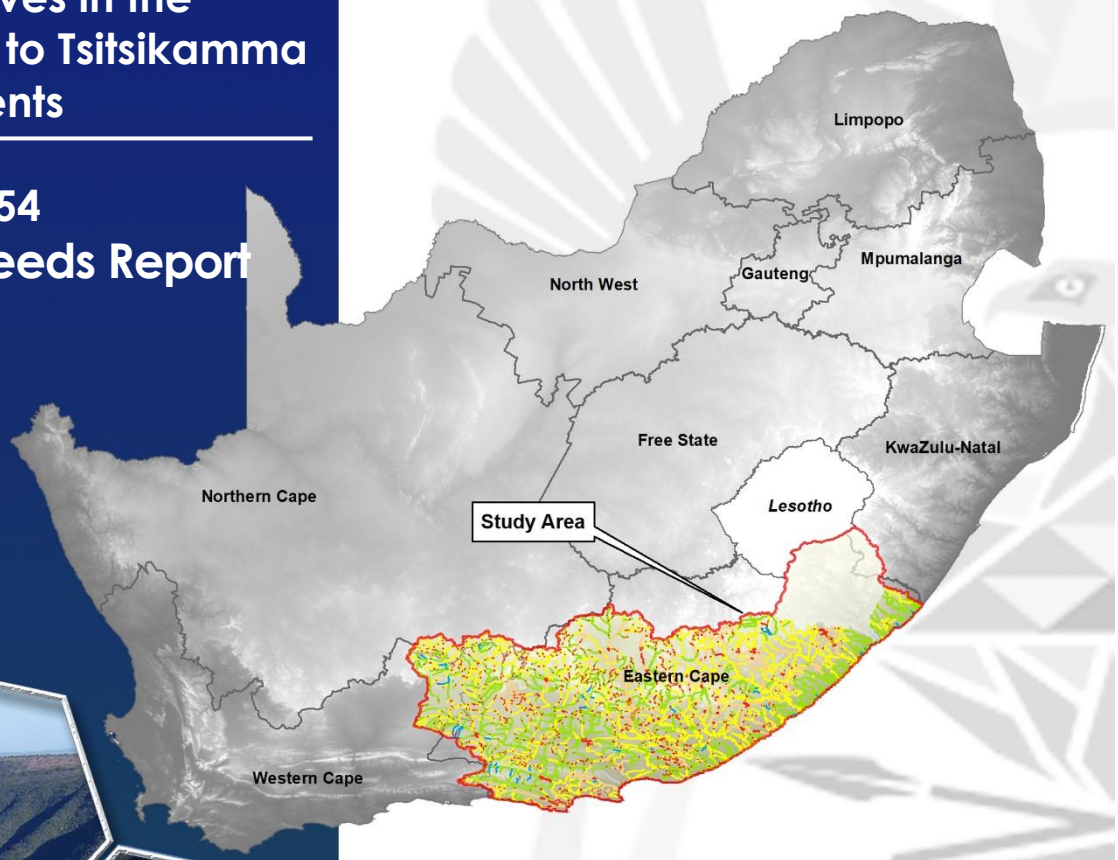
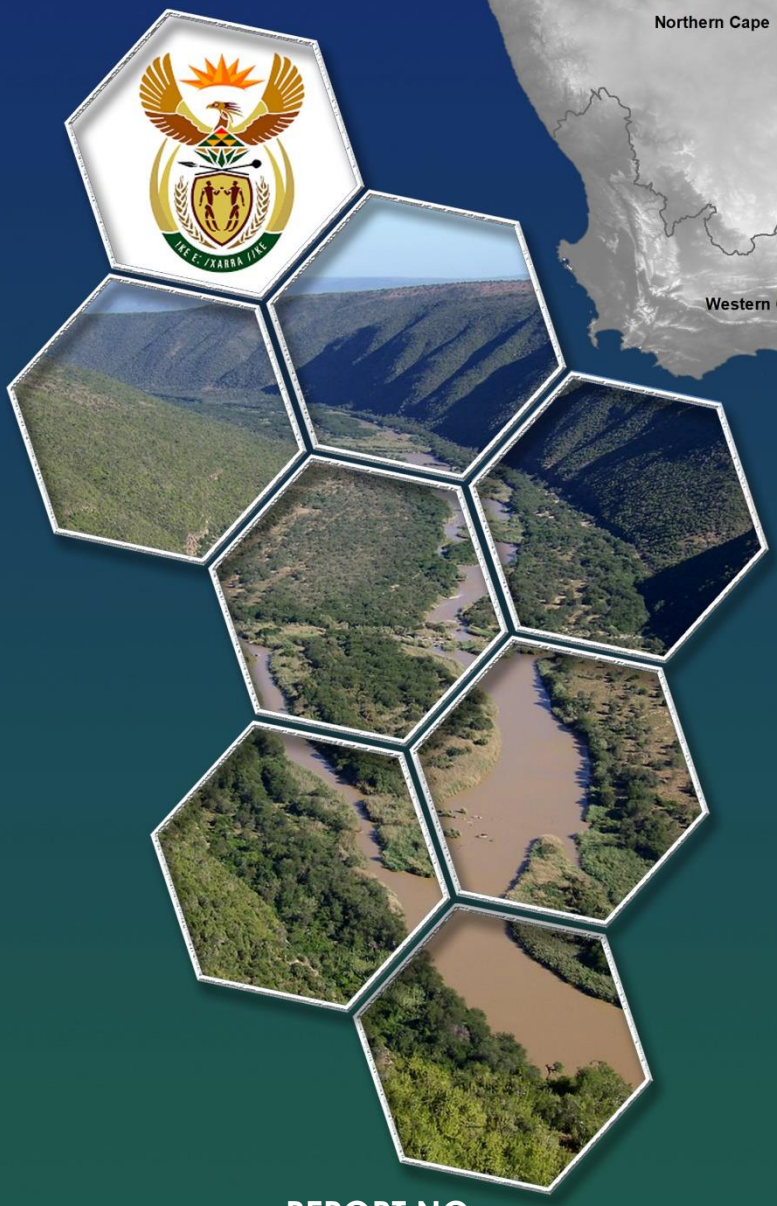
DEPARTMENT OF WATER AND SANITATION

Determination of Water Resource Classes, Reserve and the Resource Quality Objectives in the Keiskamma and Fish to Tsitsikamma Catchments

WP11354
Basic Human Needs Report





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Director: Water Resource Classification- Reserve determination

DOCUMENT INDEX

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Bold type indicates this report

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EXECUTIVE SUMMARY

The Department of Water and Sanitation, through the Chief Directorate: Water Ecosystems Management (CD: WEM), has initiated a study for the determination of Water Resource Classes, Reserve and associated Resource Quality Objectives for the identified significant water resources in the Keiskamma and Fish to Tsitsikamma catchments. The water resource components included for this study are rivers, wetlands, groundwater and estuaries. The Reserve determination includes both the water quantity and quality of the Ecological Water Requirements (EWR) and Basic Human Needs (BHN). This will ensure the availability of water required to protect aquatic systems and that the essential needs of individuals that are directly dependent on these water resources.

The purpose of the study is to determine appropriate Water Resource Classes, the Reserve and associated RQOs for all significant water resources in the study area to facilitate sustainable use of the water resources while maintaining ecological integrity.
The aim is to:

1. Implement the Water Resource Classification System (WRCS) (Regulation 810, 2010) to determine the Water Resource Classes,
2. Follow the integrated framework (DWS, 2017),
3. Undertake the 7-step process to determine and set RQOs, and
4. Determine the Reserve for the water resources of the study area.

To address aim 4, the Reserve consists of two parts: the Basic Human Need (BHN) Reserve and the Ecological Reserve (ER). The BHN Reserve provides for the essential needs of individuals served by the water resource in question and includes water for drinking, food preparation and for personal hygiene. The ER relates to the water required to protect the aquatic ecosystems of the water resource.

The report therefore provides information on the Basic Human Needs for Keiskamma and Fish to Tsitsikamma population. The determination of BHN followed the standardised methodology and procedure as set out by DWS,2017. The analysis was on the quaternary level, using QGIS and Stats SA census 2011 data (adjusted to 2021). Population reliant on surface water and ground water was determined.

The catchment is mainly rural with a few urban areas in East London, Gqeberha (Port Elizabeth), and Makhanda (Grahamstown). According to 2022 Stats SA Census data, the province is 62% rural. The catchment is home to a population of approximately 5.4 million people which represent the beneficiaries that use water (Stats SA, 2023).

As wards do not align completely with quaternary catchments, several approaches were used to identify population reliance on water resources, including identifying wards that fell partially into bigger quaternary catchments, wards that had multiple quats and using Google Earth as a supporting tool to make judgment on what percentage of the population ward fall into the quat.

To be able to quantify the amount of water required for BHN, The Water Services Act (Act No. 108 of 1997) determines the amount of water deemed to be satisfactory for basic human needs. The Water Services Act states that: “basic water supply” means the prescribed minimum standard of water supply services necessary for the reliable supply of a sufficient quantity and quality of water to households, including informal households, to support life and personal hygiene. The South African Reconstruction and Development Programme (RDP) target of 25 litres per person per day has generally been accepted as the standard quantum for the purposes of the BHN.

BHN for per quaternary catchment located in the Keiskamma and Fish to Tsitsikamma catchment for the year 2021 was determined. BHN was separated by surface water and groundwater population. Hydrological flow data used was from WR2012, Algoa system, and Amathole studies.

It was estimated that out of 6.1 million people in the study area, 1.3 million people are reliant on surface water (i.e., 21 percent), and 162,135 on groundwater for the same year. BHN was for 25 l per person per day was estimated at 12.57 million m^3/annum for surface water and 1.47 million m^3/annum for groundwater.

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BHN	Basic Human Needs
CD: WEM	Chief Directorate: Water Ecosystems Management
DWS	Department of Water and Sanitation
EWR	Ecological Water Requirements
ER	Ecological Reserve
GDP	Gross Domestic Product
QGIS	Quantum Geographic Information System
GW	Groundwater
IUA	Integrated Unit of Analysis
MAP	Mean Annual Precipitation
NWA	National Water Act
WR2012	Water Resources 2012
WRCS	Water Resources Classification System

1. INTRODUCTION

National Water Act (Act No 36 of 1998), Chapter 3: protection of water resources, discusses how protection of water resources is fundamentally related to their use, development, conservation, management and control. The chapter lays down a series of measures which together are intended to ensure the comprehensive protection of all water resources. One of these measures are in part 3 of the chapter: The Reserve. The Reserve consists of two parts: 1) the Basic Human Needs (BHN) Reserve and the 2) ecological Reserve.

This report forms part of step 3 of the integrated framework as developed by the DWS (DWS, 2017).

Step 3: Quantify BHNR and EWR

The objective of this step is to quantify the Ecological Water Requirements (EWRs) for different ecological states and set the BHN. These EWRs (ecological categories and associated flow regime) are essential input into all the next steps and especially for the scenario evaluation.

This report therefore provides information on BHN of Keiskamma and Fish to Tsitsikamma catchment. BHN provides for the essential needs of individuals served by the water resource in question and includes water for drinking, for food preparation and for personal hygiene.

Although the National Water Act talks to the importance of the BHN and what it encompasses, there is no quantity of water set, which would be deemed to be adequate to satisfy these basic human needs. The Water Services Act (Act No. 108 of 1997) determines the amount of water deemed to be satisfactory for basic human needs. The Water Services Act states that: “basic water supply” means the prescribed minimum standard of water supply services necessary for the reliable supply of a sufficient quantity and quality of water to households, including informal households, to support life and personal hygiene. The South African Reconstruction and Development Programme (RDP) target of 25 litres per person per day has generally been accepted as the standard quantum for the purposes of the BHN.

The aim of this assignment was to determine the BHN only applicable to the areas in which informal water sources are how communities are provided with Schedule 1 rights in Keiskamma and Fish to Tsitsikamma catchment.

At this stage, the BHN is quantified for different daily allocations, and it only becomes the BHNR once a decision is made on the allocation. Once a recommendation is made regarding the Target Ecological Category (TEC), the EWR determined during this step, and which supports the TEC and the Class, will become the flow or hydrology Resource Quality Objective (RQO).

It should be noted that this report only deals with BHN of surface water and groundwater.

2. STATUS QUO: SOCIAL CHARACTERISTICS OF KEISKAMMA AND FISH TO TSITSIKAMMA CATCHMENT

Keiskamma and Fish to Tsitsikamma catchment forms part of the Mzimvubu to Tsitsikamma Water Management Area (WMA7) in the Eastern Cape province. It covers 8 District Municipalities (DM), notably two Metropolitans (MM) (i.e., Nelson Mandela Bay and Buffalo City) and Mthatha which is the capital of OR Tambo DM, the economic hubs of the Eastern Cape.

The catchment contains several major river systems including the Mbashe River (part of drainage region T and includes T11, T12 and T13); Great Kei River (drainage region S); Great Fish (drainage region Q); Sundays (drainage region N); and Gamtoos River (drainage region L). A number of large dams and transfers between catchments are present within the study area. The largest transfer scheme is the water that is transferred into the study area from the Gariep Dam (Upper Orange) to the upper reaches of the Great Fish River (Grassridge Dam). The water is further transferred to the Algoa System for domestic water use.

The catchment is mainly rural with a few urban areas in East London, Gqeberha (Port Elizabeth), and Makhanda (Grahamstown). According to Stats SA 2022 census data, the province is about 62% rural. The catchment is home to a population of approximately 5.4 million people which represent the beneficiaries that use water (Stats SA, 2023). The population is predominately Xhosa speaking.

Eastern Cape had the highest unemployment rate, at 42.1% and nationally it was at 32.7% in the fourth quarter of 2022 (Stats SA, 2023). The province also had the highest agricultural households, at 33.4% and nationally it was at 17.2% in year 2021 (Stats SA, 2022). Subsistence agriculture is mainly livestock, poultry, food crops and vegetable production.

Households can be subdivided into those with formal water distribution infrastructure (i.e., piped tap water) and those without. The distribution of households with operational piped tap water is largely concentrated around cities and towns. According to Stats SA 2022 census, the Eastern Cape 19.5% households with no access to piped water, and nationally it was at 8.7% (Sats SA, 2023). The spatial distribution is uneven, and depicts the percentage of the population, within each ward, which is dependent on informal water sources.

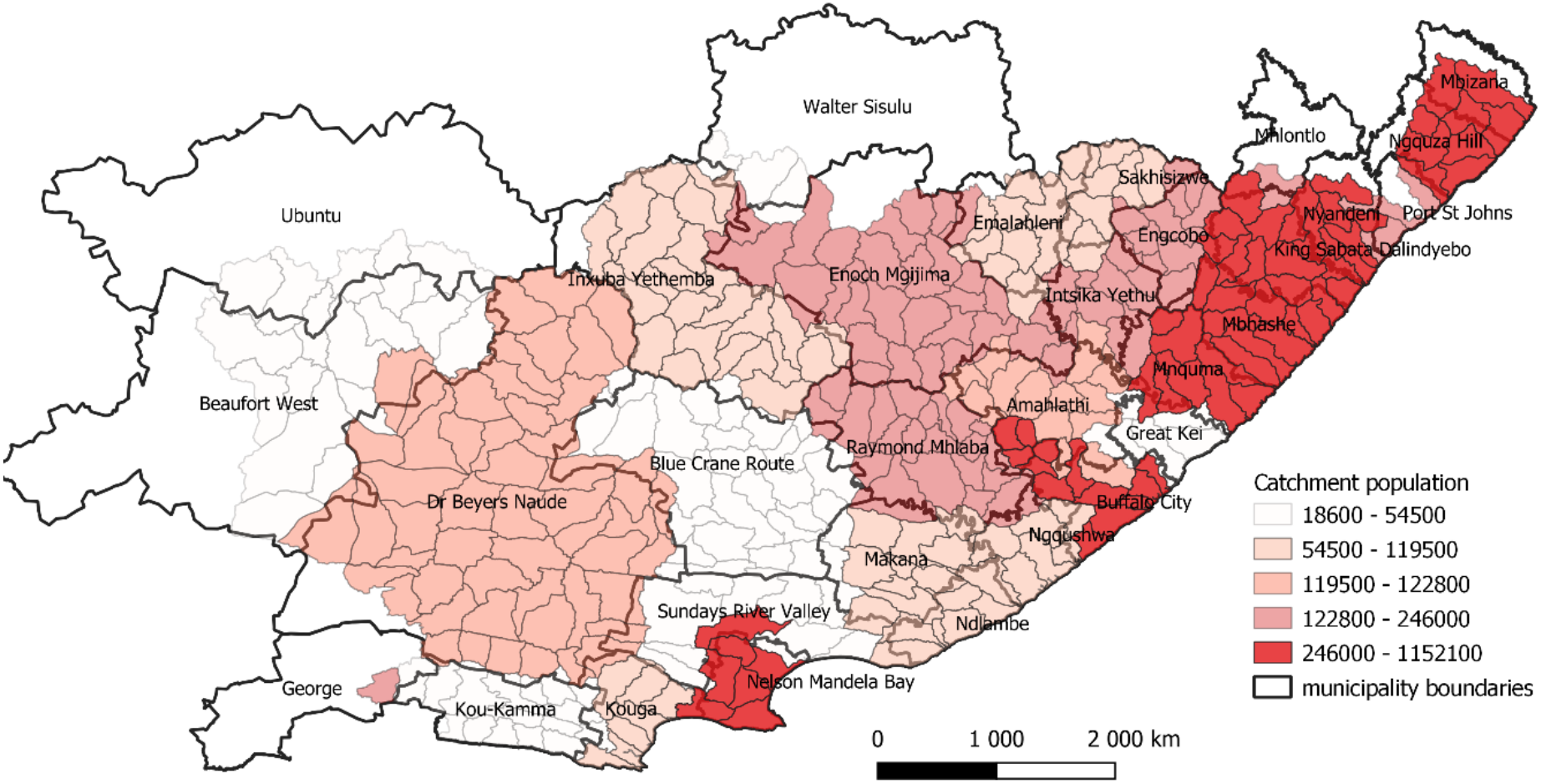

Figure 2-1: Population density of Keiskamma and Fish to Tsitsikamma catchment

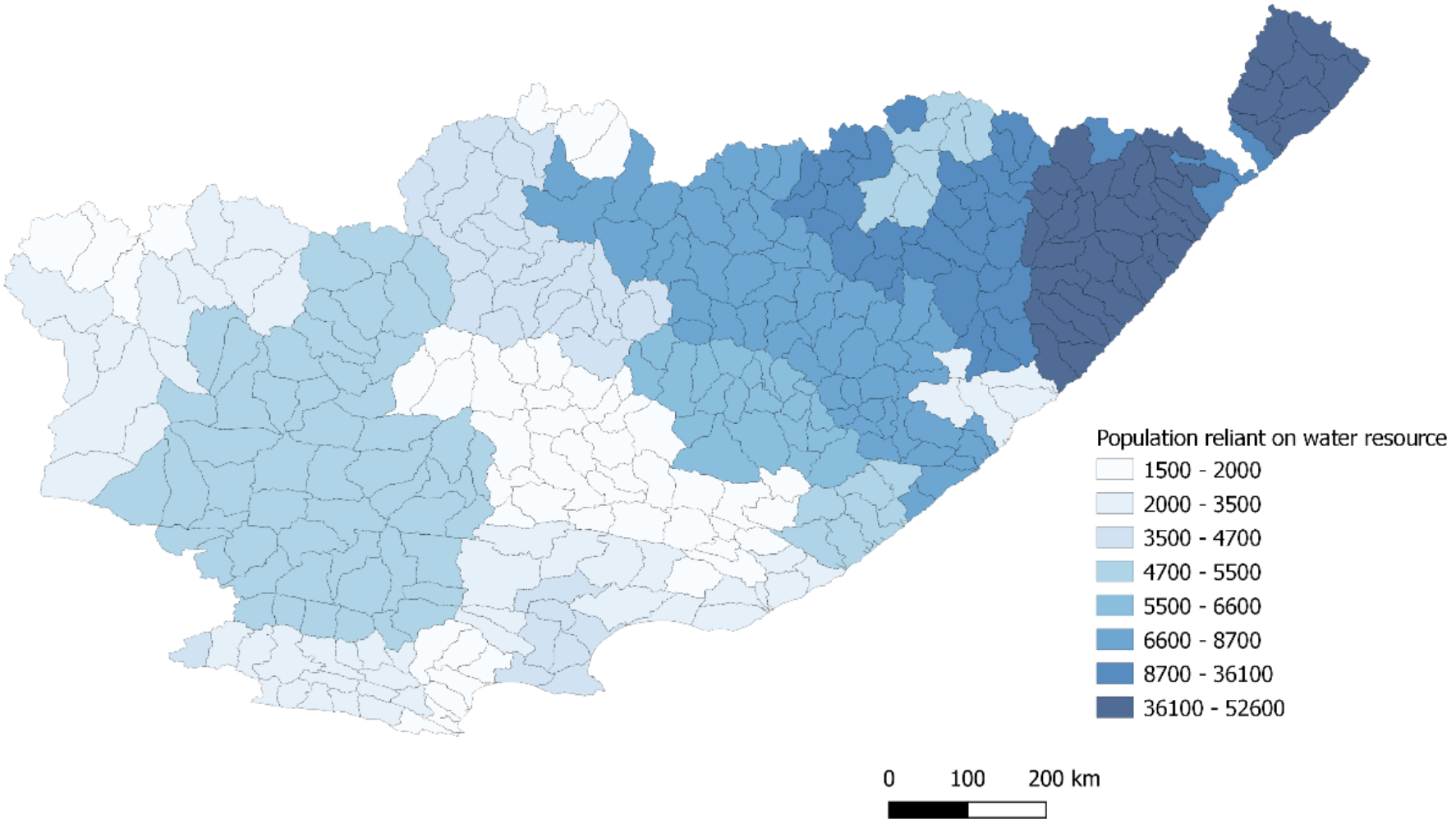

Figure 2-2: Population of Keiskamma and Fish to Tsitsikamma catchment reliance on water resources

3. APPROACH

The method followed the approach of DWS, 2017, as shown in Figure 3-1. Quaternary catchments falling within the study area were determined, using Quantum Geographic Information System (QGIS). The Stats SA 2011 census data was used to determine population reliant on water resource, as the data is represented on a ward level. This was in accordance with DWS, 2017, which describes standardised input of BHN determination.

The Census data was then adjusted to 2021 population using Eastern Cape growth rate (0.8%). The BHNR is therefore for the year 2021. It is acknowledged that population growth rates will vary, specifically between the rural and urban areas; however, this generic growth rate is considered acceptable for projection purposes.

The following methodology steps were used to quantify persons reliant on water resources using Stats SA ward level census data:

- Persons with access to piped water (formal supply) were not considered to qualify for under the BHNR.

- Wards as provided in Stats SA Census 2011, do not align completely with quaternary catchments, several approaches were used to identify population reliant.

    - Wards that fell completely into a quaternary catchment were identified
    - For wards that fell partially into bigger quaternary catchments, and for bigger wards that had multiple quaternaries, google earth was used as a supporting tool to make judgment on what percentage of the ward population fall into the quaternary catchment.
- Using the population figures a BHNR for the qualifying population was estimated per quaternary catchment. The results were calculated at 25 l per person per day.

Stat SA Census is a survey that Statistics South Africa conducts per decade across the country. The survey involves Stats SA questioning household members on their living conditions. One of the questions is on how households collect water. The data is separated into the following categories:

- Households that receive water from the municipal system: tap inside the yard
- Households that receive water from the municipal system: tap on community stand
- Households that receive water from the municipal system: water tankers
- Households that rely on water resources directly (i.e., boreholes, springs, rainwater, dams, and rivers)

The number of households that are not connected to the municipal system and rely on water resources directly, are then used as input to determine BHN for surface and groundwater individually.

Surface water nMAR was obtained from hydrological flow data used to determine BHN percentage was obtained WR2012, Algoa system, and Amathole studies.

Groundwater recharge was obtained from the groundwater specialist report of Keiskamma and Fish to Tsitsikamma catchment classification study. Mean annual precipitation from WR 2012 datasets was used to calculate the mean recharge for each quaternary catchment. According to the study, recharge

estimation was mainly based on Chloride Mass Balance (CMB) and Cumulative rainfall departure (CRD) methods from WR2012, where possible, as well as qualified guesses in cases of insufficient data.

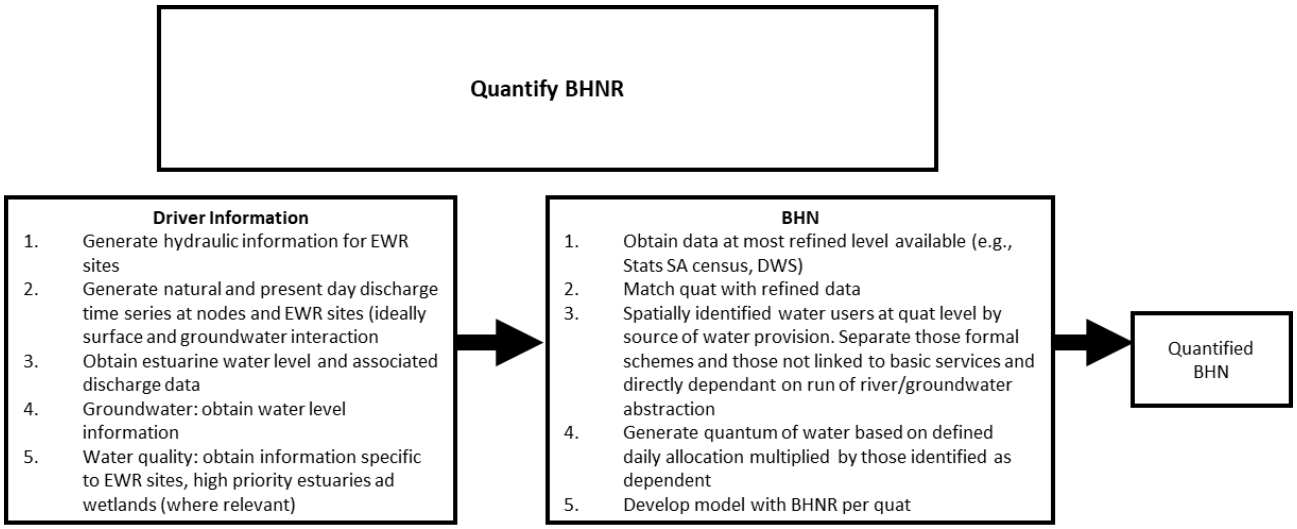

Figure 3-1: Illustration of the steps to quantify BHN

Table 3-1: Step 3.2 BHN: Standardised input and output per action (RDM/WE/00/ CON/ORDM/1016)

Action	Input	Output
Obtain data at most refined level available (e.g., Census sub-place, DWS)	SQ data as GIS shape files, Census data.	Populated catchment/project area with numbers of households and, by extrapolation, individuals as well as their primary source of water supply.
Match quaternary catchment with refined population data		Quaternary catchments showing numbers of households and individuals within each
Spatially identify water users at quaternary level by source of water provision. Separate those on formal schemes and those not linked to basic services and directly dependent on run of river/groundwater abstraction		Quaternary catchments, or SQ catchments, showing numbers of people not serviced from a formal water supply scheme. Those not serviced must be disaggregated into those dependent on ground water through borehole abstraction and those directly dependant on surface water.
Generate quantum of water based on defined daily allocation multiplied by those identified as dependent		Quantify various demand parameters expressed in litres per capita per day.
Develop model with BHNR per quaternary catchment		Water required per quaternary catchment

4. RESULTS

The BHN for each quaternary catchment located in the Kesikamma and Fish to Tsitsikamma catchment for the year 2021 was determined as shown in Table 4-1 and Table 4-2. It was estimated that out of 6.1 million people in the study area, 1.31 million people are reliant on water resources.

4.1 Surface water: Basic Human Needs

It was estimated that out of 6.1 million people in the study area, 1.3 million people are reliant on surface water (i.e., 21 percent). BHN for 25 l per person per day was estimated at 12.57 million m^3/annum for surface water. Hydrological flow data used was to determine BHN percentage was obtained WR2012, Algoa system, and Amathole studies.

Table 4-1: Basic Human Needs (25 l/p/day) on surface water for Keiskamma and Fish to Tsitikamma catchment.

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m^3/a)	nMAR (million m^3/a)	BHN (% NMAR)
IUA1	K80A	0	0	0,000	62,81	0,000%
	K80B	3 423	342	0,003	88,43	0,004%
	K80C	3 423	342	0,003	84,28	0,004%
	K80D	4 348	695	0,006	64,21	0,010%
	K80E	4 348	695	0,006	55,64	0,011%
	K 80F	2 679	278	0,003	41,78	0,006%
	K90A	2 657	370	0,003	27,57	0,012%
	K90B	2 657	370	0,003	24,03	0,014%
	K90C	2 657	370	0,003	10,39	0,033%
IUA 2	K90D	0	0	0,000	14,68	0,000%
	K90E	7 726	168	0,002	12,17	0,013%
	K90F	32 595	256	0,002	19,26	0,012%
	K90G	19 437	754	0,007	16,89	0,041%
	L90A	8 734	944	0,009	20,1	0,043%
	L90B	8 171	1552	0,014	38,83	0,036%
	L90C	11 864	1760	0,016	34,65	0,046%
IUA3	L81A	1 462	309	0,003	8,97	0,031%
	L81B	1 462	309	0,003	2,92	0,096%
	L81C	0	0	0,000	3,73	0,000%
	L81D	0	0	0,000	2,22	0,000%
	L82A	5 029	1808	0,016	28,98	0,057%
	L82B	6 715	2007	0,018	33,93	0,054%
	L82C	6 715	2007	0,018	33,79	0,054%
	L82D	7 372	439	0,004	58,37	0,007%
	L82E	0	0	0,000	11,49	0,000%
	L82F	0	0	0,000	2,79	0,000%
	L82G	0	0	0,000	3,01	0,000%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m³/a)	nMAR (million m³/a)	BHN (% NMAR)
	L82H	0	0	0,000	3,69	0,000%
	L82J	0	0	0,000	6,01	0,000%
IUA4	M10A	0	0	0,000	20,02	0,000%
	M10B	2 598	735	0,007	33,06	0,020%
	M10C	332 193	3660	0,033	38,41	0,087%
	M10D	542 873	1552	0,014	18,48	0,077%
	M20A	403 409	3360	0,031	22,69	0,135%
	M20B	56 410	1636	0,015	49,74	0,030%
	M30A	40 008	842	0,008	6,05	0,127%
	M30B	95 628	128	0,001	4,98	0,023%
IUA 5	L11A	0	0	0,000	5,78	0,000%
	L11B	0	0	0,000	6,91	0,000%
	L11C	14 154	4855	0,044	4,85	0,914%
	L11D	0	0	0,000	8,71	0,000%
	L11E	8 214	1552	0,014	3,55	0,399%
	L11F	0	0	0,000	4,86	0,000%
	L11G	0	0	0,000	9,29	0,000%
	L12A	0	0	0,000	2,12	0,000%
	L12B	0	0	0,000	1,92	0,000%
	L12C	1972	1147	0,010	2,19	0,478%
	L12D	0	0	0,000	2,58	0,000%
	L21A	0	0	0,000	5,54	0,000%
	L21B	8 214	1550	0,014	9,51	0,149%
	L21C	5 940	366	0,003	9,93	0,034%
	L21D	0	0	0,000	15,45	0,000%
	L21E	9 392	1762	0,016	6,33	0,254%
	L21F	0	0	0,000	5,64	0,000%
	L22A	0	0	0,000	7,93	0,000%
	L22B	0	0	0,000	2,62	0,000%
	L22C	0	0	0,000	5,81	0,000%
	L22D	0	0	0,000	6,33	0,000%
	L23A	0	0	0,000	1,76	0,000%
	L23B	0	0	0,000	5,97	0,000%
	L23C	0	0	0,000	3,22	0,000%
	L23D	0	0	0,000	2,5	0,000%
	L30A	9 689	547	0,005	1,67	0,299%
	L30B	0	0	0,000	0,86	0,000%
	L30C	0	0	0,000	0,77	0,000%
	L30D	0	0	0,000	1,62	0,000%
	L40A	0	0	0,000	1,72	0,000%
	L40B	0	0	0,000	1,98	0,000%
	L50A	0	0	0,000	2,46	0,000%
	L50B	0	0	0,000	2,09	0,000%
	L60A	0	0	0,000	2,04	0,000%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m³/a)	nMAR (million m³/a)	BHN (% NMAR)
	L60B	0	0	0,000	1,58	0,000%
	L70A	0	0	0,000	1,73	0,000%
	L70B	0	0	0,000	0,86	0,000%
	L70C	0	0	0,000	1,75	0,000%
	L70D	0	0	0,000	1,8	0,000%
	L70E	0	0	0,000	3,46	0,000%
	L70F	0	0	0,000	2,2	0,000%
	L70G	0	0	0,000	12,04	0,000%
	N11A	9 145	798	0,007	7,32	0,100%
	N11B	0	0	0,000	5,99	0,000%
	N12A	3 977	1448	0,013	7,64	0,173%
	N12B	3 977	1448	0,013	7,11	0,186%
	N12C	9 145	1076	0,010	6,21	0,158%
	N13A	0	0	0,000	7,44	0,000%
	N13B	3 977	1448	0,013	6,09	0,217%
	N13C	3 977	1448	0,013	3,3	0,400%
IUA 6	N40A	5 196	1471	0,013	6,98	0,192%
	N40B	5 196	1471	0,013	8,86	0,151%
	N40C	5 877	1048	0,010	14,59	0,066%
	N40D	5 877	1048	0,010	14,07	0,068%
	N40E	5 877	1048	0,010	4,02	0,238%
	N40F	9 756	419	0,004	17,28	0,022%
IUA 7	P10A	5 335	62	0,001	1,87	0,030%
	P10B	5 335	62	0,001	4,65	0,012%
	P10C	7 746	2132	0,019	0,73	2,665%
	P10D	7 746	2132	0,019	2,23	0,872%
	P10E	7 298	803	0,007	8,91	0,082%
	P10F	7 298	1107	0,010	14,32	0,071%
	P10G	12 553	1612	0,015	10,38	0,142%
	P20A	13 633	1383	0,013	32,37	0,039%
	P20B	4 878	209	0,002	16,14	0,012%
	P30A	4 254	580	0,005	8,07	0,066%
	P30B	4 254	1188	0,011	12,09	0,090%
	P30C	2 044	406	0,004	1,73	0,214%
	P40A	3 689	22	0,000	15,19	0,001%
	P40B	5 664	335	0,003	8,54	0,036%
	P40C	38 451	2747	0,025	15,27	0,164%
	P40D	5 664	1155	0,011	14,47	0,073%
IUA 8	Q11A	1 853	603	0,006	5,92	0,093%
	Q11B	1 853	603	0,006	4,09	0,135%
	Q11C	1 853	603	0,006	3,81	0,144%
	Q11D	1 853	603	0,006	3,78	0,146%
	Q14A	15 416	4086	0,037	6,27	0,595%
	Q14B	10 587	13	0,000	9,1	0,001%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m³/a)	nMAR (million m³/a)	BHN (% NMAR)
	Q14C	3 705	2370	0,022	8,36	0,259%
	Q14D	1 853	603	0,006	3,04	0,181%
	Q14E	0	0	0,000	3,01	0,000%
	Q21A	3 854	787	0,007	7,3	0,098%
	Q21B	3 854	787	0,007	2,9	0,248%
	Q22A	3 854	787	0,007	6,01	0,120%
	Q22B	3 854	787	0,007	2,13	0,337%
	Q30A	3 854	787	0,007	5,94	0,121%
	Q30B	1 853	325	0,003	4,77	0,062%
	Q80A	1 869	191	0,002	14,34	0,012%
	Q80B	1 869	191	0,002	16,55	0,011%
	Q80C	1 869	191	0,002	10,87	0,016%
IUA 9	Q12A	0	0	0,000	7,87	0,000%
	Q12B	5 956	14	0,000	9,58	0,001%
	Q12C	3 197	420	0,004	3,5	0,110%
	Q13A	2 157	112	0,001	8,4	0,012%
	Q13B	3 854	1618	0,015	1,64	0,901%
	Q13C	10 587	13	0,000	3,68	0,003%
	Q30C	3 854	1618	0,015	4,49	0,329%
	Q30D	3 854	1618	0,015	3,76	0,393%
	Q30E	32 893	192	0,002	4,03	0,043%
	Q41A	2 157	112	0,001	7,44	0,014%
	Q41B	6 170	1014	0,009	7,89	0,117%
	Q41C	1 909	17	0,000	5,38	0,003%
	Q41D	2 756	17	0,000	2,59	0,006%
	Q42A	2 157	346	0,003	9,28	0,034%
	Q42B	7 634	57	0,001	6,2	0,008%
	Q43A	0	0	0,000	8,97	0,000%
	Q43B	0	0	0,000	6,58	0,000%
	Q44A	0	0	0,000	4,13	0,000%
	Q44B	2 157	112	0,001	3,1	0,033%
	Q44C	3 854	1300	0,012	2,22	0,534%
	Q50A	3 854	1300	0,012	8,34	0,142%
	Q50B	0	0	0,000	6,37	0,000%
	Q50C	0	0	0,000	3,14	0,000%
	Q60A	0	0	0,000	5,06	0,000%
	Q60B	0	0	0,000	6,95	0,000%
	Q60C	0	0	0,000	1,4	0,000%
	Q70A	0	0	0,000	4,63	0,000%
	Q70B	0	0	0,000	5,99	0,000%
	Q70C	0	0	0,000	2,81	0,000%
	Q80D	17 562	78	0,001	25,36	0,003%
	Q80E	0	0	0,000	12,79	0,000%
	Q80F	0	0	0,000	7,54	0,000%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m³/a)	nMAR (million m³/a)	BHN (% NMAR)
	Q80G	0	0	0,000	2,94	0,000%
	Q91A	0	0	0,000	6,49	0,000%
	Q91B	0	0	0,000	10,25	0,000%
	Q91C	0	0	0,000	8,63	0,000%
	Q93A	0	0	0,000	4,14	0,000%
	Q93B	0	0	0,000	6,03	0,000%
	Q93C	0	0	0,000	6,73	0,000%
	Q93D	0	0	0,000	14,7	0,000%
IUA 10	Q92A	2 584	582	0,005	21,25	0,025%
	Q92B	2 584	445	0,004	11,19	0,036%
	Q92C	2 584	445	0,004	16,64	0,024%
	Q92D	2 584	445	0,004	10,76	0,038%
	Q92E	6 761	340	0,003	3,42	0,091%
	Q92F	7 767	119	0,001	4,24	0,026%
	Q92G	6 761	340	0,003	9,47	0,033%
	Q94A	7 613	2311	0,021	18,31	0,115%
	Q94B	5 167	1435	0,013	11,22	0,117%
	Q94C	3 704	741	0,007	14,14	0,048%
	Q94D	3 704	741	0,007	8,21	0,082%
	Q94E	2 236	18	0,000	5,21	0,003%
	Q94F	4 133	2498	0,023	9,12	0,250%
IUA 11	R10A	3 788	2847	0,026	10,52	0,247%
	R10B	8 321	2465	0,022	33,39	0,067%
	R10C	6 468	1912	0,017	9,12	0,191%
	R10D	10 966	1133	0,010	9,8	0,106%
	R10E	7 535	703	0,006	6,03	0,106%
	R10F	1 852	340	0,003	20,17	0,015%
	R10G	10 566	931	0,008	6,45	0,132%
	R10H	11 967	999	0,009	6	0,152%
	R10J	14 576	6064	0,055	3,9	1,419%
	R10K	21 516	3746	0,034	0,76	4,498%
	R10L	6 868	1679	0,015	12,71	0,121%
	R10M	6 385	1119	0,010	9,83	0,104%
	R40A	26 538	3940	0,036	41,72	0,086%
	R40B	17 539	1857	0,017	22,58	0,075%
	R40C	16 039	1725	0,016	17,37	0,091%
	R50A	10 936	2961	0,027	19,36	0,140%
	R50B	14 794	5916	0,054	20,51	0,263%
IUA12	R20A	19 592	2655	0,024	31,97	0,076%
	R20B	45 820	10875	0,099	9,61	1,033%
	R20C	56 730	5151	0,047	11,34	0,414%
	R20D	57 292	4851	0,044	8,63	0,513%
	R20E	114 577	15629	0,143	15,8	0,903%
	R20F	168 877	886	0,008	12,75	0,063%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m³/a)	nMAR (million m³/a)	BHN (% NMAR)
	R20G	202 953	2553	0,023	9,26	0,252%
	R30A	28 554	5376	0,049	48,18	0,102%
	R30B	20 607	6791	0,062	45,75	0,135%
	R30C	13 195	2708	0,025	24,63	0,100%
	R30D	14 205	807	0,007	13,56	0,054%
	R30E	43 949	3757	0,034	22,77	0,151%
	R30F	111 276	2280	0,021	9,12	0,228%
IUA 13	S10A	8 694	1552	0,014	6,02	0,235%
	S10B	8 510	4864	0,044	12,52	0,355%
	S10C	12 378	2661	0,024	6,18	0,393%
	S10D	15 453	5131	0,047	9,3	0,503%
	S10E	11 579	3764	0,034	7,81	0,440%
	S10F	11 579	3764	0,034	11,17	0,307%
	S10G	32 765	7971	0,073	12,77	0,570%
	S10H	17 629	2148	0,020	18,79	0,104%
	S10J	7 197	2624	0,024	13,07	0,183%
	S20A	9 766	1372	0,013	11,15	0,112%
	S20B	10 113	1562	0,014	19,05	0,075%
	S20C	33 777	11056	0,101	24,82	0,406%
	S20D	14 983	2966	0,027	15,17	0,178%
	S40A	8 521	461	0,004	18,03	0,023%
	S40B	9 113	680	0,006	18,46	0,034%
	S40C	2 215	568	0,005	14,22	0,036%
	S40D	7 748	5936	0,054	7,73	0,701%
	S40E	3 779	1340	0,012	28,05	0,044%
	S40F	6 393	5006	0,046	20,64	0,221%
	S50A	10 299	2905	0,027	19,39	0,137%
	S50B	4 749	503	0,005	39,97	0,011%
	S50C	5 150	895	0,008	23,57	0,035%
	S50D	25 128	8132	0,074	29,62	0,251%
	S50E	32 978	18954	0,173	55,53	0,311%
	S50F	7 604	2650	0,024	4,42	0,547%
	S50G	25 512	12039	0,110	24,24	0,453%
	S50H	28 533	6854	0,063	19,03	0,329%
	S50J	38 184	16864	0,154	44,51	0,346%
IUA 14	S31A	7 457	1419	0,013	11,07	0,117%
	S31B	1 887	197	0,002	10,56	0,017%
	S31C	3 664	245	0,002	8,91	0,025%
	S31D	4 050	92	0,001	7,37	0,011%
	S31E	6 332	825	0,008	6,27	0,120%
	S31F	65 327	2844	0,026	7,44	0,349%
	S31G	3 949	241	0,002	5,71	0,039%
	S32A	2 157	765	0,007	8,31	0,084%
	S32B	8 361	174	0,002	9,06	0,018%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m³/a)	nMAR (million m³/a)	BHN (% NMAR)
	S32C	16 068	1484	0,014	11,21	0,121%
	S32D	3 418	0	0,000	33,5	0,000%
	S32E	3 490	40	0,000	24,56	0,001%
	S32F	14 065	2797	0,026	13,57	0,188%
	S32G	44 112	2814	0,026	5,88	0,437%
	S32H	7 896	273	0,002	5,28	0,047%
	S32J	19 965	3096	0,028	9,06	0,312%
	S32K	2 805	423	0,004	12,71	0,030%
	S32L	1 709	0	0,000	9,55	0,000%
	S32M	2 805	423	0,004	18,78	0,021%
IUA 15	S60A	13 481	1281	0,012	58,33	0,020%
	S60B	19 305	1246	0,011	3,85	0,295%
	S60C	15 307	589	0,005	19,36	0,028%
	S60D	2 232	171	0,002	16,38	0,010%
	S60E	12 072	410	0,004	15,37	0,024%
	S70A	18 768	11168	0,102	29,83	0,342%
	S70B	19 371	7652	0,070	17,17	0,407%
	S70C	9 764	4500	0,041	15,75	0,261%
	S70D	59 514	30506	0,278	46,86	0,594%
	S70E	76 453	14416	0,132	31,32	0,420%
	S70F	27 416	14676	0,134	32,44	0,413%
IUA 16	T11A	2 600	466	0,004	33,78	0,013%
	T11B	2 600	466	0,004	45,58	0,009%
	T11C	4 987	3202	0,029	66,54	0,044%
	T11D	2 600	392	0,004	58,33	0,006%
	T11E	12 286	7841	0,072	51,33	0,139%
	T11F	25 277	10366	0,095	56,85	0,166%
	T11G	10 065	4687	0,043	36,9	0,116%
	T11H	6 172	7776	0,071	24,8	0,286%
	T12A	15 713	5524	0,050	36,98	0,136%
	T12B	24 277	10785	0,098	23,93	0,411%
	T12C	24 277	9188	0,084	27,4	0,306%
	T12D	24 654	10714	0,098	31,18	0,314%
	T12E	32 465	16837	0,154	42,43	0,362%
	T12F	37 456	17823	0,163	37,65	0,432%
	T12G	20 387	14122	0,129	26,06	0,494%
	T20A	23 199	12441	0,114	122,49	0,093%
IUA 17	T13A	25 243	17225	0,157	40,91	0,384%
	T13B	35 919	19541	0,178	32,74	0,545%
	T13C	18 688	13466	0,123	39,44	0,312%
	T13D	25 768	16299	0,149	45,95	0,324%
	T13E	13 793	8529	0,078	28,09	0,277%
IUA 18	T20B	49 645	19521	0,178	84,44	0,211%
	T20C	109 351	23119	0,211	41,09	0,513%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m^3/a)	nMAR (million m^3/a)	BHN (% NMAR)
	T20D	152 158	35412	0,323	31,73	1,018%
	T20E	61 989	34237	0,312	37,24	0,839%
	T20F	57 247	32938	0,301	36,27	0,829%
IUA 19	T60A	74 894	35366	0,323	74,35	0,553%
	T60B	48 790	28548	0,261	77,98	0,508%
	T60C	55 576	26445	0,241	64,37	0,424%
	T60D	13 066	6988	0,064	104,16	0,173%
	T60E	34 613	17558	0,160	28,81	0,646%
	T60F	82 680	43013	0,392	93,56	1,061%
	T60G	55 900	36519	0,333	101,56	1,393%
	T60H	8 720	6496	0,059	128,27	0,216%
	T60J	82 398	45017	0,411	80,27	1,317%
	T60K	30 475	17752	0,162	61,93	0,382%
	T70A	25 190	14194	0,130	38,61	0,344%
	T70B	37 110	10630	0,097	53,51	0,372%
	T70C	47 413	25532	0,233	30,91	0,190%
	T70D	68 749	12489	0,114	69,86	0,279%
	T70E	47 966	23060	0,210	24,8	0,643%
	T70F	33 254	20204	0,184	41,05	0,467%
	T70G	28 156	12202	0,111	43,55	0,242%
	T80A	28 775	13296	0,121	43,16	0,432%
	T80B	35 155	21119	0,193	38,02	0,228%
	T80C	38 845	20608	0,188	32,02	0,458%
	T80D	28 632	13159	0,120	50,96	0,378%
	T90A	48 557	28175	0,257	18,88	0,690%
	T90B	32 492	19236	0,176	72,98	0,484%
	T90C	18 525	13592	0,124	49,19	0,345%
	T90D	21 976	13817	0,126	33,75	0,170%
	T90E	39 075	23033	0,210	55,82	0,270%
	T90F	36 199	17578	0,160	48,95	0,249%
	T90G	27 350	12877	0,118	51,72	0,113%

4.2 Groundwater: Basic Human Needs

It was estimated that out of 6.1 million people in the study area, 162 135 people are reliant on groundwater. BHN for 25 l per person per day was estimated at 1.47 million m^3/annum for groundwater. The recharge data were obtained from the groundwater specialist report of Keiskamma and Fish to Tsitsikamma catchment classification study.

Table 4-2: Basic Human Needs (25 l/p/day) based on groundwater for Keiskamma and Fish to Tsitsikamma catchment

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m3/a)	Recharge (Mm^3/a)	Reserve as (%) of Recharge
IUA 1	K80 A	0	0	0	14,2253	0,000%
	K80 B	3 423	587	0,0054	23,0894	0,023%
	K80 C	3 423	587	0,0054	20,768	0,026%
	K80D	4 348	1266	0,0115	18,0958	0,064%
	K80 E	4 348	1266	0,0115	25,0649	0,046%
	K 80 F	2 679	1164	0,0106	15,8827	0,067%
	K90 A	2 657	119	0,0011	18,1048	0,006%
	K90 B	2 657	119	0,0011	12,1625	0,009%
	K90 C	2 657	119	0,0011	19,9716	0,005%
IUA 2	K90D	0	0	0	12,6968	0,000%
	K90E	7 726	269	0,0025	10,9721	0,022%
	K90F	32 595	66	0,0006	15,2933	0,004%
	K90G	19 437	560	0,0051	18,3647	0,028%
	L90A	8 734	97	0,0009	36,8353	0,002%
	L90B	8 171	269	0,0025	27,3253	0,009%
	L90C	11 864	326	0,0030	23,8218	0,013%
IUA 3	L81A	1 462	66	0,0006	20,9887	0,003%
	L81B	1 462	66	0,0006	14,8827	0,004%
	L81C	0	0	0	19,0958	0,000%
	L81D	0	0	0	16,862	0,000%
	L82A	5 029	675	0,0062	18,171	0,034%
	L82B	6 715	1349	0,0123	29,4217	0,042%
	L82C	6 715	1349	0,0123	26,5057	0,046%
	L82D	7 372	282	0,0026	36,3342	0,007%
	L82E	0	0	0	24,4185	0,000%
	L82F	0	0	0	10,4664	0,000%
	L82G	0	0	0	15,3078	0,000%
	L82H	0	0	0	13,4262	0,000%
	L82J	0	0	0	9,9876	0,000%
IUA 4	M10A	0	0	0	16,8095	0,000%
	M10B	2 598	207	0,0019	20,588	0,009%
	M10C	332 193	2540	0,0232	20,7642	0,112%
	M10D	542 873	2176	0,0199	13,9764	0,142%
	M20A	403 409	2059	0,0188	24,3651	0,077%
	M20B	56 410	2668	0,0243	21,9863	0,111%
	M30A	40 008	811	0,0074	13,1736	0,056%
	M30B	95 628	146	0,0013	13,5517	0,010%
IUA 5	L11A	0	0	0	43,1566	0,000%
	L11B	0	0	0	36,575	0,000%
	L11C	14 154	2893	0,0264	24,0917	0,110%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m3/a)	Recharge (Mm³/a)	Reserve as (%) of Recharge
	L11D	0	0	0	45,5386	0,000%
	L11E	8 214	1446	0,0132	15,8549	0,083%
	L11F	0	0	0	21,158	0,000%
	L11G	0	0	0	54,2539	0,000%
	L12A	0	0	0	25,0851	0,000%
	L12B	0	0	0	18,2064	0,000%
	L12C	1972	13	0,0001	30,4266	0,000%
	L12D	0	0	0	28,4896	0,000%
	L21A	0	0	0	19,2539	0,000%
	L21B	8 214	1449	0,0132	25,3361	0,052%
	L21C	5 940	4384	0,0400	37,7228	0,106%
	L21D	0	0	0	33,802	0,000%
	L21E	9 392	1449	0,0132	27,0674	0,049%
	L21F	0	0	0	22,007	0,000%
	L22A	0	0	0	35,1747	0,000%
	L22B	0	0	0	17,0856	0,000%
	L22C	0	0	0	24,687	0,000%
	L22D	0	0	0	21,0038	0,000%
	L23A	0	0	0	17,7504	0,000%
	L23B	0	0	0	30,5969	0,000%
	L23C	0	0	0	30,8148	0,000%
	L23D	0	0	0	23,1281	0,000%
	L30A	9 689	886	0,0081	13,1692	0,061%
	L30B	0	0	0	15,3568	0,000%
	L30C	0	0	0	9,915	0,000%
	L30D	0	0	0	25,72	0,000%
	L40A	0	0	0	30,7328	0,000%
	L40B	0	0	0	24,7021	0,000%
	L50A	0	0	0	20,7548	0,000%
	L50B	0	0	0	24,0024	0,000%
	L60A	0	0	0	27,9684	0,000%
	L60B	0	0	0	22,4785	0,000%
	L70A	0	0	0	24,4812	0,000%
	L70B	0	0	0	15,1566	0,000%
	L70C	0	0	0	22,3688	0,000%
	L70D	0	0	0	18,8602	0,000%
	L70E	0	0	0	23,928	0,000%
	L70F	0	0	0	11,49	0,000%
	L70G	0	0	0	26,2093	0,000%
	N11A	9 145	278	0,0025	32,7553	0,008%
	N11B	0	0	0	26,629	0,000%
	N12A	3 977	974	0,0089	34,5934	0,026%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m3/a)	Recharge (Mm³/a)	Reserve as (%) of Recharge
	N12B	3 977	974	0,0089	36,8662	0,024%
	N12C	9 145	0	0	26,8468	0,000%
	N13A	0	0	0	21,5982	0,000%
	N13B	3 977	974	0,0089	23,9122	0,037%
	N13C	3 977	974	0,0089	17,9325	0,050%
IUA 6	N40A	5 196	415	0,0038	26,3742	0,014%
	N40B	5 196	415	0,0038	46,8115	0,008%
	N40C	5 877	54	0,0005	26,8494	0,002%
	N40D	5 877	54	0,0005	30,2921	0,002%
	N40E	5 877	54	0,0005	24,5868	0,002%
	N40F	9 756	763	0,0070	40,6199	0,017%
IUA 7	P10A	5 335	49	0,0004	5,9487	0,007%
	P10B	5 335	49	0,0004	25,2117	0,002%
	P10C	7 746	849	0,0077	9,9929	0,078%
	P10D	7 746	849	0,0077	25,5297	0,030%
	P10E	7 298	1222	0,0111	21,683	0,051%
	P10F	7 298	917	0,0084	17,6851	0,047%
	P10G	12 553	902	0,0082	14,1055	0,058%
	P20A	13 633	902	0,0082	21,2165	0,039%
	P20B	4 878	381	0,0035	17,6796	0,020%
	P30A	4 254	609	0,0056	9,2647	0,060%
	P30B	4 254	0	0	19,9739	0,000%
	P30C	2 044	11	0,0001	3,2786	0,003%
	P40A	3 689	0	0	16,6083	0,000%
	P40B	5 664	1641	0,0150	12,3165	0,122%
	P40C	38 451	2152	0,0196	15,3261	0,128%
	P40D	5 664	820	0,0075	13,4315	0,056%
IUA 8	Q11A	1 853	1164	0,0106	14,7529	0,072%
	Q11B	1 853	1164	0,0106	13,7323	0,077%
	Q11C	1 853	1164	0,0106	13,1622	0,081%
	Q11D	1 853	1164	0,0106	16,7939	0,063%
	Q14A	15 416	2811	0,0257	17,6904	0,145%
	Q14B	10 587	0	0	25,1679	0,000%
	Q14C	3 705	1164	0,0106	29,3015	0,036%
	Q14D	1 853	1164	0,0106	13,7597	0,077%
	Q14E	0	0	0	12,0323	0,000%
	Q21A	3 854	937	0,0086	22,0273	0,039%
	Q21B	3 854	937	0,0086	13,0477	0,066%
	Q22A	3 854	937	0,0086	18,8552	0,045%
	Q22B	3 854	937	0,0086	7,7994	0,110%
	Q30A	3 854	937	0,0086	15,1603	0,056%
	Q30B	1 853	1442	0,0132	17,3484	0,076%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m3/a)	Recharge (Mm³/a)	Reserve as (%) of Recharge
	Q80A	1 869	332	0,0030	14,1887	0,021%
	Q80B	1 869	332	0,0030	17,6243	0,017%
	Q80C	1 869	332	0,0030	11,1074	0,027%
IUA 9	Q12A	0	0	0	23,8849	0,000%
	Q12B	5 956	79	0,0007	22,5533	0,003%
	Q12C	3 197	759	0,0069	14,2557	0,049%
	Q13A	2 157	701	0,0064	27,5277	0,023%
	Q13B	3 854	106	0,0010	7,392	0,013%
	Q13C	10 587	0	0	14,3559	0,000%
	Q30C	3 854	106	0,0010	12,5279	0,008%
	Q30D	3 854	106	0,0010	10,5084	0,009%
	Q30E	32 893	0	0	10,9143	0,000%
	Q41A	2 157	701	0,0064	9,735	0,066%
	Q41B	6 170	424	0,0039	16,6184	0,023%
	Q41C	1 909	424	0,0039	11,5919	0,033%
	Q41D	2 756	30	0,0003	10,0663	0,003%
	Q42A	2 157	467	0,0043	17,1518	0,025%
	Q42B	7 634	119	0,0011	13,9348	0,008%
	Q43A	0	0	0	25,1158	0,000%
	Q43B	0	0	0	26,7266	0,000%
	Q44A	0	0	0	14,4211	0,000%
	Q44B	2 157	701	0,0064	12,4794	0,051%
	Q44C	3 854	424	0,0039	8,4649	0,046%
	Q50A	3 854	424	0,0039	19,188	0,020%
	Q50B	0	0	0	14,7059	0,000%
	Q50C	0	0	0	6,3328	0,000%
	Q60A	0	0	0	7,2233	0,000%
	Q60B	0	0	0	15,1085	0,000%
	Q60C	0	0	0	5,0365	0,000%
	Q70A	0	0	0	10,9272	0,000%
	Q70B	0	0	0	15,928	0,000%
	Q70C	0	0	0	8,5579	0,000%
	Q80A	0	0	0	14,1887	0,000%
	Q80B	0	0	0	17,6243	0,000%
	Q80C	0	0	0	11,1074	0,000%
	Q80D	17 562	213	0,0019	14,4559	0,013%
	Q80E	0	0	0	12,7176	0,000%
	Q80F	0	0	0	23,7605	0,000%
	Q80G	0	0	0	9,0542	0,000%
	Q91A	0	0	0	14,3728	0,000%
	Q91B	0	0	0	19,7606	0,000%
	Q91C	0	0	0	19,497	0,000%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m3/a)	Recharge (Mm³/a)	Reserve as (%) of Recharge
IUA 10	Q92A	2 584	136	0,0012	15,6168	0,008%
	Q92B	2 584	272	0,0025	14,4682	0,017%
	Q92C	2 584	272	0,0025	24,0841	0,010%
	Q92D	2 584	272	0,0025	11,1915	0,022%
	Q92E	6 761	154	0,0014	11,193	0,013%
	Q92F	7 767	0	0	21,0235	0,000%
	Q92G	6 761	154	0,0014	28,92	0,005%
	Q94A	7 613	0	0	14,1618	0,000%
	Q94B	5 167	0	0	7,3995	0,000%
	Q94C	3 704	0	0	7,1791	0,000%
	Q94D	3 704	0	0	9,6672	0,000%
	Q94E	2 236	0	0	10,7474	0,000%
	Q94F	4 133	0	0	26,0606	0,000%
IUA 11	R10A	3 788	11	0,0001	8,5298	0,001%
	R10B	8 321	0	0	14,0208	0,000%
	R10C	6 468	60	0,0005	7,4924	0,007%
	R10D	10 966	108	0,0010	10,0082	0,010%
	R10E	7 535	40	0,0004	9,6127	0,004%
	R10F	1 852	31	0,0003	5,0409	0,006%
	R10G	10 566	110	0,0010	8,7659	0,011%
	R10H	11 967	2	0,0000	9,8537	0,000%
	R10J	14 576	534	0,0049	7,8851	0,062%
	R10K	21 516	68	0,0006	28,5077	0,002%
	R10L	6 868	39	0,0004	18,6693	0,002%
	R10M	6 385	193	0,0018	9,1604	0,019%
	R40A	26 538	1528	0,0139	20,615	0,068%
	R40B	17 539	234	0,0021	17,642	0,012%
	R40C	16 039	1134	0,0104	10,1192	0,102%
	R50A	10 936	318	0,0029	20,7139	0,014%
	R50B	14 794	240	0,0022	21,7493	0,010%
IUA12	R20A	19 592	88	0,0008	10,3853	0,008%
	R20B	45 820	18	0,0002	9,05	0,002%
	R20C	56 730	26	0,0002	7,7198	0,003%
	R20D	57 292	31	0,0003	13,5091	0,002%
	R20E	114 577	71	0,0006	14,0911	0,005%
	R20F	168 877	0	0	14,9757	0,000%
	R20G	202 953	26	0,0002	6,6461	0,004%
	R30A	28 554	1883	0,0172	28,5511	0,060%
	R30B	20 607	1305	0,0119	33,4118	0,036%
	R30C	13 195	132	0,0012	29,4625	0,004%
	R30D	14 205	701	0,0064	9,4878	0,067%
	R30E	43 949	357	0,0033	26,9755	0,012%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m3/a)	Recharge (Mm³/a)	Reserve as (%) of Recharge
	R30F	111 276	736	0,0067	13,2252	0,051%
IUA 13	S10A	8 694	0	0	11,648	0,000%
	S10B	8 510	644	0,0059	18,9383	0,031%
	S10C	12 378	1226	0,0112	10,8744	0,103%
	S10D	15 453	979	0,0089	15,2695	0,059%
	S10E	11 579	860	0,0078	11,5152	0,068%
	S10F	11 579	860	0,0078	14,3577	0,055%
	S10G	32 765	2567	0,0234	18,6386	0,126%
	S10H	17 629	3065	0,0280	22,3256	0,125%
	S10J	7 197	0	0	15,2003	0,000%
	S20A	9 766	719	0,0066	14,7858	0,044%
	S20B	10 113	1106	0,0101	22,1166	0,046%
	S20C	33 777	0	0	27,5498	0,000%
	S20D	14 983	1312	0,0120	16,1302	0,074%
	S40A	8 521	1352	0,0123	20,7083	0,060%
	S40B	9 113	680	0,0062	20,3026	0,031%
	S40C	2 215	0	0	15,5604	0,000%
	S40D	7 748	0	0	6,1125	0,000%
	S40E	3 779	229	0,0021	24,4118	0,009%
	S40F	6 393	109	0,0010	16,406	0,006%
	S50A	10 299	372	0,0034	12,1408	0,028%
	S50B	4 749	696	0,0063	19,4155	0,033%
	S50C	5 150	743	0,0068	19,7451	0,034%
	S50D	25 128	1976	0,0180	21,0406	0,086%
	S50E	32 978	0	0	25,3511	0,000%
	S50F	7 604	336	0,0031	4,5172	0,068%
	S50G	25 512	2073	0,0189	26,0123	0,073%
	S50H	28 533	979	0,0089	18,74	0,048%
	S50J	38 184	1658	0,0151	35,2827	0,043%
IUA 14	S31A	7 457	440	0,0040	18,7685	0,021%
	S31B	1 887	483	0,0044	17,8	0,025%
	S31C	3 664	607	0,0055	26,2355	0,021%
	S31D	4 050	1079	0,0098	15,3915	0,064%
	S31E	6 332	750	0,0068	17,7522	0,039%
	S31F	65 327	1182	0,0108	10,5402	0,102%
	S31G	3 949	444	0,0041	10,3157	0,039%
	S32A	2 157	49	0,0004	14,9502	0,003%
	S32B	8 361	289	0,0026	23,4389	0,011%
	S32C	16 068	3354	0,0306	20,3407	0,150%
	S32D	3 418	444	0,0041	16,3123	0,025%
	S32E	3 490	0	0	14,8435	0,000%
	S32F	14 065	418	0,0038	15,112	0,025%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m3/a)	Recharge (Mm³/a)	Reserve as (%) of Recharge
	S32G	44 112	476	0,0043	10,6341	0,041%
	S32H	7 896	972	0,0089	14,891	0,060%
	S32J	19 965	809	0,0074	11,071	0,067%
	S32K	2 805	192	0,0018	18,0348	0,010%
	S32L	1 709	0	0	13,0494	0,000%
	S32M	2 805	192	0,0018	19,2823	0,009%
IUA 15	S60A	13 481	170	0,0015	19,4208	0,008%
	S60B	19 305	271	0,0025	13,2528	0,019%
	S60C	15 307	130	0,0012	9,9484	0,012%
	S60D	2 232	116	0,0011	13,1589	0,008%
	S60E	12 072	0	0	11,0571	0,000%
	S70A	18 768	104	0,0009	16,2429	0,006%
	S70B	19 371	184	0,0017	14,8886	0,011%
	S70C	9 764	428	0,0039	10,3095	0,038%
	S70D	59 514	1334	0,0122	27,2208	0,045%
	S70E	76 453	234	0,0021	26,8231	0,008%
	S70F	27 416	0	0	21,0257	0,000%
IUA 16	T11A	2 600	74	0,0007	20,1117	0,003%
	T11B	2 600	74	0,0007	23,0988	0,003%
	T11C	4 987	269	0,0025	23,3999	0,010%
	T11D	2 600	148	0,0013	20,6588	0,007%
	T11E	12 286	474	0,0043	15,0156	0,029%
	T11F	25 277	3627	0,0331	17,2	0,192%
	T11G	10 065	87	0,0008	16,1976	0,005%
	T11H	6 172	2130	0,0194	11,7829	0,165%
	T12A	15 713	1303	0,0119	16,7838	0,071%
	T12B	24 277	789	0,0072	12,7309	0,057%
	T12C	24 277	2386	0,0218	15,7398	0,138%
	T12D	24 654	1865	0,0170	20,8515	0,082%
	T12E	32 465	472	0,0043	22,5419	0,019%
	T12F	37 456	1996	0,0182	19,2432	0,095%
	T12G	20 387	1556	0,0142	14,5886	0,097%
IUA 17	T13A	25 243	396	0,0036	16,0138	0,023%
	T13B	35 919	1341	0,0122	15,3206	0,080%
	T13C	18 688	157	0,0014	17,411	0,008%
	T13D	25 768	456	0,0042	22,2241	0,019%
	T13E	13 793	593	0,0054	12,2108	0,044%
IUA 18	T20B	49 645	1087	0,0099	24,3525	0,041%
	T20C	109 351	966	0,0088	16,9121	0,052%
	T20D	152 158	2033	0,0186	21,8994	0,085%
	T20E	61 989	2035	0,0186	20,7544	0,089%
	T20F	57 247	1173	0,0107	25,0295	0,043%

IUA	Quaternary	Total population	Persons with informal supply	BHN (million m3/a)	Recharge (Mm³/a)	Reserve as (%) of Recharge
IUA 19	T60A	74 894	838	0,0076	39,0578	0,020%
	T60B	48 790	576	0,0053	49,4326	0,011%
	T60C	55 576	717	0,0065	26,6148	0,025%
	T60D	13 066	286	0,0026	39,4861	0,007%
	T60E	34 613	1665	0,0152	17,0392	0,089%
	T60F	82 680	1775	0,0162	39,9278	0,041%
	T60G	55 900	247	0,0023	35,077	0,006%
	T60H	8 720	141	0,0013	35,4725	0,004%
	T60J	82 398	957	0,0087	29,8094	0,029%
	T60K	30 475	0	0	24,2726	0,000%
	T70A	25 190	410	0,0037	27,3494	0,014%
	T70B	37 110	46	0,0004	25,6223	0,002%
	T70C	47 413	443	0,0040	17,8828	0,023%
	T70D	68 749	0	0	31,2362	0,000%
	T70E	47 966	278	0,0025	19,4797	0,013%
	T70F	33 254	135	0,0012	23,9198	0,005%
	T70G	28 156	31	0,0003	24,4421	0,001%
	T80A	28 775	31	0,0003	20,0032	0,001%
	T80B	35 155	212	0,0019	21,0851	0,009%
	T80C	38 845	0	0	26,3467	0,000%
	T80D	28 632	123	0,0011	25,8344	0,004%
	T90A	48 557	269	0,0025	26,0172	0,009%
	T90B	32 492	106	0,0010	37,1138	0,003%
	T90C	18 525	79	0,0007	32,5452	0,002%
	T90D	21 976	776	0,0071	31,5909	0,022%
	T90E	39 075	1764	0,0161	36,609	0,044%
	T90F	36 199	362	0,0033	26,151	0,013%
	T90G	27 350	869	0,0079	38,3807	0,021%

5. CONCLUSIONS

In conclusion, the report has determined the BHNR for each quaternary catchment located in the Keiskamma and Fish to Tsitsikamma catchment as demonstrated in Table 4-1 and Table 4-2 above. In total, the BHNR demand for the entire catchment for the year 2021 is estimated at 14.04 million m^3/annum (i.e., 12.57 million m^3/annum for surface water and 1.47 million m^3/annum for groundwater) for 25 litres/day limit. demonstrate BHNR per quaternary.

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