It is acknowledged that the approach followed is somewhat subjective, however it still provides a useful guidance regarding the geohydrological conditions within each catchment and highlights the catchments where groundwater is being over-abstracted.

7. CAPACITY BUILDING

Ms C. Lasher graduated from the University of the Western Cape (UWC) in 2007 with a BSc (Hon) in geohydrology and then graduated in 2012 with a MSc in geohydrology also from the UWC. She was involved in the GRDM work and particularly the resource classification work associated with this project. This is a new component of geohydrology to her. She played an active role in the public participation meetings as specialist input was required on groundwater issues. Her knowledge of the Olifants-Doorn WMA has increased along with her experience.

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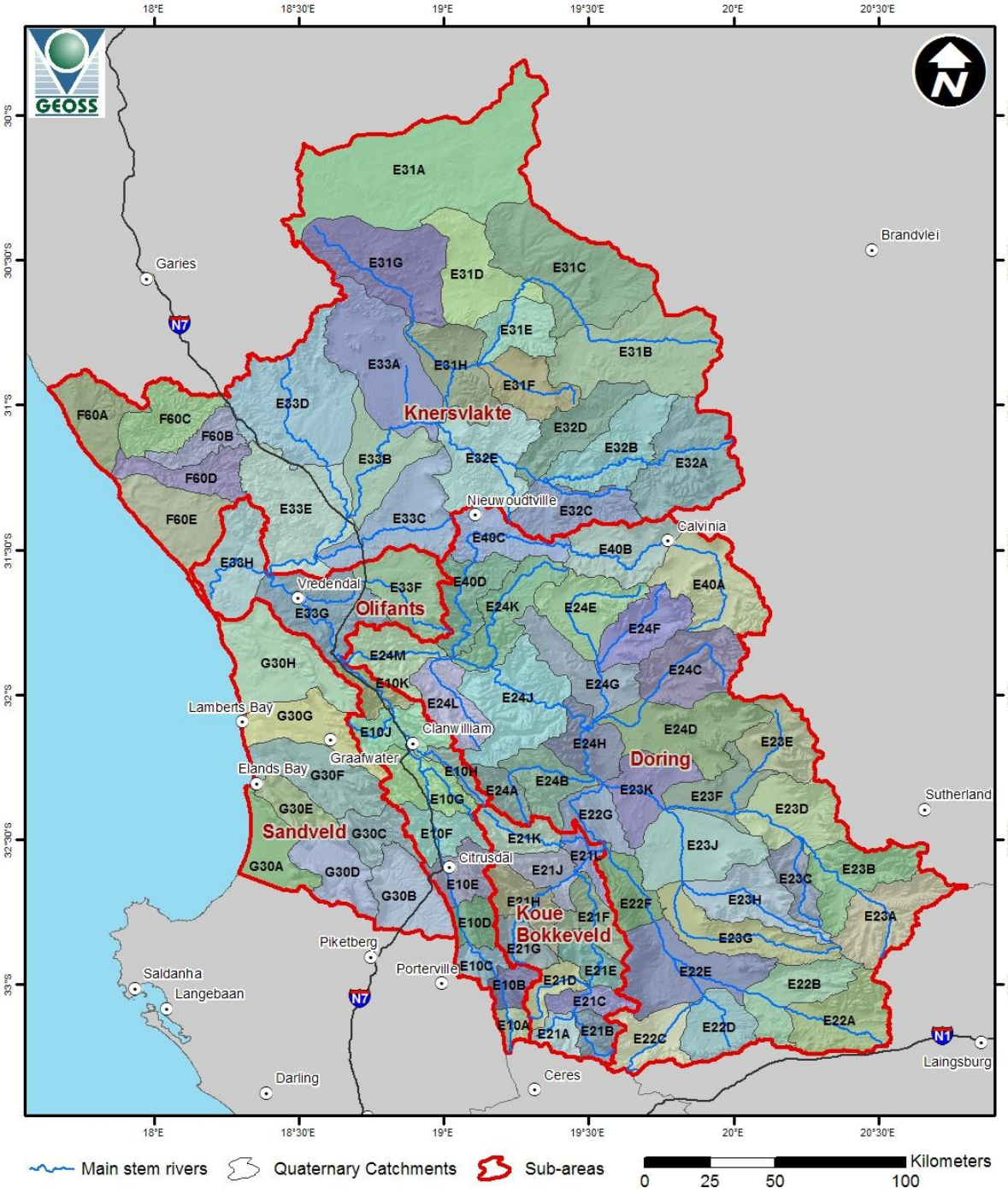
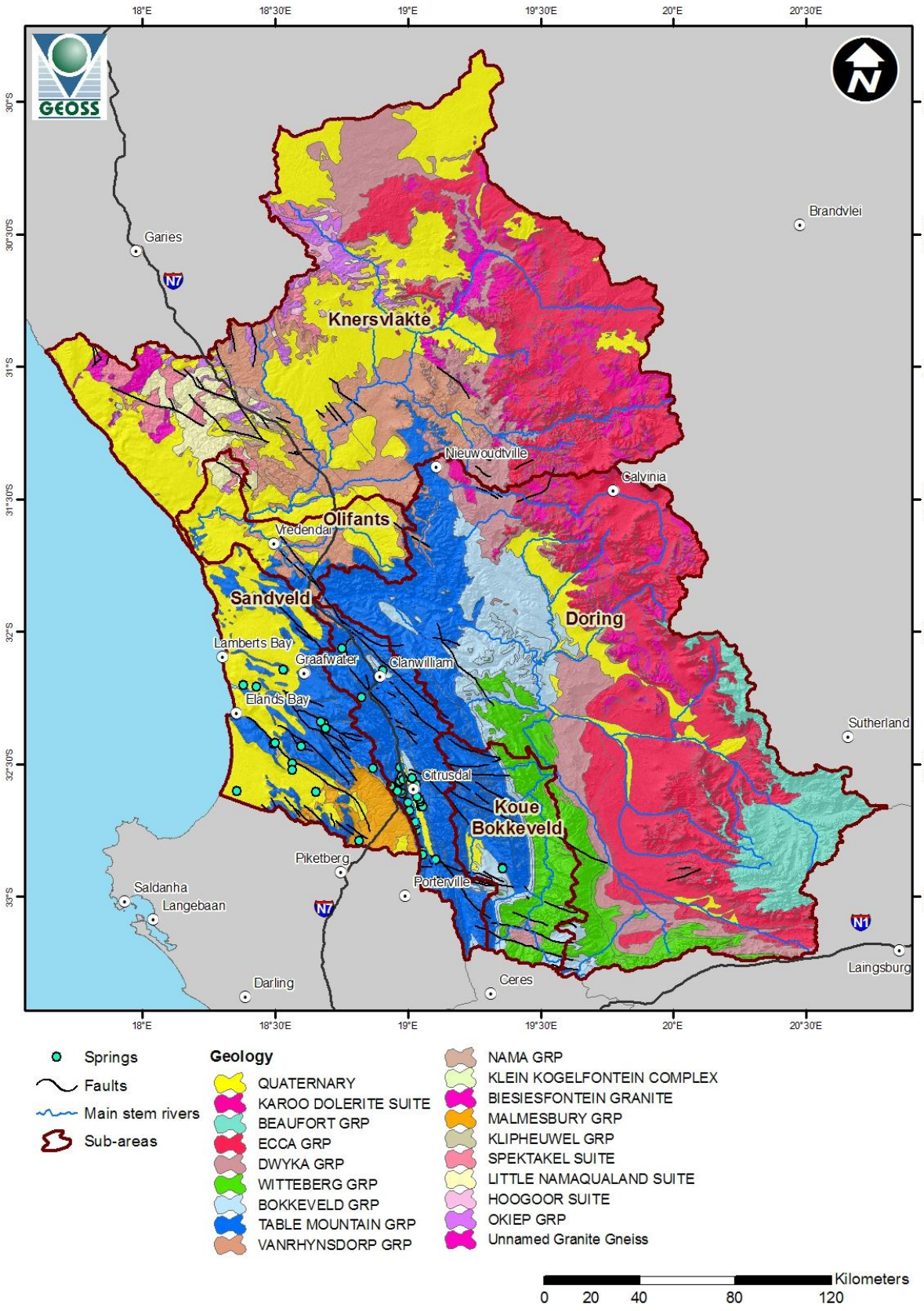
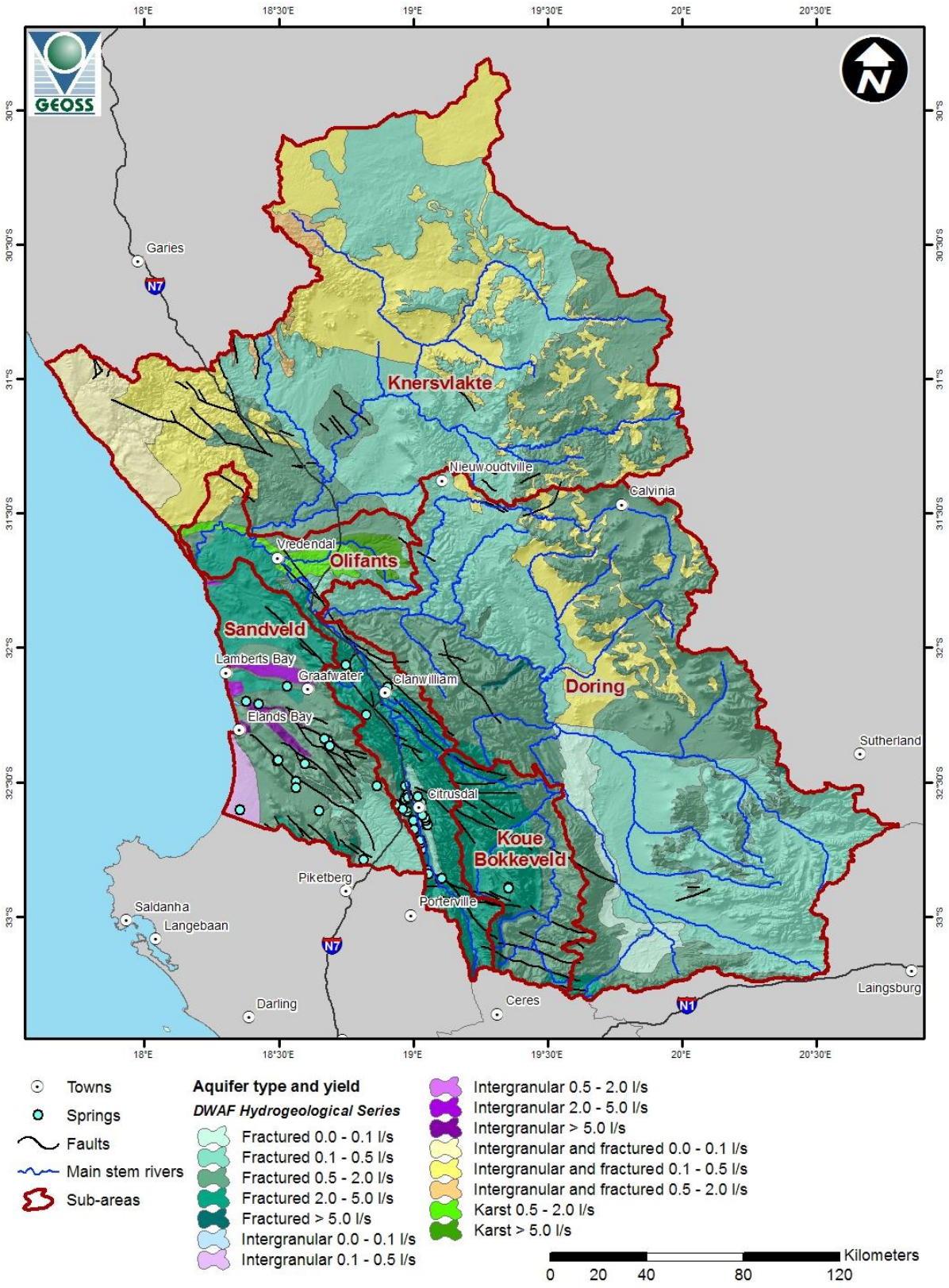
9. APPENDIX A: MAPS



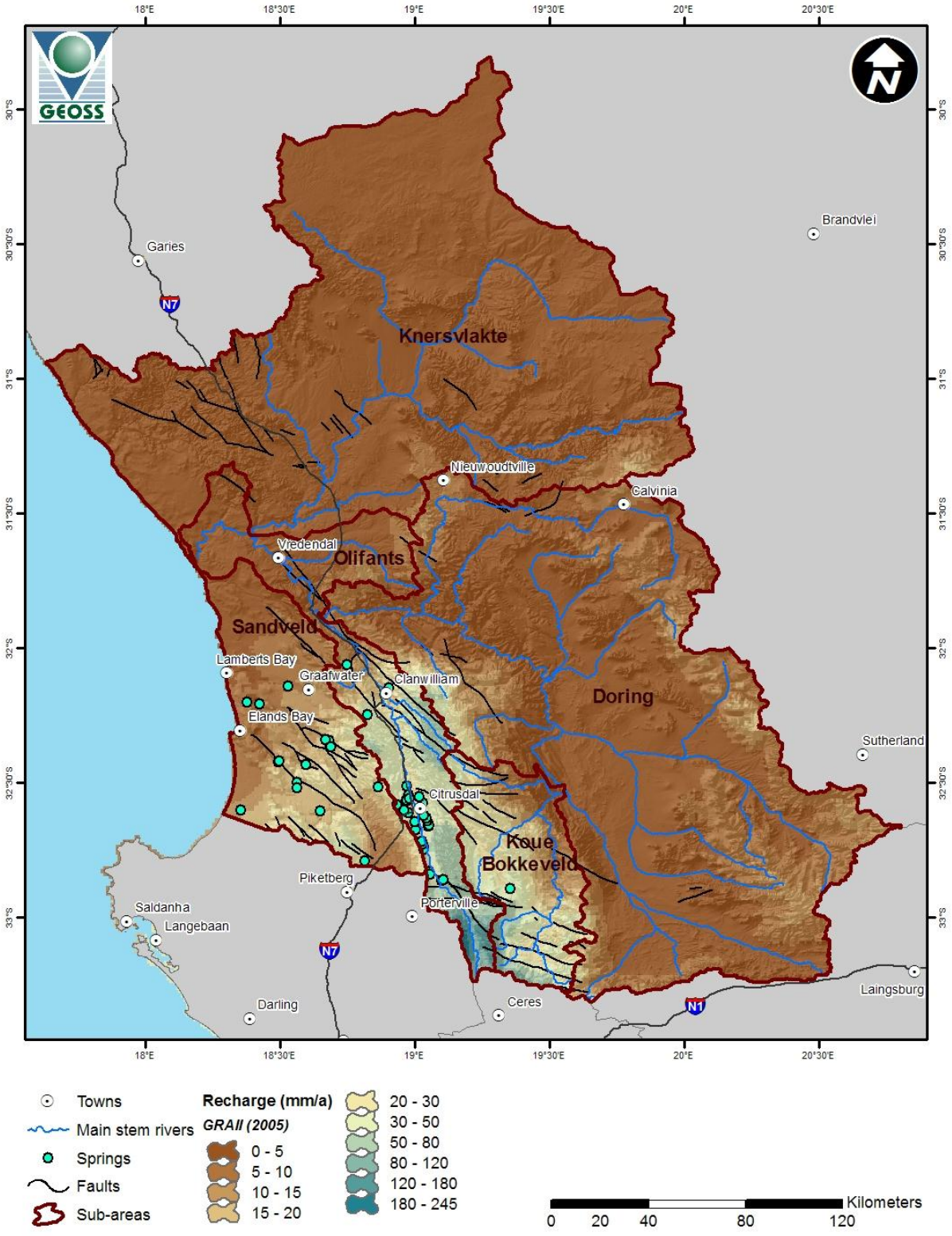
Map 1. Quaternary catchment and sub-areas within the Olifants-Doorn Water Management Area



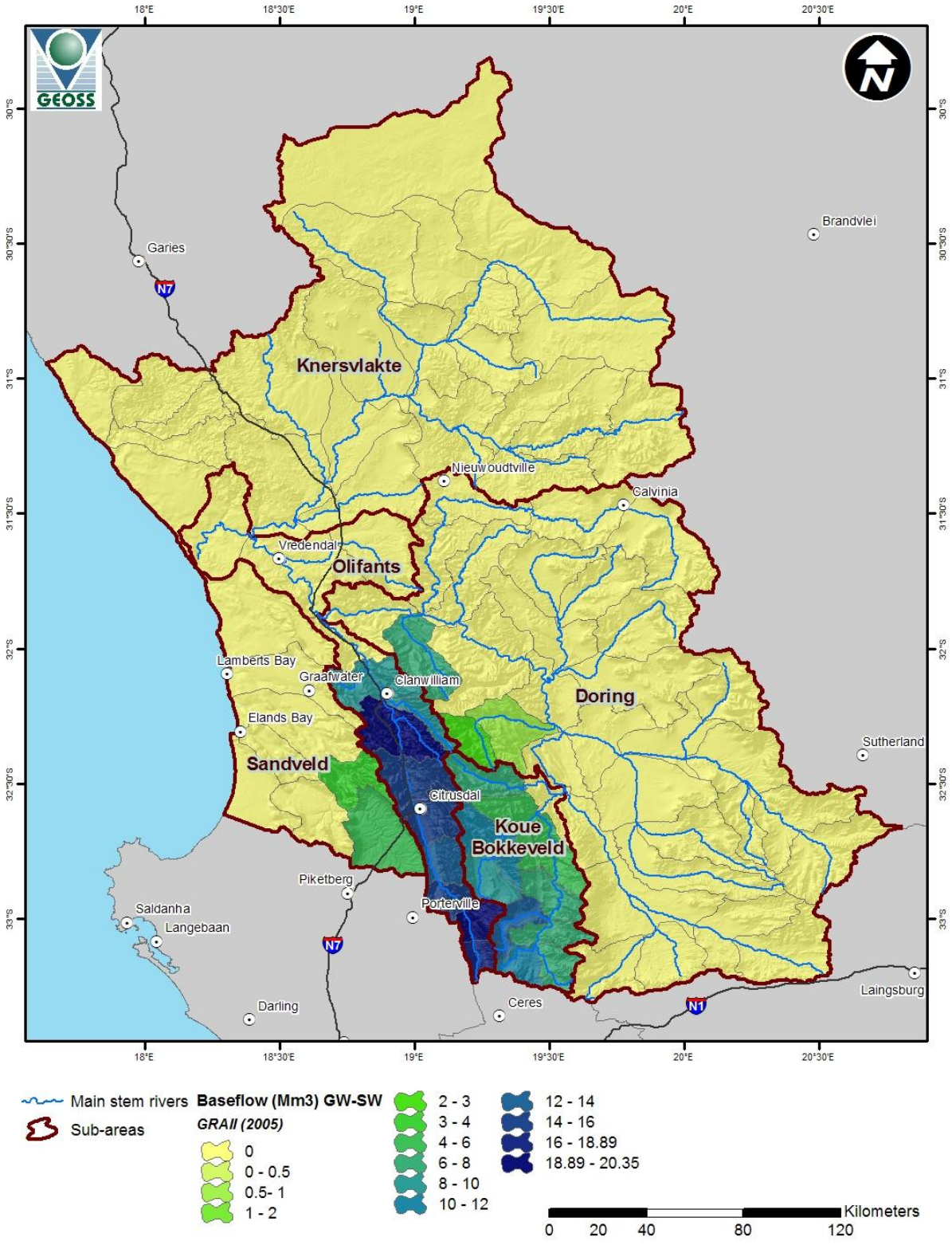
Map 2. Geological setting of the O-D WMA (Council for Geoscience geological map 1:1 000 000 scale)



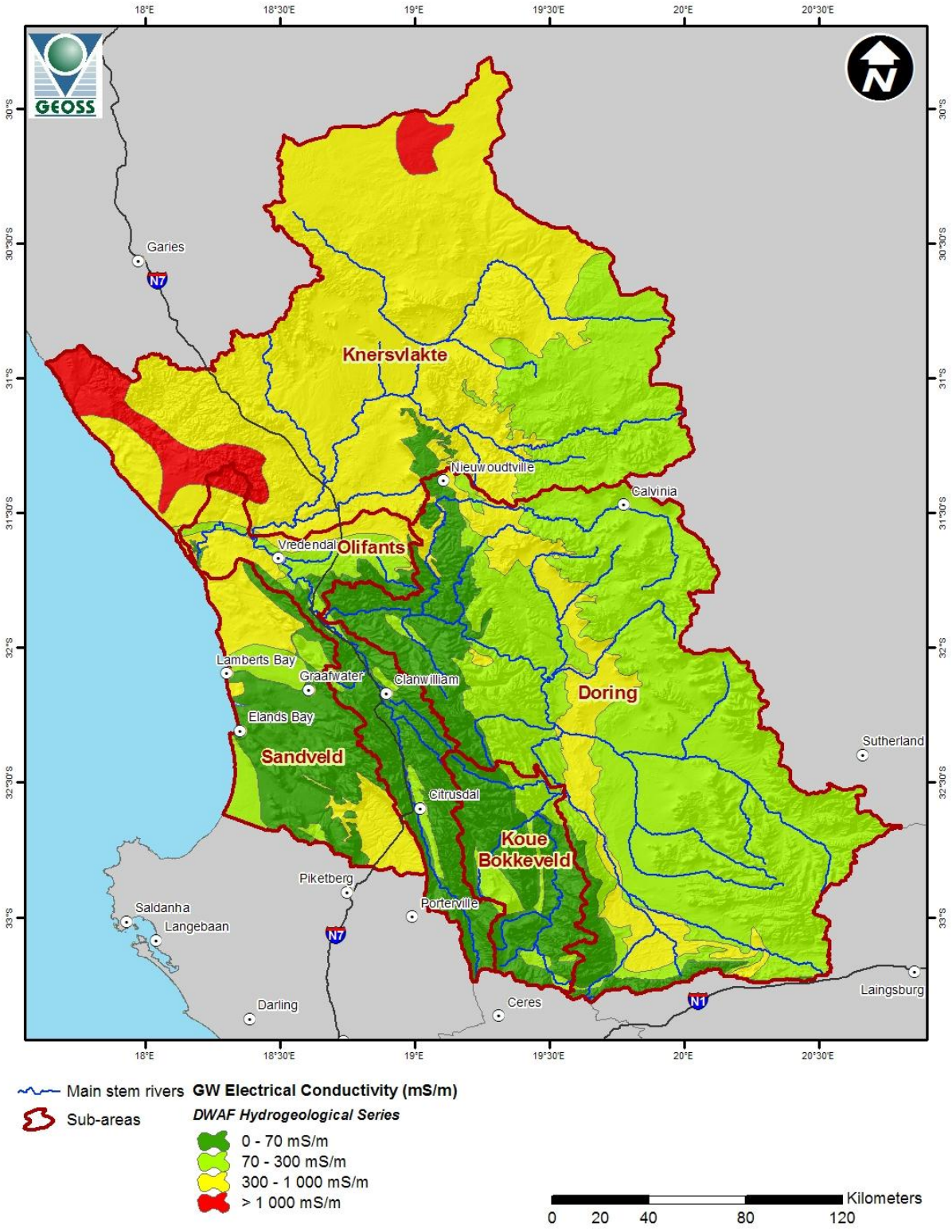
Map 3. Aquifer types and yields (DWAF Hydrogeological maps series 1:500 000 scale)



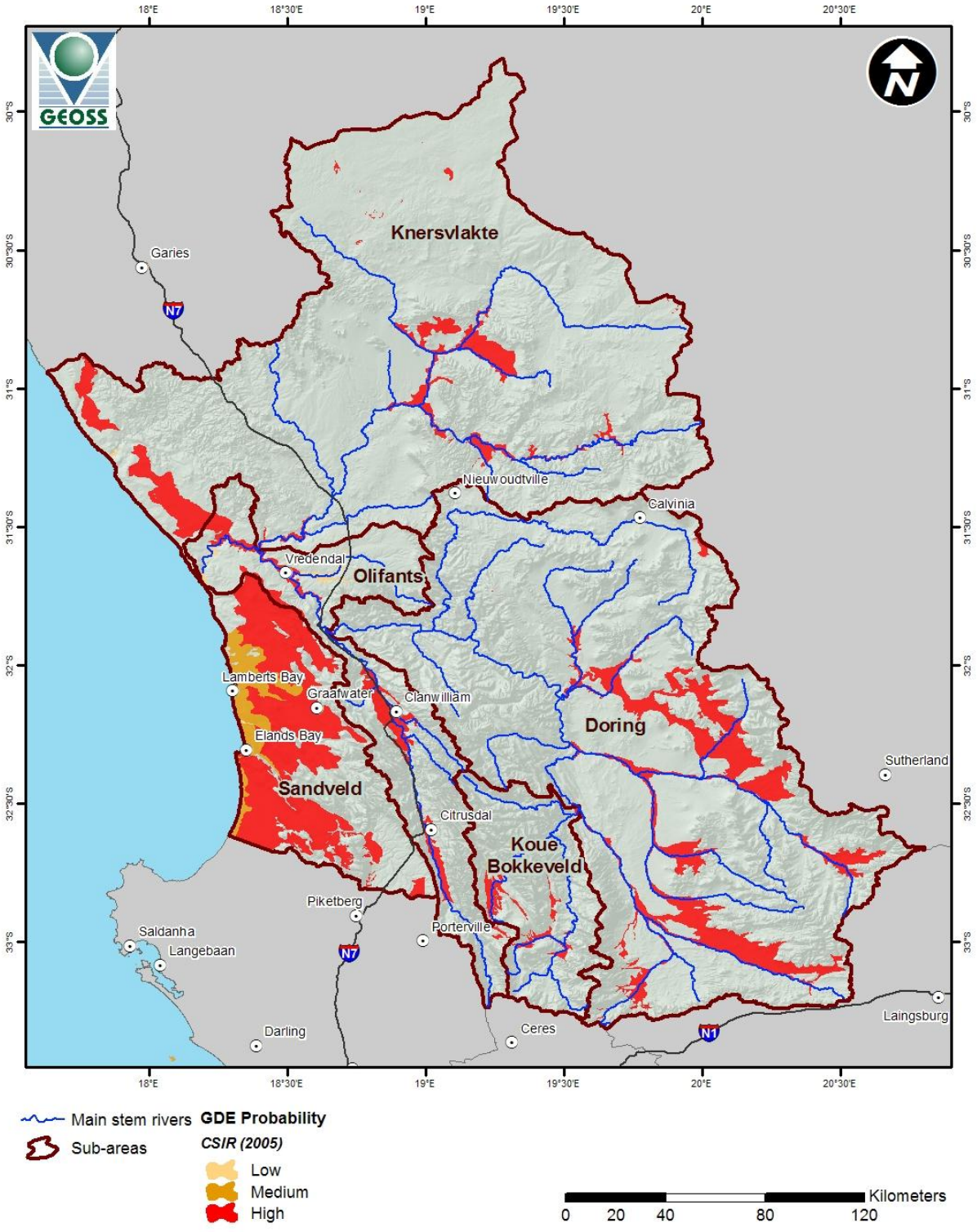
Map 4 Groundwater recharge map (mm/a) (DWAF 2005. Groundwater Resource Assessment Phase II)



Map 5 Groundwater contribution to river base flow (DWAF 2005. Groundwater Resource Assessment Phase II)



Map 6 Groundwater quality as indicated by Electrical Conductivity (EC) (DWAF Hydrogeological maps series 1:500 000 scale)



Map 7 Groundwater dependent ecosystems (CSIR, 2005)

10. APPENDIX B: QUATERNARY CATCHMENT SUMMARIES

Quaternary Catchment: **E10A**

Present Status Category(A-F): B

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 134 km²

Recharge: 17.5895 Mm³/a

Total Use: **3.452 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	3.4440	*Industry:*	0.0000
AgLive:	0.0076	*Aquaculture:*	0.0000

Water Balance: 14.138 Mm³/a

Stress Index: 0.2 *Unstressed or low levels of stress*

EWR low flow requirement: 5.44 Mm³/a

Groundwater available for use: 8.70Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured > 5.0 l/s	21
Fractured 2.0 - 5.0 l/s	79

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	100

Geology	***% of Area***	***Hydrological significance***
BOKKEVELD GRP	14.48	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	85.29	Major fractured rock/secondary aquifer system.

Risk to groundwater: In central southern portion of catchment intensive agriculture - poss. non-point source contamination risk. Gwater plays an important role is providing baseflow. CSIR studiedthe area intensively using isotopes.

Assumptions and constraints: Most of the agricultural activity is irrigated from groundwater.

Level of confidence: Low

Implications of using more/less water: Groundwater monitoring network necessary

Discussion on "hot spots": In summer groundwater levels are drawn down significantly, however these recover each winter.

Relevant previous work: -

Quaternary Catchment: **E10B**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 202 km²

Recharge: 20.6085 Mm³/a

Total Use: **3.729 Mm³/a**

Rural:	0.0070	*Mining:*	0.0000
AgIrrig:	3.7143	*Industry:*	0.0000
AgLive:	0.0075	*Aquaculture:*	0.0000

Water Balance: 16.88 Mm³/a

Stress Index: 0.18 *Unstressed or low levels of stress*

EWR low flow requirement: 6.78 Mm³/a

Groundwater available for use: 10.10 Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured > 5.0 l/s	0.24
Fractured 2.0 - 5.0 l/s	99.76

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	91.85
70 - 300 mS/m	8.15

Geology	***% of Area***	***Hydrological significance***
BOKKEVELD GRP	18.61	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	81.4	Major fractured rock/secondary aquifer system.

Risk to groundwater: In the north-eastern portion of the catchment there is intensive agriculture, mainly fruit.

Assumptions and constraints: Most of the agricultural activity is irrigated from groundwater.

Level of confidence: low

Implications of using more/less water: Groundwater monitoring network necessary

Discussion on "hot spots": The boreholes in this area are typically very high yielding and the groundwater quality is excellent. Monitoring data in the area does not show any signs of significant impact on groundwater resources.

Relevant previous work: -

Quaternary Catchment: **E10C**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 192 km²

Recharge: 14.3015 Mm³/a

Total Use: **0.342 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.3346	*Industry:*	0.0000
AgLive:	0.0079	*Aquaculture:*	0.0000

Water Balance: 13.959 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 5.66 Mm³/a

Groundwater available for use: 8.30 (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 2.0 - 5.0 l/s	100

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	100

Geology	***% of Area***	***Hydrological significance***
TABLE MOUNTAIN GRP	99.98	Major fractured rock/secondary aquifer system.

Risk to groundwater: A pristine catchment - no agricultural activity.

Assumptions and constraints: Groundwater is a completely natural unimpacted state

Level of confidence: low

Implications of using more/less water: No monitoring required - unless for regional purposes

Discussion on "hot spots": No hot spots

Relevant previous work: -

Quaternary Catchment: **E10D**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Fair

Area: 235 km²

Recharge: 13.6855 Mm³/a

Total Use: **3.576 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	3.5719	*Industry:*	0.0000
AgLive:	0.0037	*Aquaculture:*	0.0000

Water Balance: 10.11 Mm³/a

Stress Index: 0.26 *Moderate levels of stress*

EWR low flow requirement: 5.74 Mm³/a

Groundwater available for use: 4.37 (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	15.97
Fractured 0.5 - 2.0 l/s	0.37
Fractured 2.0 - 5.0 l/s	83.66

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	83.17
70 - 300 mS/m	15.99
300 - 1 000 mS/m	0.84

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	15.44	
TABLE MOUNTAIN GRP	84.56	Major fractured rock/secondary aquifer system.

Risk to groundwater: Also a mountainous catchment, however intense agriculture in the western portion (along the north/south valley). Thus non-point source contamination risk.

Assumptions and constraints: Most of the agricultural activity is irrigated from groundwater.

Level of confidence: low

Implications of using more/less water:

Discussion on "hot spots": Further work will be required to assess the status of groundwater monitoring in the area. However the groundwater contribution to base flow is very important and agricultural activities must not impact this contribution.

Relevant previous work: -

Quaternary Catchment: **E10E**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 366 km²

Recharge: 14.681 Mm³/a

Total Use: **0.27 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.2195	*Industry:*	0.0440
AgLive:	0.0065	*Aquaculture:*	0.0000

Water Balance: 14.411 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 7.35 Mm³/a

Groundwater available for use: 7.06Mm³/a(adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	3.03
Fractured 0.1 - 0.5 l/s	14.86
Fractured 0.5 - 2.0 l/s	5.07
Fractured 2.0 - 5.0 l/s	77.04

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	81.77
70 - 300 mS/m	14.83
300 - 1 000 mS/m	3.4

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	11.53	
BOKKEVELD GRP	4.25	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	84.22	Major fractured rock/secondary aquifer system.
MALMESBURY GRP	0	Impermeable aquiclude

Risk to groundwater: Citrusdal is within this catchment. Groundwater is used in summer however the bulk of the irrigation water is from the Olifants R. Groundwater is at risk from non-point source contamination sources.

Assumptions and constraints: Most of the agricultural activity is irrigated from the Olifants River.

Level of confidence: low

Implications of using more/less water: The catchment becomes quite water stressed in summer. A groundwater monitoring network is necessary.

Discussion on "hot spots": No known hot spots of over-abstraction.

Relevant previous work: -

Quaternary Catchment: **E10F**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 386 km²

Recharge: 14.6025 Mm³/a

Total Use: **4.896 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	4.8899	*Industry:*	0.0000
AgLive:	0.0059	*Aquaculture:*	0.0000

Water Balance: 9.707 Mm³/a

Stress Index: 0.34 *Moderate levels of stress*

EWR low flow requirement: 5.13

Groundwater available for use: 4.58 (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	12.33
Fractured 0.5 - 2.0 l/s	21.66
Fractured 2.0 - 5.0 l/s	66.01

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	87.66
70 - 300 mS/m	12.34
300 - 1 000 mS/m	0

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	3.37	
BOKKEVELD GRP	7.44	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	89.19	Major fractured rock/secondary aquifer system.

Risk to groundwater: Mainly a mountainous catchment - however intense agriculture along the Olifants River. Surface water and groundwater is used intensively.

Assumptions and constraints: There is significant groundwater abstraction.

Level of confidence: low

Implications of using more/less water: The catchment has a PES of C and this needs to be managed to a B, as groundwater plays a crucial role in supplying base flow to the Olifants River. This contribution is crucial in summer.

Discussion on "hot spots": No known hot spots of over-abstraction, however this catchment needs to be carefully monitored, as it is important. If a monitoring network is not in place - one needs to be installed. Groundwater allocations need to be adhered to or even revised.

Relevant previous work: -

Quaternary Catchment: **E10G**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 508 km²

Recharge: 19.3352 Mm³/a

Total Use: **0.104 Mm³/a**

Rural:	0.0080	*Mining:*	0.0000
AgIrrig:	0.0882	*Industry:*	0.0000
AgLive:	0.0077	*Aquaculture:*	0.0000

Water Balance: 19.231 Mm³/a

Stress Index: 0.01 *Unstressed or low levels of stress*

EWR low flow requirement: 4.21 Mm³/a

Groundwater available for use: 15.02Mm³/a(adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	1.8
Fractured 2.0 - 5.0 l/s	98.2

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	100

Geology	***% of Area***	***Hydrological significance***
BOKKEVELD GRP	0.33	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	99.67	Major fractured rock/secondary aquifer system.

Risk to groundwater: The risk is minimal of groundwater being impacted. The Clanwilliam Dam is within this catchment. This is a rugged and mountainous catchment.

Assumptions and constraints: Very little groundwater use. Water is obtained from the Clanwilliam Dam.

Level of confidence: low

Implications of using more/less water: No major concerns regarding groundwater in this catchment.

Discussion on "hot spots": No hot spots

Relevant previous work: -

Quaternary Catchment: **E10H**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 162 km²

Recharge: 9.0796 Mm³/a

Total Use: **1.036 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	1.0340	*Industry:*	0.0000
AgLive:	0.0025	*Aquaculture:*	0.0000

Water Balance: 8.043 Mm³/a

Stress Index: 0.11 *Unstressed or low levels of stress*

EWR low flow requirement: 1.51 Mm³/a

Groundwater available for use: 6.53Mm³/a (minimal)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	25.79
Fractured 2.0 - 5.0 l/s	74.21

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	100

Geology	***% of Area***	***Hydrological significance***
TABLE MOUNTAIN GRP	100	Major fractured rock/secondary aquifer system.

Risk to groundwater: Very rugged catchment - very little groundwater use ...the use given here may be an over-estimation.

Assumptions and constraints: Very little groundwater used and this catchment needs to be kept as natural as possible.

Level of confidence: low

Implications of using more/less water: The class of the catchment needs to be improved to an A.

Discussion on "hot spots": No known hot spots.

Relevant previous work: -

Quaternary Catchment: **E10J**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): C

Management Class *(Excellent/Good/Fair):* Fair

Area: 468 km²

Recharge: 8.738 Mm³/a

Total Use: **1.946 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	1.7888	*Industry:*	0.1500
AgLive:	0.0071	*Aquaculture:*	0.0000

Water Balance: 6.792 Mm³/a

Stress Index: 0.22 *Moderate levels of stress*

EWR low flow requirement: 1.63 Mm³/a

Groundwater available for use: 5.16Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	0.07
Fractured 0.5 - 2.0 l/s	35.02
Fractured 2.0 - 5.0 l/s	64.91

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	83.42
70 - 300 mS/m	7.91
70 - 300 mS/m	8.67

Geology	***% of Area***	***Hydrological significance***
BOKKEVELD GRP	7.56	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	92.44	Major fractured rock/secondary aquifer system.

Risk to groundwater: Groundwater is used extensively in this catchment. It is at risk from over-abstraction and non-point source contamination. Clanwilliam is within this catchment.

Assumptions and constraints: The groundwater use needs to be carefully monitored within this catchment.

Level of confidence: low

Implications of using more/less water: This catchment needs to be carefully monitored.

Discussion on "hot spots": No known hot spots of over-abstraction, however this catchment needs to be carefully monitored, as it is important. If a monitoring network is not in place - one needs to be installed. Groundwater allocations need to be adhered to or even revised.

Relevant previous work: -

Quaternary Catchment: **E10K**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 235 km²

Recharge: 2.1529 Mm³/a

Total Use: **0.095 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0910	*Industry:*	0.0000
AgLive:	0.0044	*Aquaculture:*	0.0000

Water Balance: 2.057 Mm³/a

Stress Index: 0.04 *Unstressed or low levels of stress*

EWR low flow requirement: 0.36

Groundwater available for use: 1.7Mm³/a (minimal)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	47.36
Fractured 2.0 - 5.0 l/s	52.64

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	85.26
70 - 300 mS/m	14.74

Geology	***% of Area***	***Hydrological significance***
TABLE MOUNTAIN GRP	80.45	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	19.55	Impermeable aquiclude

Risk to groundwater: There is more agriculture in this catchment than the groundwater abstraction data suggests.

Assumptions and constraints: The Olifants River is within the catchment and the assumption is that the bulk of the irrigation water is from the river.

Level of confidence: low

Implications of using more/less water: Groundwater most likley has a significant role to play in the summer months.

Discussion on "hot spots": No known hot spots of over-abstraction are known.

Relevant previous work: -

Quaternary Catchment: **E21A**

Present Status Category (A-F): D

Desired Water Resource Category (A-F): C

Management Class *(Excellent/Good/Fair):* Fair

Area: 190 km²

Recharge: 10.7001 Mm³/a

Total Use: **5.359 Mm³/a**

Rural:	0.0130	*Mining:*	0.0000
AgIrrig:	5.3397	*Industry:*	0.0000
AgLive:	0.0066	*Aquaculture:*	0.0000

Water Balance: 5.341 Mm³/a

Stress Index: 0.5 *Moderate levels of stress*

EWR low flow requirement: 1.48 Mm³/a

Groundwater available for use: 3.86Mm³/a(adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured > 5.0 l/s	12.08
Fractured 0.5 - 2.0 l/s	84.3
Fractured 2.0 - 5.0 l/s	3.62

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	79.7
70 - 300 mS/m	20.3

Geology	***% of Area***	***Hydrological significance***
DWYKA GRP	28.18	Aquiclude
WITTEBERG GRP	52.57	Marginal hydrogeological significance
BOKKEVELD GRP	11.74	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	7.47	Major fractured rock/secondary aquifer system.

Risk to groundwater: There is a lot of agriculture in this catchment (above the Gydo Pass). Groundwater levels are shallow and at risk from non-point based contamination.

Assumptions and constraints: Groundwater abstraction is high in the summer months

Level of confidence: medium

Implications of using more/less water: The TMG aquifers in this catchments are high yielding and of excellent quality

Discussion on "hot spots": From monitoring work in the area, the groundwater resources are not being impacted by agricultural activity. However the classification of the catchment needs to be improved. A few dedicated monitoring sites are necessary as the PES is a D. The volumes of groundwater being abstracted also need to be verified and if necessary allocations adjusted.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21B**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 223 km²

Recharge: 7.7935 Mm³/a

Total Use: **1.348 Mm³/a**

Rural:	0.0010	*Mining:*	0.0000
AgIrrig:	1.3389	*Industry:*	0.0000
AgLive:	0.0078	*Aquaculture:*	0.0000

Water Balance: 6.446 Mm³/a

Stress Index: 0.17 *Unstressed or low levels of stress*

EWR low flow requirement: 0.012 Mm³/a

Groundwater available for use: 6.43 Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	75.86
Fractured 2.0 - 5.0 l/s	24.14

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	67.7
70 - 300 mS/m	8.32
70 - 300 mS/m	9.76
70 - 300 mS/m	14.22

Geology	***% of Area***	***Hydrological significance***
DWYKA GRP	11.94	Aquiclude
WITTEBERG GRP	52.5	Marginal hydrogeological significance
BOKKEVELD GRP	35.21	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	0.32	Major fractured rock/secondary aquifer system.

Risk to groundwater: Agricultural activtity is limited in this rugged catchment . Best practices must be followed in the agricultural sector - as groundwater levels are shallow / artesian in places and can easily be impacted.

Assumptions and constraints: Groundwater use is limited

Level of confidence: medium

Implications of using more/less water: Groundwater is limited in this large catchment, however land owner monitoring should be encouraged.

Discussion on "hot spots": Monitoring records indicate no over-abstraction areas - aquifers are high yielding and very good quality.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21C**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 233 km²

Recharge: 7.1742 Mm³/a

Total Use: **1.256 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	1.2480	*Industry:*	0.0000
AgLive:	0.0081	*Aquaculture:*	0.0000

Water Balance: 5.918 Mm³/a

Stress Index: 0.18 *Unstressed or low levels of stress*

EWR low flow requirement: 0.07 Mm³/a

Groundwater available for use: 5.85Mm³/a(minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	100

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	100

Geology	***% of Area***	***Hydrological significance***
DWYKA GRP	0.97	Aquiclude
WITTEBERG GRP	96.36	Marginal hydrogeological significance
BOKKEVELD GRP	2.68	Little significance, else regolith aquifer

Risk to groundwater: Agricultural activtity is limited in this rugged catchment . Best practices must be followed in the agricultural sector - as groundwater levels are shallow in places and can easily be impacted.

Assumptions and constraints: Groundwater use is limited

Level of confidence: medium

Implications of using more/less water: Groundwater is limited in this large catchment, however land owner monitoring should be encouraged.

Discussion on "hot spots": Monitoring records indicate no over-abstraction areas - aquifers are high yielding and very good quality.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21D**

Present Status Category (A-F): D

Desired Water Resource Category (A-F): C

Management Class *(Excellent/Good/Fair):* Fair

Area: 242 km²

Recharge: 13.7246 Mm³/a

Total Use: **7.386 Mm³/a**

Rural:	0.0070	*Mining:*	0.0000
AgIrrig:	7.3710	*Industry:*	0.0000
AgLive:	0.0085	*Aquaculture:*	0.0000

Water Balance: 6.338 Mm³/a

Stress Index: 0.54 *Moderate levels of stress*

EWR low flow requirement: 1.884 Mm³/a

Groundwater available for use: 4.45Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured > 5.0 l/s	32.14
Fractured 0.5 - 2.0 l/s	24.2
Fractured 2.0 - 5.0 l/s	43.66

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	82.78
70 - 300 mS/m	4.33
70 - 300 mS/m	12.89

Geology	***% of Area***	***Hydrological significance***
WITTEBERG GRP	12.21	Marginal hydrogeological significance
BOKKEVELD GRP	47.17	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	40.62	Major fractured rock/secondary aquifer system.

Risk to groundwater: There is a lot of agricultural activity within this catchment (>50%). There are also a lot of shallow surface water dams, however groundwater is used extensively in summer. The groundwater is generally shallow and the risk with be from non-point source

Assumptions and constraints: Extensive groundwater use in summer

Level of confidence: medium

Implications of using more/less water: Generally the TMG aquifers are high yielding and good quality. However there should be monitoring by the land owners to ensure sustainable groundwater use. Some DWA monitoring within the catchment will be good to have.

Discussion on "hot spots": There are no known hot spots as the groundwater levels recover each year and the water quality remains good.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21E**

Present Status Category (A-F): D

Desired Water Resource Category (A-F): C

Management Class *(Excellent/Good/Fair):* Fair

Area: 293 km²

Recharge: 6.1869 Mm³/a

Total Use: **2.69 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	2.6799	*Industry:*	0.0000
AgLive:	0.0102	*Aquaculture:*	0.0000

Water Balance: 3.497 Mm³/a

Stress Index: 0.43 *Moderate levels of stress*

EWR low flow requirement: 0.09 Mm³/a

Groundwater available for use: 3.41Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	66.46
Fractured 2.0 - 5.0 l/s	33.54

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	91.17
70 - 300 mS/m	8.83

Geology	***% of Area***	***Hydrological significance***
WITTEBERG GRP	66.98	Marginal hydrogeological significance
BOKKEVELD GRP	9.36	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	23.67	Major fractured rock/secondary aquifer system.

Risk to groundwater: Agricultural activity is limited to the river valley - with the large dams within the catchment , the groundwater use figure may be an over-estimate otherwise there is extensive use of groundwater in summer. Groundwater will be at risk to non-point sourc

Assumptions and constraints: Extensive groundwater use in summer

Level of confidence: medium

Implications of using more/less water: As the class of this cathcment is to be improved land owners and DWA need to monitor.

Discussion on "hot spots": There are no known hot spots as the groundwater levels recover each year and the water quality remains good.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21F**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 379 km²

Recharge: 5.0851 Mm³/a

Total Use: **0.544 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.5304	*Industry:*	0.0000
AgLive:	0.0132	*Aquaculture:*	0.0000

Water Balance: 4.542 Mm³/a

Stress Index: 0.11 *Unstressed or low levels of stress*

EWR low flow requirement: 0.15 Mm³/a

Groundwater available for use: 4.39Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	80.59
Fractured 2.0 - 5.0 l/s	19.41

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	93.5
70 - 300 mS/m	6.5

Geology	***% of Area***	***Hydrological significance***
DWYKA GRP	1.48	Aquiclude
WITTEBERG GRP	81.56	Marginal hydrogeological significance
BOKKEVELD GRP	3.95	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	13.01	Major fractured rock/secondary aquifer system.

Risk to groundwater: There is very little agricultural activity in this catchment. It should probably be an A class catchment. No risk to groundwater.

Assumptions and constraints: Groundwatercontributes significantly to river base flow.

Level of confidence: medium

Implications of using more/less water: Some further consultation is required but this is probably an A class aquifer.

Discussion on "hot spots": No hot spots.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21G**

Present Status Category (A-F): F

Desired Water Resource Category (A-F): D

Management Class *(Excellent/Good/Fair):* Fair

Area: 266 km²

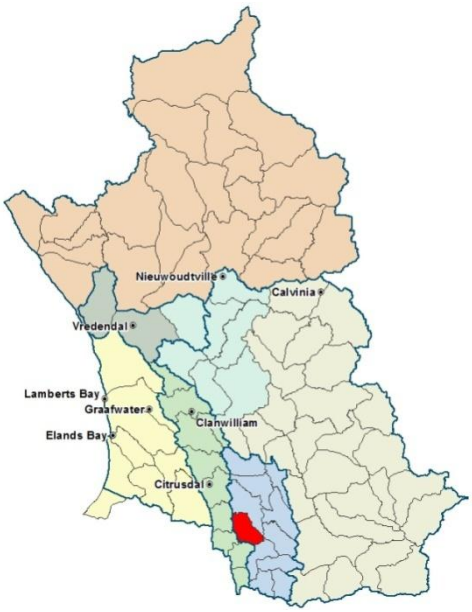
Recharge: 9.6261 Mm³/a

Total Use: **12.088 Mm³/a**

Rural:	0.0110	*Mining:*	0.0000
AgIrrig:	12.0681	*Industry:*	0.0000
AgLive:	0.0092	*Aquaculture:*	0.0000

Water Balance: -2.462 Mm³/a

Stress Index: 1.26 *Critically stressed*



EWR low flow requirement: 2.07 Mm³/a

Groundwater available for use: -4.53Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 2.0 - 5.0 l/s	100

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	31.9
70 - 300 mS/m	68.1

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	24.07	
BOKKEVELD GRP	38.79	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	37.15	Major fractured rock/secondary aquifer system.

Risk to groundwater: There is extensive agriculture in this catchment. Indications are the groundwater is not being used sustainably. Water levels are likely to be dropping and groundwater quality deteriorating. Groundwater supply at risk.

Assumptions and constraints: Groundwater use exceeds recharge and levels are dropping.

Level of confidence: medium

Implications of using more/less water: Groundwater use needs to be assessed with a hydrocensus and a monitoring network established. It will be necessary to introduce compulsory licensing if the groundwater use is not sustainable after the land owners are informed of the situation.

Discussion on "hot spots": Likely to be several hot spots - where groundwater levels are dropping and possibly water quality deteriorating.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21H**

Present Status Category (A-F): F

Desired Water Resource Category (A-F): D

Management Class *(Excellent/Good/Fair):* Fair

Area: 404 km²

Recharge: 11.8491 Mm³/a

Total Use: **2.561 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	2.5496	*Industry:*	0.0000
AgLive:	0.0116	*Aquaculture:*	0.0000

Water Balance: 9.288 Mm³/a

Stress Index: 0.22 *Moderate levels of stress*

EWR low flow requirement: 16.656

Groundwater available for use: -7.37 Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 2.0 - 5.0 l/s	100

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	98.48
70 - 300 mS/m	1.52

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	0.23	
TABLE MOUNTAIN GRP	99.77	Major fractured rock/secondary aquifer system.

Risk to groundwater: Agriculture is limited - groundwater contribution to baseflow important. Groundwater quality could be impacted through agricultural activities.

Assumptions and constraints: Groundwater is shallow and contributes to baseflow.

Level of confidence: medium

Implications of using more/less water: This class of the catchment can be improved a level.

Discussion on "hot spots": Unlikley.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21J**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 317 km²

Recharge: 5.5 Mm³/a

Total Use: **0.006 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0062	*Aquaculture:*	0.0000

Water Balance: 5.494 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.321 Mm³/a

Groundwater available for use: 5.17 Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	10.87
Fractured 2.0 - 5.0 l/s	89.13

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	76.78
70 - 300 mS/m	23.22

Geology	***% of Area***	***Hydrological significance***
WITTEBERG GRP	14.08	Marginal hydrogeological significance
BOKKEVELD GRP	17.95	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	67.97	Major fractured rock/secondary aquifer system.

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Groundwater will provide baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21K**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 330 km²

Recharge: 6.3447 Mm³/a

Total Use: **0.4 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.3953	*Industry:*	0.0000
AgLive:	0.0050	*Aquaculture:*	0.0000

Water Balance: 5.944 Mm³/a

Stress Index: 0.06 *Unstressed or low levels of stress*

EWR low flow requirement: 0.184 Mm³/a

Groundwater available for use: 5.76Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	11.45
Fractured 2.0 - 5.0 l/s	88.55

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	82.21
70 - 300 mS/m	17.79

Geology	***% of Area***	***Hydrological significance***
WITTEBERG GRP	16.03	Marginal hydrogeological significance
BOKKEVELD GRP	6.87	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	77.1	Major fractured rock/secondary aquifer system.

Risk to groundwater: Groundwater use is very low and this is very close to Class A

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Groundwater will provide baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E21L**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 195 km²

Recharge: 0.5102 Mm³/a

Total Use: **0.004 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0036	*Aquaculture:*	0.0000

Water Balance: 0.507 Mm³/a

Stress Index: 0.01 *Unstressed or low levels of stress*

EWR low flow requirement: 0.14 Mm³/a

Groundwater available for use: 0.37 Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	2.17
Fractured 0.5 - 2.0 l/s	97.83

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	14.12
70 - 300 mS/m	83.85
300 - 1 000 mS/m	2.02

Geology	***% of Area***	***Hydrological significance***
DWYKA GRP	7.73	Aquiclude
WITTEBERG GRP	90.72	Marginal hydrogeological significance
BOKKEVELD GRP	1.56	Little significance, else regolith aquifer

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Groundwater will provide baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E22A**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 750 km²

Recharge: 3.5276 Mm³/a

Total Use: **0.03 Mm³/a**

Rural:	0.0020	*Mining:*	0.0000
AgIrrig:	0.0217	*Industry:*	0.0000
AgLive:	0.0062	*Aquaculture:*	0.0000

Water Balance: 3.498 Mm³/a

Stress Index: 0.01 *Unstressed or low levels of stress*

EWR low flow requirement: 0.39 Mm³/a

Groundwater available for use: 3.11Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	89.38
Fractured 0.5 - 2.0 l/s	10.62

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	0.67
0 - 70 mS/m	3.15
70 - 300 mS/m	84.54
300 - 1 000 mS/m	11.65

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	2.3	
BEAUFORT GRP	16.21	Localised significance as aquifer systems.
ECCA GRP	50.07	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	22.05	Aquiclude
WITTEBERG GRP	9.15	Marginal hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Groundwater will provide some baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E22B**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 638 km²

Recharge: 2.6987 Mm³/a

Total Use: **0.022 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0220	*Aquaculture:*	0.0000

Water Balance: 2.677 Mm³/a

Stress Index: 0.01 *Unstressed or low levels of stress*

EWR low flow requirement: 0.432 Mm³/a

Groundwater available for use: 2.24Mm³/a (minimal)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	88.32
Fractured 0.5 - 2.0 l/s	11.68

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	6.17
70 - 300 mS/m	82.19
300 - 1 000 mS/m	11.64

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	8.56	
BEAUFORT GRP	23.97	Localised significance as aquifer systems.
ECCA GRP	44.22	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	11.79	Aquiclude
WITTEBERG GRP	11.48	Marginal hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Groundwater will provide some baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E22C**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 490 km²

Recharge: 3.8245 Mm³/a

Total Use: **0.209 Mm³/a**

Rural:	0.0170	*Mining:*	0.0000
AgIrrig:	0.1752	*Industry:*	0.0000
AgLive:	0.0171	*Aquaculture:*	0.0000

Water Balance: 3.615 Mm³/a

Stress Index: 0.05 *Unstressed or low levels of stress*

EWR low flow requirement: 0.332 Mm³/a

Groundwater available for use: 3.28Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	% of Area
Fractured 0.0 - 0.1 l/s	18.64
Fractured 0.1 - 0.5 l/s	0.26
Fractured 0.1 - 0.5 l/s	0.47
Fractured 0.5 - 2.0 l/s	60.12
Fractured 2.0 - 5.0 l/s	20.51

Groundwater Quality (EC)	% of Area
0 - 70 mS/m	66.38
70 - 300 mS/m	0.05
70 - 300 mS/m	18.89
300 - 1 000 mS/m	14.67

Geology	% of Area	Hydrological significance
ECCA GRP	3.06	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	13.04	Aquiclude
WITTEBERG GRP	52.8	Marginal hydrogeological significance
BOKKEVELD GRP	29.27	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	1.77	Major fractured rock/secondary aquifer system.

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Groundwater will provide baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E22D**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 496 km²

Recharge: 1.038 Mm³/a

Total Use: **0.017 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0173	*Aquaculture:*	0.0000

Water Balance: 1.021 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 0.26 Mm³/a

Groundwater available for use: 0.76 Mm³/a(minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	43.35
Fractured 0.1 - 0.5 l/s	1.43
Fractured 0.1 - 0.5 l/s	5.57
Fractured 0.5 - 2.0 l/s	48.26
Fractured 2.0 - 5.0 l/s	1.39

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	21.32
70 - 300 mS/m	23.7
300 - 1 000 mS/m	54.98

Geology	***% of Area***	***Hydrological significance***
ECCA GRP	14.07	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	39.58	Aquiclude
WITTEBERG GRP	45.77	Marginal hydrogeological significance
BOKKEVELD GRP	0.53	Little significance, else regolith aquifer

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Groundwater will provide baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E22E**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 1013 km²

Recharge: 2.2736 Mm³/a

Total Use: **0.12 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0846	*Industry:*	0.0000
AgLive:	0.0354	*Aquaculture:*	0.0000

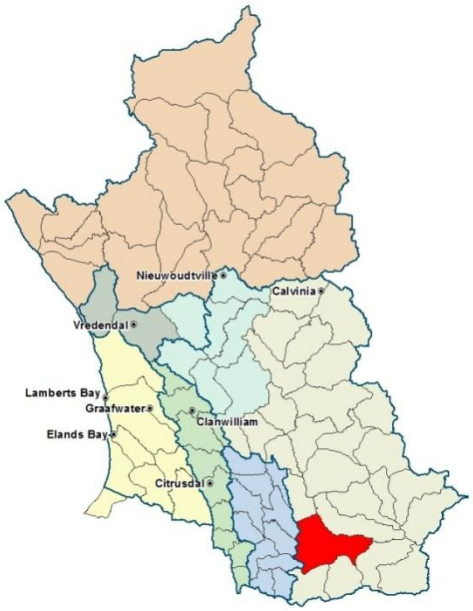
Water Balance: 2.154 Mm³/a

Stress Index: 0.05 *Unstressed or low levels of stress*

EWR low flow requirement: 1.78 Mm³/a

Groundwater available for use: 0.37Mm³/a (minimal)

GW Reserve completed (Y/N): N



Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	17.68
Fractured 0.1 - 0.5 l/s	0.45
Fractured 0.1 - 0.5 l/s	52.09
Fractured 0.5 - 2.0 l/s	0.77
Fractured 0.5 - 2.0 l/s	29.01

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	18.47
70 - 300 mS/m	8.95
70 - 300 mS/m	42.97
300 - 1 000 mS/m	29.61

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	0.99	
BEAUFORT GRP	0.23	Localised significance as aquifer systems.
ECCA GRP	51.79	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	16.61	Aquiclude
WITTEBERG GRP	30.36	Marginal hydrogeological significance
BOKKEVELD GRP	0.03	Little significance, else regolith aquifer

Risk to groundwater: None - a very large catchment

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E22F**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 400 km²

Recharge: 0.4846 Mm³/a

Total Use: **0.012 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0121	*Aquaculture:*	0.0000

Water Balance: 0.472 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 0.21 Mm³/a

Groundwater available for use: 0.26 Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	34.74
Fractured 0.1 - 0.5 l/s	10.34
Fractured 0.5 - 2.0 l/s	54.92

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	15.7
70 - 300 mS/m	10.03
70 - 300 mS/m	39.65
300 - 1 000 mS/m	34.63

Geology	***% of Area***	***Hydrological significance***
ECCA GRP	12.77	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	40.12	Aquiclude
WITTEBERG GRP	47.13	Marginal hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E22G**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 367 km²

Recharge: 0.141 Mm³/a

Total Use: **0.004 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0036	*Aquaculture:*	0.0000

Water Balance: 0.137 Mm³/a

Stress Index: 0.03 *Unstressed or low levels of stress*

EWR low flow requirement: 0.43 Mm³/a

Groundwater available for use: -0.29Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	35.54
Fractured 0.1 - 0.5 l/s	0.12
Fractured 0.5 - 2.0 l/s	64.34

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	0.09
70 - 300 mS/m	64.69
300 - 1 000 mS/m	35.22

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	0.68	
ECCA GRP	0.21	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	37.15	Aquiclude
WITTEBERG GRP	61.29	Marginal hydrogeological significance
BOKKEVELD GRP	0.67	Little significance, else regolith aquifer

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23A**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 762 km²

Recharge: 6.0995 Mm³/a

Total Use: **0.059 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0585	*Industry:*	0.0000
AgLive:	0.0001	*Aquaculture:*	0.0000

Water Balance: 6.041 Mm³/a

Stress Index: 0.01 *Unstressed or low levels of stress*

EWR low flow requirement: 1.048 Mm³/a

Groundwater available for use: 4.99Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	100

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
BEAUFORT GRP	99.77	Localised significance as aquifer systems.

Risk to groundwater: None - the most eastern catchment of the WMA

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23B**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 705 km²

Recharge: 4.265 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 4.265 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.97 Mm³/a

Groundwater available for use: 3.30Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	83.98
Fractured 0.5 - 2.0 l/s	2.32
Fractured 0.5 - 2.0 l/s	13.7

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
BEAUFORT GRP	73.11	Localised significance as aquifer systems.
ECCA GRP	26.74	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23C**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 318 km²

Recharge: 1.8446 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0003	*Aquaculture:*	0.0000

Water Balance: 1.844 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.437 Mm³/a

Groundwater available for use: 1.41Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	% of Area
Fractured 0.1 - 0.5 l/s	67.76
Fractured 0.5 - 2.0 l/s	32.24

Groundwater Quality (EC)	% of Area
70 - 300 mS/m	100

Geology	% of Area	Hydrological significance
BEAUFORT GRP	20.45	Localised significance as aquifer systems.
ECCA GRP	79.58	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23D**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 750 km²

Recharge: 3.2592 Mm³/a

Total Use: **0.052 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0426	*Industry:*	0.0000
AgLive:	0.0089	*Aquaculture:*	0.0000

Water Balance: 3.208 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 1.031 Mm³/a

Groundwater available for use: 2.13Mm³/a(minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	36.88
Fractured 0.5 - 2.0 l/s	0.19
Fractured 0.5 - 2.0 l/s	61.54
Fractured 2.0 - 5.0 l/s	1.39

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	15.3	
Karoo dolerite Suite	1.54	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
BEAUFORT GRP	17.23	Localised significance as aquifer systems.
ECCA GRP	65.74	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23E**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 564 km²

Recharge: 4.5617 Mm³/a

Total Use: **0.338 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.3329	*Industry:*	0.0000
AgLive:	0.0056	*Aquaculture:*	0.0000

Water Balance: 4.223 Mm³/a

Stress Index: 0.07 *Unstressed or low levels of stress*

EWR low flow requirement: 0.604 Mm³/a

Groundwater available for use: 3.62 Mm³/a(minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	94.95
Fractured 2.0 - 5.0 l/s	1.18
Intergranular and fractured 0.1 - 0.5 l/s	1.42
Intergranular and fractured 0.1 - 0.5 l/s	2.45

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	0.32	
Karoo dolerite Suite	3.72	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
BEAUFORT GRP	40.95	Localised significance as aquifer systems.
ECCA GRP	54.65	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: The agricultural use of groundwater is over-estimated - this is a Class A catchment.

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23F**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 473 km²

Recharge: 0.4311 Mm³/a

Total Use: **1.071 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	1.0619	*Industry:*	0.0000
AgLive:	0.0089	*Aquaculture:*	0.0000

Water Balance: -0.64 Mm³/a

Stress Index: 2.48 *Unstressed or low levels of stress*

EWR low flow requirement: 0.506 Mm³/a

Groundwater available for use: -1.15Mm³/a(none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	21.23
Fractured 0.5 - 2.0 l/s	74.19
Intergranular and fractured 0.1 - 0.5 l/s	4.59

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	23.41	
Karoo dolerite Suite	10.86	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	65.75	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: The groundwater use is likely to be completely wrong - the Tankwa Karoo National park is in this catchment - likley to be no groundwater use.

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23G**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 747 km²

Recharge: 1.7226 Mm³/a

Total Use: **0.027 Mm³/a**

Rural:	0.0010	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0261	*Aquaculture:*	0.0000

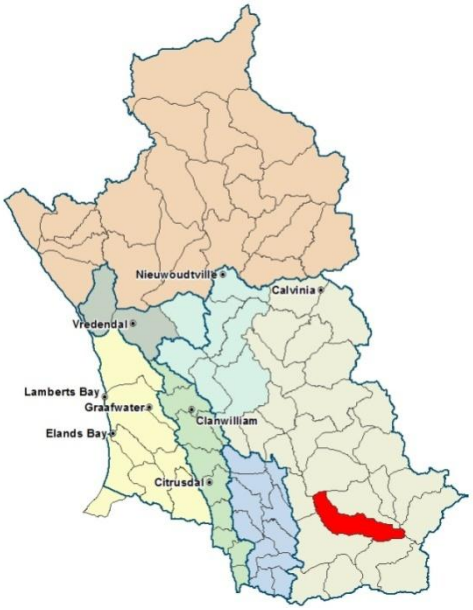
Water Balance: 1.696 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 0.8 Mm³/a

Groundwater available for use: 0.90 Mm³/a (minimal)

GW Reserve completed (Y/N): N



Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	87.4
Fractured 0.5 - 2.0 l/s	3.08
Fractured 0.5 - 2.0 l/s	9.52

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
BEAUFORT GRP	15.21	Localised significance as aquifer systems.
ECCA GRP	84.82	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23H**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 660 km²

Recharge: 2.9601 Mm³/a

Total Use: **0.023 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0227	*Aquaculture:*	0.0000

Water Balance: 2.937 Mm³/a

Stress Index: 0.01 *Unstressed or low levels of stress*

EWR low flow requirement: 0.907 Mm³/a

Groundwater available for use: 2.03 Mm³/a(minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	71.8
Fractured 0.5 - 2.0 l/s	3.63
Fractured 0.5 - 2.0 l/s	24.57

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	0	
BEAUFORT GRP	10.98	Localised significance as aquifer systems.
ECCA GRP	89.04	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23J**

Present Status Category (A-F): F

Desired Water Resource Category (A-F): D

Management Class *(Excellent/Good/Fair):* Fair

Area: 895 km²

Recharge: 0.7403 Mm³/a

Total Use: **0.031 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0311	*Aquaculture:*	0.0000

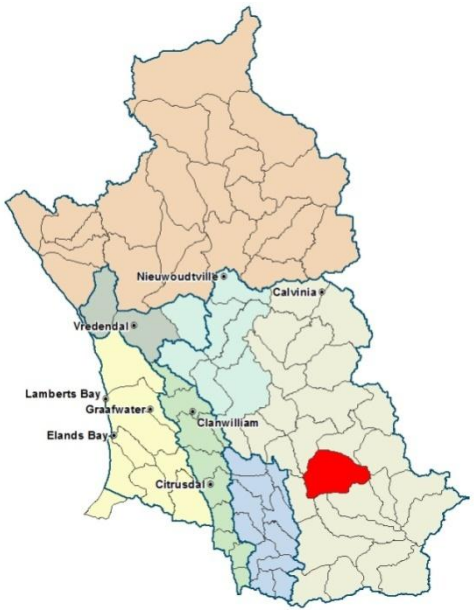
Water Balance: 0.709 Mm³/a

Stress Index: 0.04 *Unstressed or low levels of stress*

EWR low flow requirement: 0.958 Mm³/a

Groundwater available for use: -0.25 Mm³/a(none)

GW Reserve completed (Y/N): N



Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	0.3
Fractured 0.1 - 0.5 l/s	90.17
Fractured 0.5 - 2.0 l/s	9.52

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	99.66
300 - 1 000 mS/m	0.34

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	6.05	
BEAUFORT GRP	0.26	Localised significance as aquifer systems.
ECCA GRP	93.68	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	0.03	Aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E23K**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): D

Management Class *(Excellent/Good/Fair):* Fair

Area: 572 km²

Recharge: 0.0199 Mm³/a

Total Use: **0.002 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0025	*Aquaculture:*	0.0000

Water Balance: 0.017 Mm³/a

Stress Index: 0.13 *Unstressed or low levels of stress*

EWR low flow requirement: 0.612 Mm³/a

Groundwater available for use: -0.59Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	30.15
Fractured 0.1 - 0.5 l/s	25.68
Fractured 0.5 - 2.0 l/s	30.21
Intergranular and fractured 0.1 - 0.5 l/s	13.96

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	55.57
300 - 1 000 mS/m	44.43

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	5.88	
Karoo dolerite Suite	3.41	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	45.65	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	45.07	Aquiclude

Risk to groundwater: The agricultural use of groundwater is over-estimated - this is a Class A catchment. Limited use in the western part of the catchment on the river.

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24A**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 255 km²

Recharge: 4.8767 Mm³/a

Total Use: **0.046 Mm³/a**

Rural:	0.0070	*Mining:*	0.0000
AgIrrig:	0.0350	*Industry:*	0.0000
AgLive:	0.0039	*Aquaculture:*	0.0000

Water Balance: 4.831 Mm³/a

Stress Index: 0.01 *Unstressed or low levels of stress*

EWR low flow requirement: 0.468 Mm³/a

Groundwater available for use: 4.36Mm³/a(adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	59.18
Fractured 2.0 - 5.0 l/s	40.82

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	92.9
70 - 300 mS/m	7.1

Geology	***% of Area***	***Hydrological significance***
WITTEBERG GRP	0.04	Marginal hydrogeological significance
BOKKEVELD GRP	14.39	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	85.57	Major fractured rock/secondary aquifer system.

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: TMG aquifers contribute to river baseflow

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24B**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 468 km²

Recharge: 2.693 Mm³/a

Total Use: **0.061 Mm³/a**

Rural:	0.0020	*Mining:*	0.0000
AgIrrig:	0.0516	*Industry:*	0.0000
AgLive:	0.0075	*Aquaculture:*	0.0000

Water Balance: 2.632 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 0.857 Mm³/a

Groundwater available for use: 1.77 Mm³/a(minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	0.79
Fractured 0.5 - 2.0 l/s	98.61
Fractured 2.0 - 5.0 l/s	0.6

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	1.35
70 - 300 mS/m	97.9
300 - 1 000 mS/m	0.75

Geology	***% of Area***	***Hydrological significance***
DWYKA GRP	0.61	Aquiclude
WITTEBERG GRP	60.11	Marginal hydrogeological significance
BOKKEVELD GRP	39.25	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	0.04	Major fractured rock/secondary aquifer system.

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: TMG aquifers contribute to river baseflow

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24C**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 784 km²

Recharge: 2.5331 Mm³/a

Total Use: **0.243 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.2430	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 2.29 Mm³/a

Stress Index: 0.1 *Unstressed or low levels of stress*

EWR low flow requirement: 0.75 Mm³/a

Groundwater available for use: 1.54Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	74.04
Intergranular and fractured 0.1 - 0.5 l/s	25.96

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	96.85
300 - 1 000 mS/m	3.15

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	1.74	
Karoo dolerite Suite	23.08	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
BEAUFORT GRP	1.22	Localised significance as aquifer systems.
ECCA GRP	72.16	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	1.65	Aquiclude

Risk to groundwater: The agricultural use of groundwater is over-estimated - this is a Class A catchment.

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24D**

Present Status Category(A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 997 km²

Recharge: 1.665 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 1.665 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.96 Mm³/a

Groundwater available for use: 0.71Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	% of Area
Fractured 0.1 - 0.5 l/s	3.6
Fractured 0.5 - 2.0 l/s	50.73
Intergranular& fractured 0.1 - 0.5 l/s	1.43
Intergranular and fractured 0.1 - 0.5 l/s	1.86
Intergranular and fractured 0.1 - 0.5 l/s	5.1
Intergranular and fractured 0.1 - 0.5 l/s	7.28
Intergranular and fractured 0.1 - 0.5 l/s	30

Groundwater Quality (EC)	% of Area
70 - 300 mS/m	3.64
70 - 300 mS/m	66.3
300 - 1 000 mS/m	30.06

Geology	% of Area	Hydrological significance
QUATERNARY	17.38	
Karoo dolerite Suite	18.47	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
BEAUFORT GRP	1.83	Localised significance as aquifer systems.
ECCA GRP	41.92	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	17.04	Aquiclude
BOKKEVELD GRP	3.33	Little significance, else regolith aquifer

Risk to groundwater: None - a large catchment

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24E**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 671 km²

Recharge: 1.2469 Mm³/a

Total Use: **0.039 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0390	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 1.208 Mm³/a

Stress Index: 0.03 *Unstressed or low levels of stress*

EWR low flow requirement: 1.576 Mm³/a

Groundwater available for use: -0.37 Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	34.28
Fractured 0.5 - 2.0 l/s	25.08
Intergranular and fractured 0.1 - 0.5 l/s	40.64

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	22.93
70 - 300 mS/m	27.89
300 - 1 000 mS/m	49.18

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	34.98	
Karoo dolerite Suite	5.79	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	24.14	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	15.65	Aquiclude
BOKKEVELD GRP	19.45	Little significance, else regolith aquifer

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24F**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 582 km²

Recharge: 1.7163 Mm³/a

Total Use: **0.004 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0040	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 1.712 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 1.07 Mm³/a

Groundwater available for use: 0.64Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	0.79
Fractured 0.5 - 2.0 l/s	68.67
Intergranular and fractured 0.1 - 0.5 l/s	30.54

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	0.85
70 - 300 mS/m	76.46
300 - 1 000 mS/m	22.69

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	21.53	
Karoo dolerite Suite	18.44	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	58.84	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	0.72	Aquiclude
BOKKEVELD GRP	0.49	Little significance, else regolith aquifer

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24G**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 633 km²

Recharge: 0.1209 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 0.121 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 1.16 Mm³/a

Groundwater available for use: -1.04Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	80.79
Fractured 0.5 - 2.0 l/s	4.93
Intergranular and fractured 0.1 - 0.5 l/s	14.29

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	5.05
70 - 300 mS/m	80.18
300 - 1 000 mS/m	14.77

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	19.87	
Karoo dolerite Suite	0.71	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	6.72	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	3.24	Aquiclude
BOKKEVELD GRP	69.46	Little significance, else regolith aquifer

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24H**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 483 km²

Recharge: 0.3017 Mm³/a

Total Use: **0.008 Mm³/a**

Rural:	0.0020	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0062	*Aquaculture:*	0.0000

Water Balance: 0.294 Mm³/a

Stress Index: 0.03 *Unstressed or low levels of stress*

EWR low flow requirement: 0.56 Mm³/a

Groundwater available for use: -0.27 Mm³/a(none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.0 - 0.1 l/s	1.99
Fractured 0.1 - 0.5 l/s	38.59
Fractured > 5.0 l/s	1.18
Fractured 0.5 - 2.0 l/s	37.16
Intergranular and fractured 0.1 - 0.5 l/s	21.08

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	77.16
300 - 1 000 mS/m	22.84

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	6.6	
DWYKA GRP	20.2	Aquiclude
WITTEBERG GRP	8.07	Marginal hydrogeological significance
BOKKEVELD GRP	65.14	Little significance, else regolith aquifer

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24J**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 1078 km²

Recharge: 5.7537 Mm³/a

Total Use: **1.456 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	1.4461	*Industry:*	0.0000
AgLive:	0.0095	*Aquaculture:*	0.0000

Water Balance: 4.298 Mm³/a

Stress Index: 0.25 *Moderate levels of stress*

EWR low flow requirement: 1.24 Mm³/a

Groundwater available for use: 3.06Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	29.27
Fractured > 5.0 l/s	5.01
Fractured 0.5 - 2.0 l/s	65.73

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	29.99
70 - 300 mS/m	66.84
300 - 1 000 mS/m	3.18

Geology	***% of Area***	***Hydrological significance***
DWYKA GRP	0.29	Aquiclude
WITTEBERG GRP	1.24	Marginal hydrogeological significance
BOKKEVELD GRP	68.93	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	29.54	Major fractured rock/secondary aquifer system.

Risk to groundwater: The agricultural use of groundwater is probably over-estimated - this is more a Class B catchment.

Assumptions and constraints: The agriculture in the west is probably more dryland farming, some centre pivots adjacent to the river - groundwater probably used mainly in summer.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24K**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 652 km²

Recharge: 0.6656 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 0.666 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.75 Mm³/a

Groundwater available for use: -0.08Mm³/a(none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	95.32
Fractured 0.5 - 2.0 l/s	0.38
Fractured 0.5 - 2.0 l/s	4.27
Intergranular and fractured 0.1 - 0.5 l/s	0.02

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	48.28
70 - 300 mS/m	0.37
70 - 300 mS/m	22.91
300 - 1 000 mS/m	28.44

Geology	***% of Area***	***Hydrological significance***
Karoo dolerite Suite	0.7	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	1.85	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	27.43	Aquiclude
BOKKEVELD GRP	21.84	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	48.19	Major fractured rock/secondary aquifer system.

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24L**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 516 km²

Recharge: 6.6738 Mm³/a

Total Use: **2.43 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	2.0090	*Industry:*	0.0000
AgLive:	0.0078	*Aquaculture:*	0.0000

Water Balance: 4.244 Mm³/a

Stress Index: 0.36 *Moderate levels of stress*

EWR low flow requirement: 1.014 Mm³/a

Groundwater available for use: 3.23Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	0.92
Fractured 0.5 - 2.0 l/s	99.08

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	89.53
70 - 300 mS/m	10.47

Geology	***% of Area***	***Hydrological significance***
BOKKEVELD GRP	12.27	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	87.73	Major fractured rock/secondary aquifer system.

Risk to groundwater: Very limited

Assumptions and constraints: A few centre pivots in the catchment - groundwater probably used extensively in summer

Level of confidence: low

Implications of using more/less water:

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E24M**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 529 km²

Recharge: 2.7315 Mm³/a

Total Use: **0.004 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0040	*Aquaculture:*	0.0000

Water Balance: 2.728 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.71 Mm³/a

Groundwater available for use: 2.02Mm³/a(minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	53.12
Fractured 0.5 - 2.0 l/s	46.88

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	94.1
70 - 300 mS/m	2.55
70 - 300 mS/m	3.35

Geology	***% of Area***	***Hydrological significance***
BOKKEVELD GRP	2.01	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	95.48	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	2.51	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E31A**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 2865 km²

Recharge: 0.0233 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 0.023 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.021 Mm³/a

Groundwater available for use: 0.00 Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	% of Area
Fractured 0.1 - 0.5 l/s	49.5
Intergranular and fractured 0.1 - 0.5 l/s	49.42
Intergranular and fractured 0.5 - 2.0 l/s	1.07

Groundwater Quality (EC)	% of Area
300 - 1 000 mS/m	88.11
> 1 000 mS/m	11.89

Geology	% of Area	Hydrological significance
QUATERNARY	55.39	
Karoo dolerite Suite	1.39	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	8.61	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	33.33	Aquiclude
SPEKTAKEL Suite	0.21	
HOOGOOR Suite	0.15	
OKIEP GRP	0.68	
Unnamed Granite Gneiss	0.06	

Risk to groundwater: None (the most northern catchment of the study area)

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E31B**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 1476 km²

Recharge: 0.6397 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 0.64 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.088 Mm³/a

Groundwater available for use: 0.55 Mm³/a(minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	23.79
Fractured 0.5 - 2.0 l/s	64.47
Intergranular and fractured 0.1 - 0.5 l/s	11.76

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	76.11
300 - 1 000 mS/m	23.89

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	7.98	
Karoo dolerite Suite	11.89	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	79.95	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E31C**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 1572 km²

Recharge: 0.0117 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

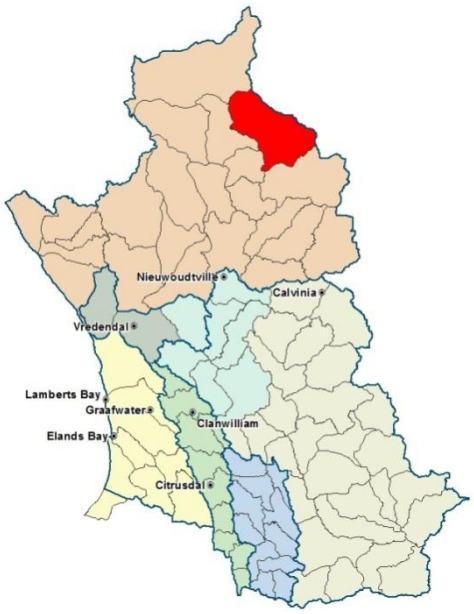
Water Balance: 0.012 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.093 Mm³/a

Groundwater available for use: -0.08 (none)

GW Reserve completed (Y/N): N



Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	69.95
Fractured 0.5 - 2.0 l/s	11.74
Intergranular and fractured 0.1 - 0.5 l/s	18.3

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	10.14
300 - 1 000 mS/m	89.86

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	7.8	
Karoo dolerite Suite	13.69	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	63.41	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	10.12	Aquiclude
Unnamed Granite Gneiss	4.77	

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E31D**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 839 km²

Recharge: 0.0001 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 0 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.049 Mm³/a

Groundwater available for use: -0.05 Mm³/a (none)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	35
Intergranular and fractured 0.1 - 0.5 l/s	65

Groundwater Quality (EC)	***% of Area***
300 - 1 000 mS/m	100

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	51.76	
Karoo dolerite Suite	3.4	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	24.86	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	10.41	Aquiclude
OKIEP GRP	0.03	
Unnamed Granite Gneiss	9.55	

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E31E**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 478 km²

Recharge: 0.0001 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 0 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.029 Mm³/a

Groundwater available for use: -0.03Mm³/a(none)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	38.98
Intergranular and fractured 0.1 - 0.5 l/s	61.02

Groundwater Quality (EC)	***% of Area***
300 - 1 000 mS/m	100

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	10.77	
Karoo dolerite Suite	20.67	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	17.66	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	21.12	Aquiclude
Unnamed Granite Gneiss	29.78	

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E31F**

Present Status Category(A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 525 km²

Recharge: 0.0006 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 0.001 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.029

Groundwater available for use: -0.03 Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	45.68
Fractured 0.5 - 2.0 l/s	4.76
Intergranular and fractured 0.1 - 0.5 l/s	49.56

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	40.09
300 - 1 000 mS/m	59.91

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	44.37	
Karoo dolerite Suite	10.94	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	30.85	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	13.15	Aquiclude
Unnamed Granite Gneiss	0.7	

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E31G**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 1238 km²

Recharge: 0.0039 Mm³/a

Total Use: **0.003 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0027	*Aquaculture:*	0.0000

Water Balance: 0.001 Mm³/a

Stress Index: 0.69 *Unstressed or low levels of stress*

EWR low flow requirement: 0.073 Mm³/a

Groundwater available for use: -0.07 Mm³/a(none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	39.04
Intergranular and fractured 0.1 - 0.5 l/s	46.05
Intergranular and fractured 0.5 - 2.0 l/s	14.91

Groundwater Quality (EC)	***% of Area***
300 - 1 000 mS/m	100

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	24.1	
ECCA GRP	24.29	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	14	Aquiclude
SPEKTAKEL Suite	8.07	
LITTLE NAMAQUALAND Suite	1.6	
HOOGOOR Suite	5.1	
OKIEP GRP	22.84	

Risk to groundwater: The agricultural use of groundwater is over-estimated - this is a Class A catchment.

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E31H**

Present Status Category (A-F): F

Desired Water Resource Category (A-F): D

Management Class *(Excellent/Good/Fair):* Fair

Area: 726 km²

Recharge: 0.0046 Mm³/a

Total Use: **0.001 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0012	*Aquaculture:*	0.0000

Water Balance: 0.003 Mm³/a

Stress Index: 0.26 *Moderate levels of stress*

EWR low flow requirement: 0.043 Mm³/a

Groundwater available for use: -0.04 Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	30.23
Intergranular and fractured 0.1 - 0.5 l/s	69.77

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	0.04
300 - 1 000 mS/m	99.96

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	48.35	
ECCA GRP	2.33	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	12.58	Aquiclude
VANRHYNSDORP GRP	15.46	Impermeable aquiclude
SPEKTAKEL Suite	0.78	
HOOGOOR Suite	1.67	
OKIEP GRP	5.36	
Unnamed Granite Gneiss	13.48	

Risk to groundwater: Very low

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E32A**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 1118 km²

Recharge: 4.2423 Mm³/a

Total Use: **2.159 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	2.1590	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 2.083 Mm³/a

Stress Index: 0.51 *Unstressed or low levels of stress*

EWR low flow requirement: 0.401 Mm³/a

Groundwater available for use: 1.68 Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	68.2
Intergranular and fractured 0.1 - 0.5 l/s	31.8

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
Karoo dolerite Suite	33.92	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	65.84	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: The agricultural use of groundwater is over-estimated - this is a Class A catchment.

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E32B**

Present Status Category (A-F): F

Desired Water Resource Category (A-F): D

Management Class *(Excellent/Good/Fair):* Fair

Area: 828 km²

Recharge: 1.1174 Mm³/a

Total Use: **3.377 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	3.3770	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: -2.26 Mm³/a

Stress Index: 3.02 *Criticallystressed*

EWR low flow requirement: 0.297 Mm³/a

Groundwater available for use: -2.56 Mm³/a(none)

GW Reserve completed (Y/N): N

Aquifer type and yield	% of Area
Fractured 0.1 - 0.5 l/s	8.61
Fractured 0.5 - 2.0 l/s	76.89
Intergranular and fractured 0.1 - 0.5 l/s	14.5

Groundwater Quality (EC)	% of Area
70 - 300 mS/m	90.76
300 - 1 000 mS/m	9.24

Geology	% of Area	Hydrological significance
Karoo dolerite Suite	15.14	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	77	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	7.88	Aquiclude

Risk to groundwater: The agricultural use of groundwater is over-estimated - this appears a Class A catchment. This must be assessed in more detail. Why is the groundwater stress index so high?

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E32C**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 638 km²

Recharge: 1.9643 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 1.964 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.228 Mm³/a

Groundwater available for use: 1.74Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	37.52
Fractured 0.5 - 2.0 l/s	47.32
Intergranular and fractured 0.1 - 0.5 l/s	15.16

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	60.86
300 - 1 000 mS/m	39.14

Geology	***% of Area***	***Hydrological significance***
Karoo dolerite Suite	16.7	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	44.62	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	37.79	Aquiclude
VANRHYNSDORP GRP	0.9	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E32D**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 616 km²

Recharge: 0.3491 Mm³/a

Total Use: **0 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

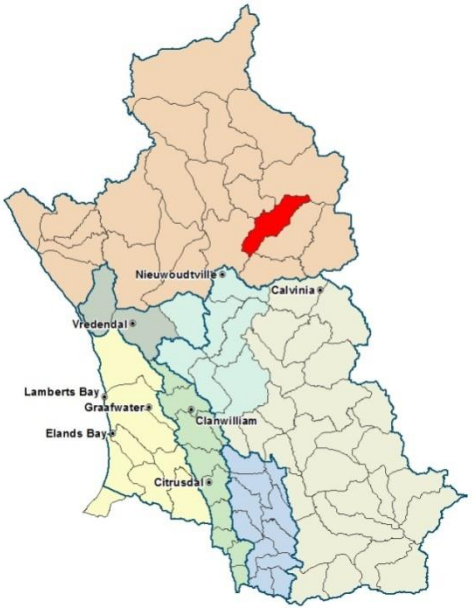
Water Balance: 0.349 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.22 Mm³/a

Groundwater available for use: 0.13Mm³/a(minimal)

GW Reserve completed (Y/N): N



Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	23.12
Fractured 0.5 - 2.0 l/s	51.82
Intergranular and fractured 0.1 - 0.5 l/s	25.06

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	79.03
300 - 1 000 mS/m	20.97

Geology	***% of Area***	***Hydrological significance***
Karoo dolerite Suite	26.03	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	54.72	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	12.93	Aquiclude
VANRHYNSDORP GRP	6.32	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E32E**

Present Status Category (A-F): F

Desired Water Resource Category (A-F): D

Management Class *(Excellent/Good/Fair):* Fair

Area: 1001 km²

Recharge: 1.2983 Mm³/a

Total Use: **3.636 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	3.6360	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: -2.338 Mm³/a

Stress Index: 2.8 *Critically stressed*

EWR low flow requirement: 0.358 Mm³/a

Groundwater available for use: -2.70 Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	95.53
Intergranular and fractured 0.1 - 0.5 l/s	4.47

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	17.29
70 - 300 mS/m	6.69
300 - 1 000 mS/m	76.02

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	2.22	
Karoo dolerite Suite	1.89	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	2.59	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	26.74	Aquiclude
TABLE MOUNTAIN GRP	16.63	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	47.6	Impermeable aquiclude
Unnamed Granite Gneiss	2.34	

Risk to groundwater: There is a lot of agricultural activity in the west - including centre pivots. Groundwater abstraction is > recharge, so groundwater levels are likely to be dropping and groundwater quality worsening.

Assumptions and constraints: Significant groundwater use in the west of the catchment

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.Groundwater monitoring needs to be carried out by land owners and DWA

Discussion on "hot spots": There are possibly hot spots.

Relevant previous work: SRK, 2006

Quaternary Catchment: **E33A**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 1355 km²

Recharge: 0.058 Mm³/a

Total Use: **0.033 Mm³/a**

Rural:	0.0030	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0302	*Aquaculture:*	0.0000

Water Balance: 0.025 Mm³/a

Stress Index: 0.57 *Unstressed or low levels of stress*

EWR low flow requirement: 0.083 Mm³/a

Groundwater available for use: -0.06 Mm³/a (none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	35.99
Intergranular and fractured 0.1 - 0.5 l/s	64.01

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	0.23
300 - 1 000 mS/m	99.77

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	63.91	
TABLE MOUNTAIN GRP	0.01	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	16.56	Impermeable aquiclude
SPEKTAKEL Suite	7.14	
LITTLE NAMAQUALAND Suite	0.06	
HOOGOOR Suite	6.04	
OKIEP GRP	6.28	

Risk to groundwater: The groundwater use is probably over-estimated. The calculated stress index is too high. This needs to be checked.

Assumptions and constraints: Groundwater use is very little.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E33B**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 702 km²

Recharge: 0.0844 Mm³/a

Total Use: **0.021 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0209	*Aquaculture:*	0.0000

Water Balance: 0.064 Mm³/a

Stress Index: 0.25 *Unstressed or low levels of stress*

EWR low flow requirement: 0.062 Mm³/a

Groundwater available for use: 0.00 Mm³/a(none)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	45.66
Fractured 0.5 - 2.0 l/s	54.34

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	0.55
300 - 1 000 mS/m	99.45

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	41.39	
TABLE MOUNTAIN GRP	0.98	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	57.64	Impermeable aquiclude

Risk to groundwater: The groundwater use is probably over-estimated. The calculated stress index is too high. This needs to be checked.

Assumptions and constraints: Groundwater use is very little.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E33C**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 980 km²

Recharge: 1.5792 Mm³/a

Total Use: **0.027 Mm³/a**

Rural:	0.0010	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0263	*Aquaculture:*	0.0000

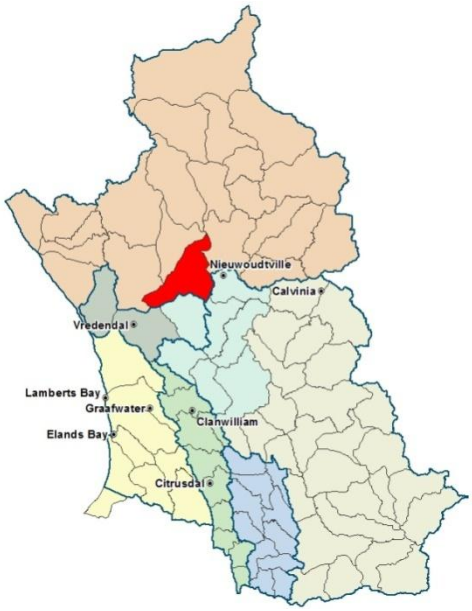
Water Balance: 1.552 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 0 Mm³/a

Groundwater available for use: 1.55 Mm³/a (adequate)

GW Reserve completed (Y/N): N



Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	69.57
Fractured 0.5 - 2.0 l/s	30.43

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	4.18
300 - 1 000 mS/m	95.82

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	36.5	
TABLE MOUNTAIN GRP	3.01	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	60.49	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E33D**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 1559 km²

Recharge: 0.2322 Mm³/a

Total Use: **0.049 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0487	*Aquaculture:*	0.0000

Water Balance: 0.184 Mm³/a

Stress Index: 0.21 *Moderate levels of stress*

EWR low flow requirement: 0.138 Mm³/a

Groundwater available for use: 0.05Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	70.63
Fractured 0.5 - 2.0 l/s	6.98
Intergranular and fractured 0.1 - 0.5 l/s	14.96
Intergranular and fractured 0.5 - 2.0 l/s	7.44

Groundwater Quality (EC)	***% of Area***
300 - 1 000 mS/m	100

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	36.71	
VANRHYNSDORP GRP	36.66	Impermeable aquiclude
NAMA GRP	5.12	
SPEKTAKEL Suite	5.05	
LITTLE NAMAQUALAND Suite	3.29	
HOOGOOR Suite	1.32	
OKIEP GRP	11.8	

Risk to groundwater: Very low

Assumptions and constraints: Groundwater use is very little.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E33E**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 1282 km²

Recharge: 0.5992 Mm³/a

Total Use: **0.169 Mm³/a**

Rural:	0.0010	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0398	*Aquaculture:*	0.0000

Water Balance: 0.43 Mm³/a

Stress Index: 0.28 *Moderate levels of stress*

EWR low flow requirement: 0.06 Mm³/a

Groundwater available for use: 0.37 Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	6.84
Fractured 0.5 - 2.0 l/s	75.4
Intergranular and fractured 0.1 - 0.5 l/s	17.16
Karst 0.5 - 2.0 l/s	0.59

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	0.62
300 - 1 000 mS/m	83.23
> 1 000 mS/m	16.15

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	37.69	
VANRHYNSDORP GRP	40.68	Impermeable aquiclude
NAMA GRP	8.19	
SPEKTAKEL Suite	3.52	
LITTLE NAMAQUALAND Suite	7.2	
OKIEP GRP	2.72	

Risk to groundwater: Lutzville is in the south of this catchment. There is groundwater use in the south. Groundwater could be over-abstracted.

Assumptions and constraints: Groundwater use in the south of the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E33F**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent*(to be finalized)*

Area: 725 km²

Recharge: 3.5663 Mm³/a

Total Use: **0.073 Mm³/a**

Rural:	0.0050	*Mining:*	0.0552
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0132	*Aquaculture:*	0.0000

Water Balance: 3.493 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 0.05 Mm³/a

Groundwater available for use: 3.44 Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	33.49
Fractured 0.5 - 2.0 l/s	26.23
Karst 0.5 - 2.0 l/s	2.18
Karst > 5.0 l/s	38.09

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	23.97
70 - 300 mS/m	40.38
300 - 1 000 mS/m	35.65

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	64.7	
TABLE MOUNTAIN GRP	21.32	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	13.98	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E33G**

Present Status Category (A-F): D

Desired Water Resource Category (A-F): C

Management Class *(Excellent/Good/Fair):* Fair

Area: 894 km²

Recharge: 2.2859 Mm³/a

Total Use: **1.302 Mm³/a**

Rural:	0.0000	*Mining:*	0.9830
AgIrrig:	0.0000	*Industry:*	0.0300
AgLive:	0.0209	*Aquaculture:*	0.0000

Water Balance: 0.984 Mm³/a

Stress Index: 0.57 *Moderate levels of stress*

EWR low flow requirement: 0 Mm³/a

Groundwater available for use: 0.98 Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	12.17
Fractured 0.5 - 2.0 l/s	21.5
Fractured 2.0 - 5.0 l/s	26.35
Karst 0.5 - 2.0 l/s	39.9
Karst > 5.0 l/s	0.08

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	25.3
70 - 300 mS/m	49.92
300 - 1 000 mS/m	24.78

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	42.23	
TABLE MOUNTAIN GRP	19.14	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	38.64	Impermeable aquiclude

Risk to groundwater: Vredendal is in this catchment. Groundwater levels could be dropping. DWA are doing excellent monitoring in this area.

Assumptions and constraints: Groundwater is used throughout the year.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E33H**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 719 km²

Recharge: 0.7588 Mm³/a

Total Use: **0.044 Mm³/a**

Rural:	0.0250	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0188	*Aquaculture:*	0.0000

Water Balance: 0.715 Mm³/a

Stress Index: 0.06 *Unstressed or low levels of stress*

EWR low flow requirement: 0.01 Mm³/a

Groundwater available for use: 0.71 Mm³/a (minimal)

GW Reserve completed (Y/N): Y

Aquifer type and yield	% of Area
Fractured 0.5 - 2.0 l/s	21.78
Fractured 2.0 - 5.0 l/s	33.7
Intergranular and fractured 0.1 - 0.5 l/s	32.58
Karst 0.5 - 2.0 l/s	11.95

Groundwater Quality (EC)	% of Area
0 - 70 mS/m	2.85
70 - 300 mS/m	11.95
300 - 1 000 mS/m	68.33
> 1 000 mS/m	16.86

Geology	% of Area	Hydrological significance
QUATERNARY	72.14	
TABLE MOUNTAIN GRP	2.94	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	2.99	Impermeable aquiclude
SPEKTAKEL Suite	5.62	
LITTLE NAMAQUALAND Suite	14.9	
OKIEP GRP	1.39	

Risk to groundwater: None

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E40A**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 941 km²

Recharge: 4.6549 Mm³/a

Total Use: **1.722 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	1.7217	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 2.933 Mm³/a

Stress Index: 0.37 *Moderate levels of stress*

EWR low flow requirement: 0.9 Mm³/a

Groundwater available for use: 2.03 Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	86.92
Intergranular and fractured 0.1 - 0.5 l/s	13.08

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	100

Geology	***% of Area***	***Hydrological significance***
Karoo dolerite Suite	15.07	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	84.61	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: The groundwater use is probably over-estimated. The calculated stress index is too high.

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E40B**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 707 km²

Recharge: 3.4478 Mm³/a

Total Use: **0.933 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.3479	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 2.515 Mm³/a

Stress Index: 0.27 *Moderate levels of stress*

EWR low flow requirement: 0.68 Mm³/a

Groundwater available for use: 1.84 Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	0.17
Fractured 0.5 - 2.0 l/s	71.31
Intergranular and fractured 0.1 - 0.5 l/s	28.52

Groundwater Quality (EC)	***% of Area***
70 - 300 mS/m	99.81
300 - 1 000 mS/m	0.19

Geology	***% of Area***	***Hydrological significance***
Karoo dolerite Suite	32.47	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	67.49	Middle to upper thin sandstone strata may have greater hydrogeological significance

Risk to groundwater: Calvinia lies in the eastern portion of this catchment. Possibility of groundwater levels being over-abstracted and groundwater levels dropping

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: medium

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E40C**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 530 km²

Recharge: 2.845 Mm³/a

Total Use: **0.094 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0000	*Aquaculture:*	0.0000

Water Balance: 2.751 Mm³/a

Stress Index: 0.03 *Unstressed or low levels of stress*

EWR low flow requirement: 0.11 Mm³/a

Groundwater available for use: 2.64Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	79.63
Fractured 0.5 - 2.0 l/s	5.07
Intergranular and fractured 0.1 - 0.5 l/s	15.3

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	34.95
70 - 300 mS/m	20.19
300 - 1 000 mS/m	44.85

Geology	***% of Area***	***Hydrological significance***
Karoo dolerite Suite	16.49	Fractured contact zones and metamorphic aureoles serve as aquifers. Also barriers to flow.
ECCA GRP	5.59	Middle to upper thin sandstone strata may have greater hydrogeological significance
DWYKA GRP	39.87	Aquiclude
BOKKEVELD GRP	1.1	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	32.56	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	4.39	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **E40D**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 544 km²

Recharge: 2.4849 Mm³/a

Total Use: **0.002 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0015	*Aquaculture:*	0.0000

Water Balance: 2.483 Mm³/a

Stress Index: 0 *Unstressed or low levels of stress*

EWR low flow requirement: 0.996 Mm³/a

Groundwater available for use: 1.49 Mm³/a (adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	100

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	70.03
70 - 300 mS/m	6.52
300 - 1 000 mS/m	23.44

Geology	***% of Area***	***Hydrological significance***
DWYKA GRP	5.41	Aquiclude
BOKKEVELD GRP	5.57	Little significance, else regolith aquifer
TABLE MOUNTAIN GRP	74.99	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	14.04	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: SRK, 2006

Quaternary Catchment: **F60A**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 572 km²

Recharge: 0.4399 Mm³/a

Total Use: **0.009 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0089	*Aquaculture:*	0.0000

Water Balance: 0.431 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 0.02 Mm³/a

Groundwater available for use: 0.41 Mm³/a(adequate)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Intergranular and fractured 0.0 - 0.1 l/s	98.6
Intergranular and fractured 0.1 - 0.5 l/s	1.38

Groundwater Quality (EC)	***% of Area***
300 - 1 000 mS/m	14.91
> 1 000 mS/m	84.75

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	73.32	
Biesiesfontein Granite	13.11	
SPEKTAKEL Suite	10.26	
LITTLE NAMAQUALAND Suite	1.68	
OKIEP GRP	0.44	

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work:

Quaternary Catchment: **F60B**

Present Status Category (A-F): B

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 320 km²

Recharge: 0.4776 Mm³/a

Total Use: **0.044 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0103	*Aquaculture:*	0.0000

Water Balance: 0.433 Mm³/a

Stress Index: 0.09 *Unstressed or low levels of stress*

EWR low flow requirement: 0.018 Mm³/a

Groundwater available for use: 0.42 Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Intergranular and fractured 0.0 - 0.1 l/s	12.67
Intergranular and fractured 0.1 - 0.5 l/s	87.33

Groundwater Quality (EC)	***% of Area***
300 - 1 000 mS/m	85.22
> 1 000 mS/m	14.78

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	6.65	
NAMA GRP	1.46	
Biesiesfontein Granite	4.25	
SPEKTAKEL Suite	24.3	
LITTLE NAMAQUALAND Suite	61.36	
OKIEP GRP	1.99	

Risk to groundwater: None

Assumptions and constraints: Limited groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work:

Quaternary Catchment: **F60C**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 622 km²

Recharge: 0.9391 Mm³/a

Total Use: **0.023 Mm³/a**

Rural:	0.0040	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0194	*Aquaculture:*	0.0000

Water Balance: 0.916 Mm³/a

Stress Index: 0.02 *Unstressed or low levels of stress*

EWR low flow requirement: 0.039 Mm³/a

Groundwater available for use: 0.88 Mm³/a (minimal)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Intergranular and fractured 0.0 - 0.1 l/s	19.16
Intergranular and fractured 0.1 - 0.5 l/s	80.84

Groundwater Quality (EC)	***% of Area***
300 - 1 000 mS/m	81.97
> 1 000 mS/m	18.03

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	20.56	
KLEIN KOGELFONTEIN* Suite	0.87	
Biesiesfontein Granite	22.08	
SPEKTAKEL Suite	27.54	
LITTLE NAMAQUALAND Suite	20.66	
HOOGOOR Suite	0.5	
OKIEP GRP	7.63	

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work:

Quaternary Catchment: **F60D**

Present Status Category(A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 481 km²

Recharge: 0.4966 Mm³/a

Total Use: **0.016 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0164	*Aquaculture:*	0.0000

Water Balance: 0.48 Mm³/a

Stress Index: 0.03 *Unstressed or low levels of stress*

EWR low flow requirement: 0.032 Mm³/a

Groundwater available for use: 0.45 Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	9.2
Intergranular and fractured 0.0 - 0.1 l/s	24.16
Intergranular and fractured 0.1 - 0.5 l/s	66.64

Groundwater Quality (EC)	***% of Area***
300 - 1 000 mS/m	55.99
> 1 000 mS/m	44.01

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	32.54	
NAMA GRP	2.21	
Biesiesfontein Granite	10.23	
SPEKTAKEL Suite	12.22	
LITTLE NAMAQUALAND Suite	41.72	
OKIEP GRP	1.09	

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work:

Quaternary Catchment: **F60E**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 795 km²

Recharge: 0.71 Mm³/a

Total Use: **0.027 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0274	*Aquaculture:*	0.0000

Water Balance: 0.683 Mm³/a

Stress Index: 0.04 *Unstressed or low levels of stress*

EWR low flow requirement: 0.005 Mm³/a

Groundwater available for use: 0.68 Mm³/a (minimal)

GW Reserve completed (Y/N): N

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	1.8
Fractured 2.0 - 5.0 l/s	0.66
Intergranular and fractured 0.0 - 0.1 l/s	48.41
Intergranular and fractured 0.1 - 0.5 l/s	47.07
Karst 0.5 - 2.0 l/s	2.05

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	0
70 - 300 mS/m	2.07
300 - 1 000 mS/m	67.89
> 1 000 mS/m	29.88

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	88.15	
TABLE MOUNTAIN GRP	0.21	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	1.32	Impermeable aquiclude
Biesiesfontein Granite	0.18	
SPEKTAKEL Suite	0.81	
LITTLE NAMAQUALAND Suite	7.99	
OKIEP GRP	0.61	

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work:

Quaternary Catchment: **G30A**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 761 km²

Recharge: 10.7313 Mm³/a

Total Use: **2.769 Mm³/a**

Rural:	0.0040	*Mining:*	0.0000
AgIrrig:	2.6167	*Industry:*	0.0000
AgLive:	0.1487	*Aquaculture:*	0.0000

Water Balance: 7.962 Mm³/a

Stress Index: 0.26 *Moderate levels of stress*

EWR low flow requirement: 0.82 Mm³/a

Groundwater available for use: 7.14 Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	1.44
Fractured 0.5 - 2.0 l/s	27.98
Fractured 2.0 - 5.0 l/s	2.52
Intergranular 0.0 - 0.1 l/s	4.39
Intergranular 0.1 - 0.5 l/s	63.58
Intergranular> 5.0 l/s	0.01

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	29.86
70 - 300 mS/m	69.87

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	88.61	
TABLE MOUNTAIN GRP	9.03	Major fractured rock/secondary aquifer system.
MALMESBURY GRP	0.31	Impermeable aquiclude

Risk to groundwater: Groundwater stable currently however can easily be impacted in times of low rainfall

Assumptions and constraints: None - really - the area is being studied in some detail.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: GEOSS, 2006

Quaternary Catchment: **G30B**

Present Status Category(A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 658 km²

Recharge: 15.62 Mm³/a

Total Use: **0.49 Mm³/a**

Rural:	0.0070	*Mining:*	0.0000
AgIrrig:	0.3585	*Industry:*	0.0000
AgLive:	0.1245	*Aquaculture:*	0.0000

Water Balance: 15.13 Mm³/a

Stress Index: 0.03 *Unstressed or low levels of stress*

EWR low flow requirement: 1.49 Mm³/a

Groundwater available for use: 13.64Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	89.75
Fractured 0.5 - 2.0 l/s	7.96
Fractured 2.0 - 5.0 l/s	2.29

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	12.33
300 - 1 000 mS/m	87.67

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	11.95	
TABLE MOUNTAIN GRP	10.38	Major fractured rock/secondary aquifer system.
KLIPHEUWEL GRP	1.31	Aquitard of limited hydrogeological significance
MALMESBURY GRP	76.35	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: high

Implications of using more/less water: TMG aquifers contribute to river baseflow

Discussion on "hot spots": None

Relevant previous work: GEOSS, 2006

Quaternary Catchment: **G30C**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): C

Management Class *(Excellent/Good/Fair):* Good

Area: 351 km²

Recharge: 8.48 Mm³/a

Total Use: **2.78 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	2.7698	*Industry:*	0.0000
AgLive:	0.0102	*Aquaculture:*	0.0000

Water Balance: 5.7 Mm³/a

Stress Index: 0.33 *Moderate levels of stress*

EWR low flow requirement: 1.98 Mm³/a

Groundwater available for use: 3.72Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	11
Fractured 0.5 - 2.0 l/s	89

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	84.33
70 - 300 mS/m	0.44
300 - 1 000 mS/m	15.23

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	1.27	
TABLE MOUNTAIN GRP	93.28	Major fractured rock/secondary aquifer system.
KLIPHEUWEL GRP	1.75	Aquitard of limited hydrogeological significance
MALMESBURY GRP	3.71	Impermeable aquiclude

Risk to groundwater: Groundwater over-abstraction can occur. Monitoring is important.

Assumptions and constraints: Good rainfall / recharge in this area, but with low rainfall the water balance can change quite rapidly.

Level of confidence: high

Implications of using more/less water: Over-abstraction must be avoided - an important recharge area.

Discussion on "hot spots": None

Relevant previous work: GEOSS, 2006

Quaternary Catchment: **G30D**

Present Status Category (A-F): C

Desired Water Resource Category (A-F): B

Management Class *(Excellent/Good/Fair):* Good

Area: 534 km²

Recharge: 12.38 Mm³/a

Total Use: **4 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	3.8936	*Industry:*	0.0000
AgLive:	0.1064	*Aquaculture:*	0.0000

Water Balance: 8.38 Mm³/a

Stress Index: 0.32 *Moderate levels of stress*

EWR low flow requirement: 1.27 Mm³/a

Groundwater available for use: 7.11Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	8.46
Fractured 0.5 - 2.0 l/s	80.22
Fractured 2.0 - 5.0 l/s	11.32

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	83.75
70 - 300 mS/m	8.77
300 - 1 000 mS/m	7.48

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	59.32	
TABLE MOUNTAIN GRP	22.6	Major fractured rock/secondary aquifer system.
MALMESBURY GRP	18.07	Impermeable aquiclude

Risk to groundwater: Groundwater is used extensively, however the aquifers are high yielding. The risk is quite high that over-abstraction can occur. Groundwater quality can also deteriorate.

Assumptions and constraints: None - really - the area is being studied in detail.

Level of confidence: high

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None - but needs to be monitored carefully

Relevant previous work: GEOSS, 2006

Quaternary Catchment: **G30E**

Present Status Category (A-F): D

Desired Water Resource Category (A-F): C

Management Class *(Excellent/Good/Fair):* Fair

Area: 352 km²

Recharge: 4.45 Mm³/a

Total Use: **2.9 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	2.8328	*Industry:*	0.0000
AgLive:	0.0672	*Aquaculture:*	0.0000

Water Balance: 1.55 Mm³/a

Stress Index: 0.65 *Moderate levels of stress*

EWR low flow requirement: 0.6 Mm³/a

Groundwater available for use: 0.95Mm³/a(minimal)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.1 - 0.5 l/s	0.63
Fractured 0.5 - 2.0 l/s	94.68
Intergranular> 5.0 l/s	4.69

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	99.3
70 - 300 mS/m	0.7

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	42.16	
TABLE MOUNTAIN GRP	54.5	Major fractured rock/secondary aquifer system.
KLIPHEUWEL GRP	3.35	Aquitard of limited hydrogeological significance

Risk to groundwater: Groundwater is used extensively, however the aquifers are high yielding. The risk is quite high that over-abstraction can occur. Groundwater quality can also deteriorate.

Assumptions and constraints: None - really - the area is being studied in detail.

Level of confidence: high

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwater contribution to baseflow. However groundwater does sustainVelorenvlei.

Discussion on "hot spots": Yes - in the proximity of Velorenvlei

Relevant previous work: GEOSS, 2006

Quaternary Catchment: **G30F**

Present Status Category (A-F): F

Desired Water Resource Category (A-F): D

Management Class *(Excellent/Good/Fair):* Fair

Area: 780 km²

Recharge: 13.8 Mm³/a

Total Use: **14.03 Mm³/a**

Rural:	0.0120	*Mining:*	0.0000
AgIrrig:	14.0018	*Industry:*	0.0000
AgLive:	0.0162	*Aquaculture:*	0.0000

Water Balance: -0.23 Mm³/a

Stress Index: 1.02 *Critically stressed*

EWR low flow requirement: 1.049 Mm³/a

Groundwater available for use: -1.28Mm³/a (none)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	75.77
Fractured 2.0 - 5.0 l/s	5.52
Intergranular 2.0 - 5.0 l/s	0.19
Intergranular> 5.0 l/s	18.07

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	99.26
300 - 1 000 mS/m	0.2

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	34.62	
TABLE MOUNTAIN GRP	64.87	Major fractured rock/secondary aquifer system.

Risk to groundwater: Groundwater is being over-abstracted. Ecosystems impacted. Groundwater quality worsening in places.

Assumptions and constraints: None - really - the area is being studied in detail.

Level of confidence: high

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": Yes

Relevant previous work: GEOSS, 2006

Quaternary Catchment: **G30G**

Present Status Category (A-F): D

Desired Water Resource Category (A-F): C

Management Class *(Excellent/Good/Fair):* Fair

Area: 647 km²

Recharge: 11.06 Mm³/a

Total Use: **6.74 Mm³/a**

Rural:	0.0090	*Mining:*	0.0000
AgIrrig:	6.7206	*Industry:*	0.0810
AgLive:	0.0104	*Aquaculture:*	0.0000

Water Balance: 4.32 Mm³/a

Stress Index: 0.61 *Moderate levels of stress*

EWR low flow requirement: 0.413 Mm³/a

Groundwater available for use: 3.91 Mm³/a (adequate)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	32.86
Fractured 2.0 - 5.0 l/s	38.38
Intergranular 2.0 - 5.0 l/s	28.73

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	47.8
70 - 300 mS/m	45.9
300 - 1 000 mS/m	6.18

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	57.74	
TABLE MOUNTAIN GRP	42	Major fractured rock/secondary aquifer system.

Risk to groundwater: Groundwater levsl are dropping and water quality worsening in places

Assumptions and constraints: None - really - the area is being studied in detail.

Level of confidence: high

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": Yes

Relevant previous work: GEOSS, 2006

Quaternary Catchment: **G30H**

Present Status Category (A-F): A

Desired Water Resource Category (A-F): A

Management Class *(Excellent/Good/Fair):* Excellent

Area: 1077 km²

Recharge: 4.5224 Mm³/a

Total Use: **0.035 Mm³/a**

Rural:	0.0000	*Mining:*	0.0000
AgIrrig:	0.0000	*Industry:*	0.0000
AgLive:	0.0353	*Aquaculture:*	0.0000

Water Balance: 4.487 Mm³/a

Stress Index: 0.01 *Unstressed or low levels of stress*

EWR low flow requirement: 0.589 Mm³/a

Groundwater available for use: 3.90 Mm³/a (minimal)

GW Reserve completed (Y/N): Y

Aquifer type and yield	***% of Area***
Fractured 0.5 - 2.0 l/s	6
Fractured 2.0 - 5.0 l/s	93
Intergranular 2.0 - 5.0 l/s	0.97

Groundwater Quality (EC)	***% of Area***
0 - 70 mS/m	20.17
70 - 300 mS/m	14.26
300 - 1 000 mS/m	65.54

Geology	***% of Area***	***Hydrological significance***
QUATERNARY	60.63	
TABLE MOUNTAIN GRP	38.85	Major fractured rock/secondary aquifer system.
VANRHYNSDORP GRP	0.08	Impermeable aquiclude

Risk to groundwater: None

Assumptions and constraints: Essentially no groundwater use in the catchment.

Level of confidence: low

Implications of using more/less water: Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so low groundwatercontribution to baseflow.

Discussion on "hot spots": None

Relevant previous work: GEOSS, 2006

11. APPENDIX C: QUATERNARY SUMMARIES

QUAT	Present Class	Desired_ status_ category	Manage't Class	Area_ (km2)	Recharge (Mm3/a)	Total_ Usage (Mm3/a)	Water_ Balance (Mm3/a)	EWR Low Flow (Mm3/a)	GW Available for use (Mm3/a)	GW Avail 4Use
E10A	B	B	Good	134	17.5895	3.452	14.138	5.44	8.70	Adequate
E10B	B	B	Good	202	20.6085	3.729	16.880	6.78	10.10	Adequate
E10C	A	A	Excellent	192	14.3015	0.343	13.959	5.66	8.30	Adequate
E10D	C	B	Fair	235	13.6855	3.576	10.110	5.74	4.37	Adequate
E10E	A	A	Excellent	366	14.6810	0.270	14.411	7.35	7.06	Adequate
E10F	C	B	Good	386	14.6025	4.896	9.707	5.13	4.58	Adequate
E10G	A	A	Excellent	508	19.3352	0.104	19.231	4.21	15.02	Adequate
E10H	B	A	Excellent	162	9.0796	1.037	8.043	1.51	6.53	Minimal
E10J	C	C	Fair	468	8.7380	1.946	6.792	1.63	5.16	Adequate
E10K	A	A	Excellent	235	2.1529	0.095	2.058	0.36	1.70	Minimal
E21A	D	C	Fair	190	10.7001	5.359	5.341	1.48	3.86	Adequate
E21B	B	B	Good	223	7.7935	1.348	6.446	0.012	6.43	Minimal
E21C	B	B	Good	233	7.1742	1.256	5.918	0.07	5.85	Minimal
E21D	D	C	Fair	242	13.7246	7.387	6.338	1.884	4.45	Adequate
E21E	D	C	Fair	293	6.1869	2.690	3.497	0.09	3.41	Adequate
E21F	B	B	Good	379	5.0851	0.544	4.542	0.15	4.39	Minimal
E21G	F	D	Fair	266	9.6261	12.088	-2.462	2.07	-4.53	None
E21H	F	D	Fair	404	11.8491	2.561	9.288	16.656	-7.37	None
E21J	A	A	Excellent	317	5.5000	0.006	5.494	0.321	5.17	Adequate
E21K	B	A	Excellent	330	6.3447	0.400	5.944	0.184	5.76	Adequate
E21L	A	A	Excellent	195	0.5102	0.004	0.507	0.14	0.37	Minimal
E22A	A	A	Excellent	750	3.5276	0.030	3.498	0.39	3.11	Minimal
E22B	A	A	Excellent	638	2.6987	0.022	2.677	0.432	2.24	Minimal
E22C	A	A	Excellent	490	3.8245	0.209	3.615	0.332	3.28	Minimal
E22D	A	A	Excellent	496	1.0380	0.017	1.021	0.26	0.76	Minimal
E22E	A	A	Excellent	1013	2.2736	0.120	2.154	1.78	0.37	Minimal
E22F	A	A	Excellent	400	0.4846	0.012	0.473	0.21	0.26	Adequate
E22G	F	D	Fair	367	0.1410	0.004	0.137	0.43	-0.29	None
E23A	A	A	Excellent	762	6.0995	0.059	6.041	1.048	4.99	Adequate
E23B	A	A	Excellent	705	4.2650	0.000	4.265	0.97	3.30	Adequate
E23C	A	A	Excellent	318	1.8446	0.000	1.844	0.437	1.41	Minimal
E23D	A	A	Excellent	750	3.2592	0.052	3.208	1.031	2.18	Minimal
E23E	B	A	Excellent	564	4.5617	0.339	4.223	0.604	3.62	Minimal
E23F	F	D	Fair	473	0.4311	1.071	-0.640	0.506	-1.15	None
E23G	A	A	Excellent	747	1.7226	0.027	1.696	0.8	0.90	Minimal
E23H	A	A	Excellent	660	2.9601	0.023	2.937	0.907	2.03	Minimal
E23J	F	D	Fair	895	0.7403	0.031	0.709	0.958	-0.25	None
E23K	B	D	Fair	572	0.0199	0.003	0.017	0.612	-0.59	None
E24A	A	A	Excellent	255	4.8767	0.046	4.831	0.468	4.36	Adequate
E24B	A	A	Excellent	468	2.6930	0.061	2.632	0.857	1.77	Minimal
E24C	B	A	Excellent	784	2.5331	0.243	2.290	0.75	1.54	Adequate
E24D	A	A	Excellent	997	1.6650	0.000	1.665	0.96	0.71	Adequate
E24E	A	A	Excellent	671	1.2469	0.039	1.208	1.576	-0.37	None
E24F	A	A	Excellent	582	1.7163	0.004	1.712	1.07	0.64	Adequate
E24G	A	A	Excellent	633	0.1209	0.000	0.121	1.16	-1.04	None
E24H	A	A	Excellent	483	0.3017	0.008	0.294	0.56	-0.27	None
E24J	C	B	Good	1078	5.7537	1.456	4.298	1.24	3.06	Adequate
E24K	A	A	Excellent	652	0.6656	0.000	0.666	0.75	-0.08	None
E24L	C	B	Good	516	6.6738	2.430	4.244	1.014	3.23	Adequate
E24M	A	A	Excellent	529	2.7315	0.004	2.728	0.71	2.02	Minimal
E31A	A	A	Excellent	2865	0.0233	0.000	0.023	0.021	0.00	None
E31B	A	A	Excellent	1476	0.6397	0.000	0.640	0.088	0.55	Minimal
E31C	A	A	Excellent	1572	0.0117	0.000	0.012	0.093	-0.08	None
E31D	A	A	Excellent	839	0.0001	0.000	0.000	0.049	-0.05	None
E31E	A	A	Excellent	478	0.0001	0.000	0.000	0.029	-0.03	None
E31F	A	A	Excellent	525	0.0006	0.000	0.001	0.029	-0.03	None
E31G	A	A	Excellent	1238	0.0039	0.003	0.001	0.073	-0.07	None
E31H	F	D	Fair	726	0.0046	0.001	0.003	0.043	-0.04	None
E32A	A	A	Excellent	1118	4.2423	2.159	2.083	0.401	1.68	Adequate
E32B	F	D	Fair	828	1.1174	3.377	-2.260	0.297	-2.56	None
E32C	A	A	Excellent	638	1.9643	0.000	1.964	0.228	1.74	Minimal
E32D	A	A	Excellent	616	0.3491	0.000	0.349	0.22	0.13	Minimal
E32E	F	D	Fair	1001	1.2983	3.636	-2.338	0.358	-2.70	None
E33A	A	A	Excellent	1355	0.0580	0.033	0.025	0.083	-0.06	None
E33B	A	A	Excellent	702	0.0844	0.021	0.064	0.062	0.00	None

E33C	A	A	Excellent	980	1.5792	0.027	1.552	0	1.55	Adequate
E33D	C	B	Good	1559	0.2322	0.049	0.184	0.138	0.05	Minimal
E33E	C	B	Good	1282	0.5992	0.169	0.430	0.06	0.37	Adequate
E33F	A	A	Excellent	725	3.5663	0.073	3.493	0.05	3.44	None
E33G	D	C	Fair	894	2.2859	1.302	0.984	0	0.98	Adequate
E33H	B	A	Excellent	719	0.7588	0.044	0.715	0.01	0.71	Minimal
E40A	C	B	Good	941	4.6549	1.722	2.933	0.9	2.03	Adequate
E40B	C	B	Good	707	3.4478	0.933	2.515	0.68	1.84	Adequate
E40C	A	A	Excellent	530	2.8450	0.094	2.751	0.11	2.64	Adequate
E40D	A	A	Excellent	544	2.4849	0.002	2.483	0.996	1.49	Minimal
F60A	A	A	Excellent	572	0.4399	0.009	0.431	0.02	0.41	None
F60B	B	A	Excellent	320	0.4776	0.045	0.433	0.018	0.42	Minimal
F60C	A	A	Excellent	622	0.9391	0.023	0.916	0.039	0.88	Minimal
F60D	A	A	Excellent	481	0.4966	0.016	0.480	0.032	0.45	Minimal
F60E	A	A	Excellent	795	0.7100	0.027	0.683	0.005	0.68	Minimal
G30A	C	B	Good	761	10.7313	2.769	7.962	0.82	7.14	Adequate
G30B	A	A	Excellent	658	15.6200	0.490	15.130	1.49	13.64	Adequate
G30C	C	C	Good	351	8.4800	2.780	5.700	1.98	3.72	Adequate
G30D	C	B	Good	534	12.3800	4.000	8.380	1.27	7.11	Adequate
G30E	D	C	Fair	352	4.4500	2.900	1.550	0.6	0.95	Minimal
G30F	F	D	Fair	780	13.8000	14.030	-0.230	1.049	-1.28	None
G30G	D	C	Fair	647	11.0600	6.740	4.320	0.413	3.91	Adequate
G30H	A	A	Excellent	1077	4.5224	0.035	4.487	0.589	3.90	Minimal

QUAT	GW_Risk	Assumptions	Confi-dence	Implications	HotSpot Discussion
E10A	In central southern portion of catchment intensive agriculture - poss. non-point source contamination risk. Gwater plays an important role is providing baseflow. CSIR studiedthe area intensively using isotopes.	Most of the agricultural activity is irrigated from groundwater.	low	Groundwater monitoring network necessary	In summer groundwater levels are drawn down significantly, however these recover each winter.
E10B	In the north-eastern portion of the catchment there is intensive agriculture, mainly fruit.	Most of the agricultural activity is irrigated from groundwater.	low	Groundwater monitoring network necessary	The boreholes in this area are typically very high yielding and the groundwater quality is excellent. Monitoring data in the area does not show any signs of significant impact on groundwater resources.
E10C	A pristine catchment - no agricultural activity.	Groundwater is a completely natural unimpacted state	low	No monitoring required - unless for regional purposes	No hot spots
E10D	Also a mountainous catchment, however intense agriculture in the western portion (along the north/south valley). Thus non-point source contamination risk.	Most of the agricultural activity is irrigated from groundwater.	low		Further work will be required to assess the status of groundwater monitoring in the area. However the groundwater contribution to base flow is very important and agricultural activities must not impact this contribution.
E10E	Citrusdal is within this catchment. Groundwater is used in summer however the bulk of the irrigation water is from the Olifants R. Groundwater is at risk from non-point source contamination sources.	Most of the agricultural activity is irrigated from the Olifants River.	low	The catchment becomes quite water stressed in summer. A groundwater monitoring network is necessary.	No known hot spots of over-abstraction.
E10F	Mainly a mountainous catchment - however intense agriculture along the Olifants River. Surface water and groundwater is used intensively.	There is significant groundwater abstraction.	low	The catchment has a PES of C and this needs to be managed to a B, as groundwater plays a crucial role in supplying base flow to the Olifants River. This contribution is crucial in summer.	No known hot spots of over-abstraction, however this catchment needs to be carefully monitored, as it is important. If a monitoring network is not in place - one needs to be installed. Groundwater allocations need to be adhered to or even revised.
E10G	The risk is minimal of groundwater being impacted. The Clanwilliam Dam is within this catchment. This is a rugged and mountainous catchment.	Very little groundwater use. Water is obtained from the Clanwilliam Dam.	low	No major concerns regarding groundwater in this catchment.	No hot spots
E10H	Very rugged catchment - very little groundwater use ...the use given here may be an over-estimation.	Very little groundwater used and this catchment needs to be kept as natural as possible.	low	The class of the catchment needs to be improved to an A.	No known hot spots.
E10J	Groundwater is used extensively in this catchment. It is at risk from over-abstraction and non-point source contamination. Clanwilliam is within this catchment.	The groundwater use needs to be carefully monitored within this catchment.	low	This catchment needs to be carefully monitored.	No known hot spots of over-abstraction, however this catchment needs to be carefully monitored, as it is important. If a monitoring network is not in place - one needs to be installed. Groundwater allocations need to be adhered to or even revised.
E10K	There is more agriculture in this catchment than the groundwater abstraction data suggests.	The Olifants River is within the catchment and the assumption is that the bulk of the irrigation water is from the river.	low	Groundwater most likley has a significant role to play in the summer months.	No known hot spots of over-abstraction are known.
E21A	There is a lot of agriculture in this catchment (above the Gydo Pass). Groundwater levels are shallow and at risk from non-point based contamination.	Groundwater abstraction is high in the summer months	medium	The TMG aquifers in this catchments are high yielding and of excellent quality	From monitoring work in the area, the groundwater resources are not being impacted by agricultural activity. However the classification of the catchment needs to be improved. A few dedicated monitoring sites are necessary as the PES is a D. The volumes of groundwater being abstracted also need to be verified and if necessary allocations adjusted.
E21B	Agricultural activtity is limited in this rugged catchment . Best practices must be followed in the agricultural sector - as groundwater levels are shallow / artesian in places and can easily be impacted.	Groundwater use is limited	medium	Groundwater is limited in this large catchment, however land owner monitoring should be encouraged.	Monitoring records indicate no over-abstraction areas - aquifers are high yielding and very good quality.
E21C	Agricultural activtity is limited in this rugged catchment . Best practices must be followed in the agricultural sector - as groundwater levels are shallow in places and can easily be impacted.	Groundwater use is limited	medium	Groundwater is limited in this large catchment, however land owner monitoring should be encouraged.	Monitoring records indicate no over-abstraction areas - aquifers are high yielding and very good quality.
E21D	There is a lot of agricultural activity within this catchment (>50%). There are also a lot of shallow surface water dams, however groundwater is used extensively in summer. The groundwater is generally shallow and the risk with be from non-point source contamination.	Extensive groundwater use in summer	medium	Generally the TMG aquifers are high yielding and good quality. However there should be monitoring by the land owners to ensure sustainable groundwater use. Some DWA monitoring within the catchment will be good to have.	There are no known hot spots as the groundwater levels recover each year and the water quality remains good.
E21E	Agricultural activity is limited to the river valley - with the large dams within the catchment, the groundwater use figure may be an over-estimate otherwise there is extensive use of groundwater in summer. Groundwater will be at risk to non-point source contamination.	Extensive groundwater use in summer	medium	As the class of this catchment is to be improved land owners and DWA need to monitor.	There are no known hot spots as the groundwater levels recover each year and the water quality remains good.
E21F	There is very little agricultural activity in this catchment. It should probably be an A class catchment. No risk to groundwater.	Groundwater contributes significantly to river base flow.	medium	Some further consultation is required but this is probably an A class aquifer.	No hot spots.
E21G	There is extensive agriculture in this catchment. Indications are the groundwater is not being used sustainably. Water levels are likley to be dropping and groundwater quality deteriorating. Groundwater supply at risk.	Groundwater use exceeds recharge and levels are dropping.	medium	Groundwater use needs to be assessed with a hydrocensus and a monitoring network established. It will be necessary to introduce compulsory licensing if the groundwater use is not sustainable after the land owners are informed of the situation.	Likely to be several hot spots - where groundwater levels are dropping and possibly water quality deteriorating.
E21H	Agriculture is limited - groundwater contribution to baseflow important. Groundwater quality could be impacted through agricultural activities.	Groundwater is shallow and contributes to baseflow.	medium	This class of the catchment can be imporved a level.	Unlikely.
E21J	None	Essentially no groundwater use in the	medium	Groundwater will provide baseflow.	None

		catchment.			
E21K	Groundwater use is very low and this is very close to Class A	Essentially no groundwater use in the catchment.	medium	Groundwater will provide baseflow.	None
E21L	None	Essentially no groundwater use in the catchment.	low	Groundwater will provide baseflow.	None
E22A	None	Essentially no groundwater use in the catchment.	low	Groundwater will provide some baseflow.	None
E22B	None	Essentially no groundwater use in the catchment.	low	Groundwater will provide some baseflow.	None
E22C	None	Essentially no groundwater use in the catchment.	medium	Groundwater will provide baseflow.	None
E22D	None	Essentially no groundwater use in the catchment.	medium	Groundwater will provide baseflow.	None
E22E	None - a very large catchment	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E22F	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E22G	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23A	None - the most eastern catchment of the WMA	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23B	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23C	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23D	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23E	The agricultural use of groundwater is over-estimated - this is a Class A catchment.	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23F	The groundwater use is likely to be completely wrong - the Tankwa Karoo National park is in this catchment - likley to be no groundwater use.	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23G	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23H	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23J	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E23K	The agricultural use of groundwater is over-estimated - this is a Class A catchment. Limited use in the western part of the catchment on the river.	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E24A	None	Essentially no groundwater use in the catchment.	low	TMG aquifers contribute to river baseflow	None
E24B	None	Essentially no groundwater use in the catchment.	low	TMG aquifers contribute to river baseflow	None
E24C	The agricultural use of groundwater is over-estimated - this is a Class A catchment.	Limited groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E24D	None - a large catchment	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None

E24E	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E24F	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E24G	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E24H	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E24J	The agricultural use of groundwater is probably over-estimated - this is more a Class B catchment.	The agriculture in the west is probably more dryland farming, some centre pivots adjacent to the river - groundwater probably used mainly in summer.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E24K	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E24L	Very limited	A few centre pivots in the catchment - groundwater probably used extensively in summer	low		None
E24M	None	Essentially no groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E31A	None (the most northern catchment of the study area)	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E31B	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E31C	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E31D	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E31E	None	Essentially no groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E31F	None	Essentially no groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E31G	The agricultural use of groundwater is over-estimated - this is a Class A catchment.	Limited groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E31H	Very low	Limited groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E32A	The agricultural use of groundwater is over-estimated - this is a Class A catchment.	Limited groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E32B	The agricultural use of groundwater is over-estimated - this appears a Class A catchment. This must be assessed in more detail. Why is the groundwater stress index so high?	Limited groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E32C	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E32D	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None

E32E	There is a lot of agricultural activity in the west - including centre pivots. Groundwater abstraction is >recharge, so groundwater levels are likely to be dropping and groundwater quality worsening.	Significant groundwater use in the west of the catchment	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.Groundwater monitoring needs to be carried out by land owners and DWA	There are possibly hot spots.
E33A	The groundwater use is probably over-estimated. The calculated stress index is too high. This needs to be checked.	Groundwater use is very little.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E33B	The groundwater use is probably over-estimated. The calculated stress index is too high. This needs to be checked.	Groundwater use is very little.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E33C	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E33D	Very low	Groundwater use is very little.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E33E	Lutzville is in the south of this catchment. There is groundwater use in the south. Groundwater could be over-abstracted.	Groundwater use in the south of the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E33F	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E33G	Vredendal is in this catchment. Groundwater levels could be dropping. DWA are doing excellent monitoring in this area.	Groundwater is used throughout the year.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E33H	None	Limited groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E40A	The groundwater use is probably over-estimated. The calculated stress index is too high.	Limited groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E40B	Calvinia lies in the eastern portion of this catchment. Possibility of groundwater levels being over-abstracted and groundwater levels dropping	Limited groundwater use in the catchment.	medium	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E40C	None	Limited groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
E40D	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
F60A	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
F60B	None	Limited groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
F60C	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
F60D	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
F60E	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
G30A	Groundwater stable currently however can easily be impacted in times of low rainfall	None - really - the area is being studied in some detail.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None
G30B	None	Essentially no groundwater use in the catchment.	high	TMG aquifers contribute to river baseflow	None

G30C	Groundwater over-abstraction can occur. Monitoring is important.	Good rainfall / recharge in this area, but with low rainfall the water balance can change quite rapidly.	high	Over-abstraction must be avoided - an important recharge area.	None
G30D	Groundwater is used extensively, however the aquifers are high yielding. The risk is quite high that over-abstraction can occur. Groundwater quality can also deteriorate.	None - really - the area is being studied in detail.	high	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None - but needs to be monitored carefully
G30E	Groundwater is used extensively; however the aquifers are high yielding. The risk is quite high that over-abstraction can occur. Groundwater quality can also deteriorate.	None - really - the area is being studied in detail.	high	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow. However groundwater does sustain Velorenvlei.	Yes - in the proximity of Velorenvlei
G30F	Groundwater is being over-abstracted. Ecosystems impacted. Groundwater quality worsening in places.	None - really - the area is being studied in detail.	high	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	Yes
G30G	Groundwater levsl are dropping and water quality worsening in places	None - really - the area is being studied in detail.	high	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	Yes
G30H	None	Essentially no groundwater use in the catchment.	low	Unfavourable conditions (low rainfall/deep groundwater levels/limited presence of groundwater) - so no groundwater contribution to baseflow.	None

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