The Determination Of Water Resource Classes, Reserve And Resource Quality Objectives For Secondary Catchments (A5-A9) Within The Limpopo WMA and Secondary Catchment B9 in the Olifants WMA

Project Steering Committee Meeting No. 2

BASIC HUMAN NEEDS RESERVE (BHNR)

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Date: 14 March 2024

WATER IS LIFE - SANITATION IS DIGNITY

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

RATIONALE

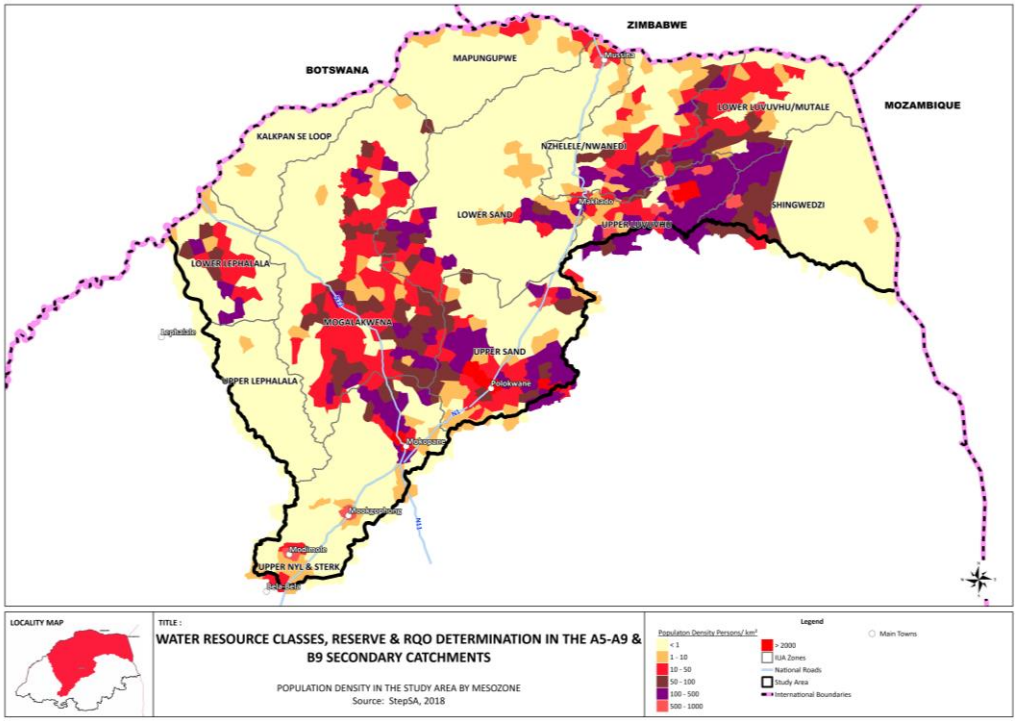
- Many people rely on direct abstraction from informal sources
  - Groundwater sources (boreholes, wells and springs)
  - Surface water sources (pools, streams, rivers)
- If these are compromised, this can deepen poverty
- The BHN Reserve ensures these needs can continue to be met
- Without compromising ecosystem condition
  - BHNR is over and above the EWR,
  - Since the BHNR is extracted by users, it cannot exceed system capacity

AIM

Quantify BHN requirements for the study area population who rely directly on surface or groundwater ecosystems for their basic water needs, i.e., their water is not delivered to houses, yards or community standpipes from service provisioners

POPULATION OF THE STUDY AREA

- 3.3 million people
- Dense rural settlements
  - Upper Sand, Upper Luvuvhu, & Mogalakwena IUAs particularly densely populated
- > a third of population considered poor or living in poverty
- Many households reliant on natural ecosystems for maintaining livelihoods and food security



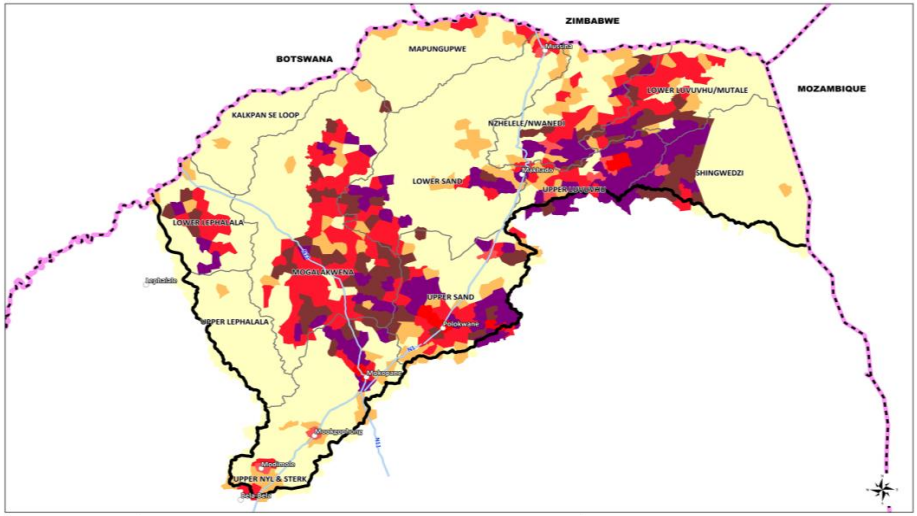
APPROACH

- Determine population reliant on informal water sources
- Calculate their current water requirements
- Forecast their future water requirements

- Following methods of King & Pienaar (2011)

METHODS: POPULATION RELIANT ON INFORMAL WATER SOURCES

- Census 2011
  - Comprehensive statistics at sub-place level, including no. of households (HH) by water source
  - Summarise for each quaternary catchment (GIS)
- Census 2022 (provincial level)
  - Used to adjust HH numbers and HH size
- Community Survey 2016
  - Used to adjust level of HH dependence
- Expressed in terms of # people



Water source	Adjustment factor 2011 - 2022
Borehole	0.76
Spring	0.57
Dam, pool or stagnant water	0.48
River or stream	1.00

METHODS: ESTIMATING CURRENT BHN REQUIREMENTS

BHNR

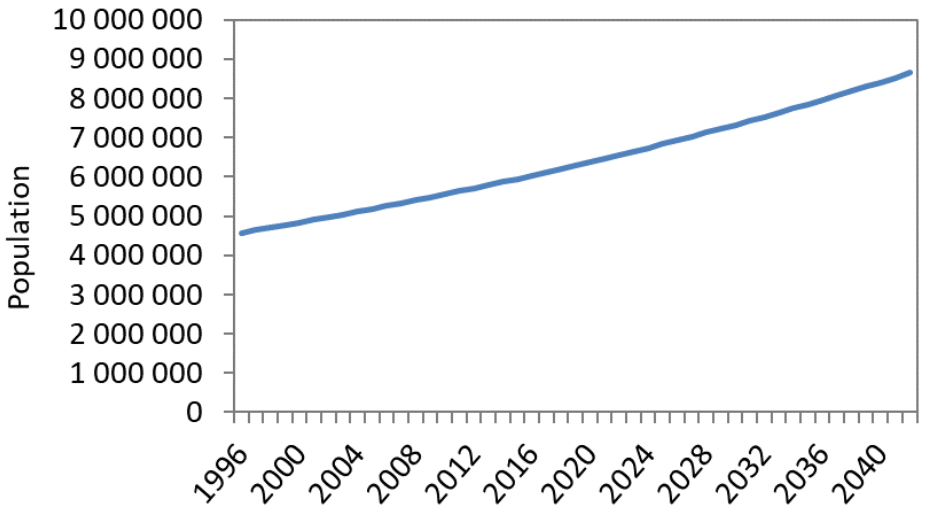
- BHNR = Reliant people x Daily allowance x 365
- Then translated into a constant flow allowance **per day** (the BHNR/365) to be able to meet household needs.

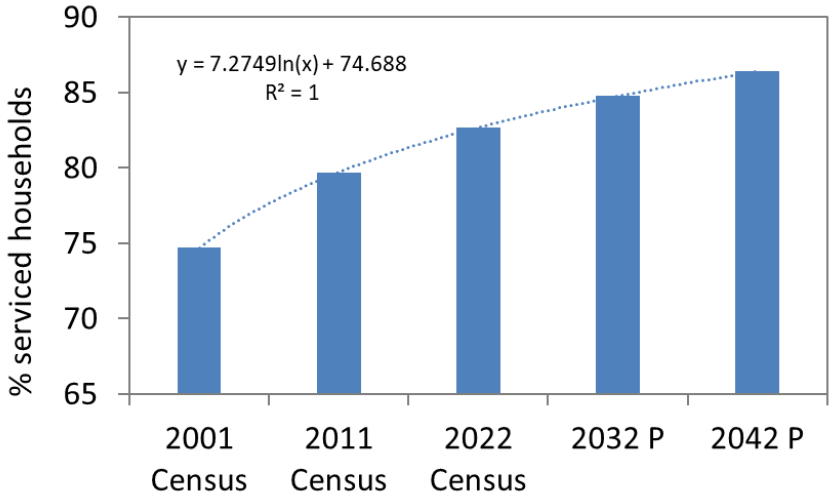
Daily allowance (per person per day)

- Calculations of BHNR typically use 25 litres
  - but higher allocations can be motivated for considering local conditions (King & Pienaar 2011).
- International guidelines suggest 50 litres
  - World Health Organization (WHO), United Nations, Gleick 1996), .
- We present results using both

METHODS: FORECASTING FUTURE WATER REQUIREMENTS

- Numbers projected using population trends and service delivery trends
  - based on Census data from 1996, 2001, 2011, 2016 and 2022.





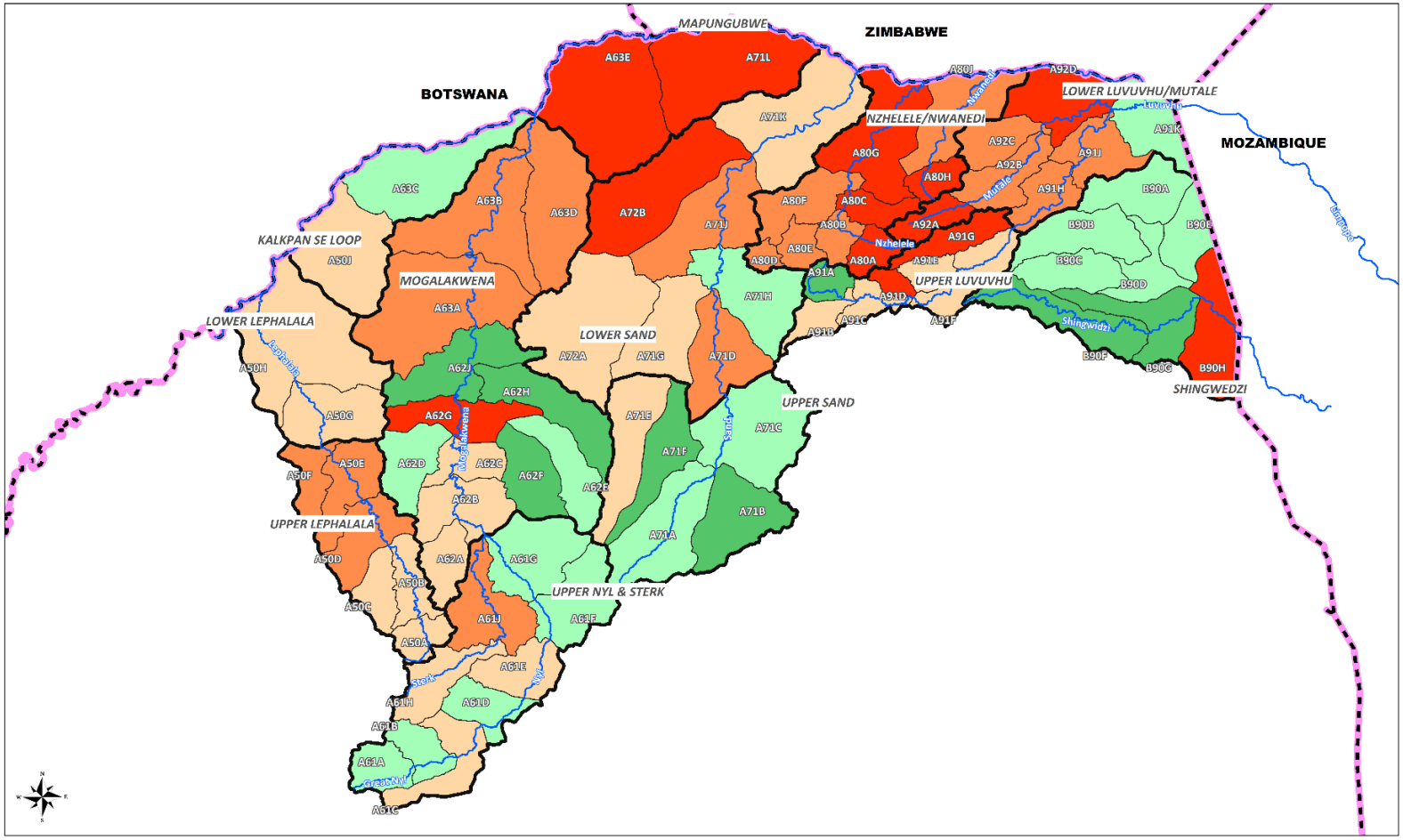
PRESENT DAY (2022) BHNR PER IUA IN MILLION m^3 PER ANNUM

IUA	Total number of households 2022	Number of households dependent on groundwater	BHNR groundwater (million m^3/y)	Number of households dependent on surface water	BHNR surface water (million m^3/y)
Upper Lephalala	1 444	802	0.026	71	0.002
Lower Lephalala	18 068	2 737	0.090	583	0.019
Upper Nyl & Sterk	96 489	10 502	0.345	505	0.017
Mogalakwena	89 042	15 035	0.494	3 893	0.128
Kalkpan se Loop	1 101	658	0.022	29	0.001
Upper Sand	232 721	20 280	0.666	2 398	0.079
Lower Sand	93 722	13 907	0.457	2 791	0.092
Mapungubwe	4 586	1 605	0.053	1 324	0.044
Nzhelele/Ṅwaneḍi	58 352	9 059	0.298	6 961	0.229
Upper Luvuvhu	157 335	11 020	0.362	9 681	0.318
Lower Luvuvhu/Mutale	50 533	5 385	0.177	7 565	0.249
Shingwedzi	47 584	3 867	0.127	387	0.013
Total	**850 976**	**94 857**	**3.116**	**36 189**	**1.189**

PRESENT DAY (2022) BHNR - CONSTANT FLOW ALLOWANCE PER DAY PER IUA

IUA	BHNR GW / 365 (m^3/d)	BHNR SW / 365 (m^3/d)
Upper Lephalala	72.19	6.4
Lower Lephalala	246.33	52.5
Upper Nyl & Sterk	945.14	45.5
Mogalakwena	1 353.13	350.4
Kalkpan se Loop	59.24	2.6
Upper Sand	1 825.23	215.8
Lower Sand	1 251.63	251.2
Mapungubwe	144.42	119.2
Nzhelele/Ṅwanedi	815.31	626.5
Upper Luvuvhu	991.80	871.3
Lower Luvuvhu/Mutale	484.65	680.9
Shingwedzi	348.03	34.8
Total	**8 537.10**	**3 257.0**

% POPULATION DEPENDENT ON GROUNDWATER BY QC (2022)



LOCALITY MAP

TITLE :

WATER RESOURCE CLASSES, RESERVE & RQO DETERMINATION IN THE A5-A9 & B9 SECONDARY CATCHMENTS

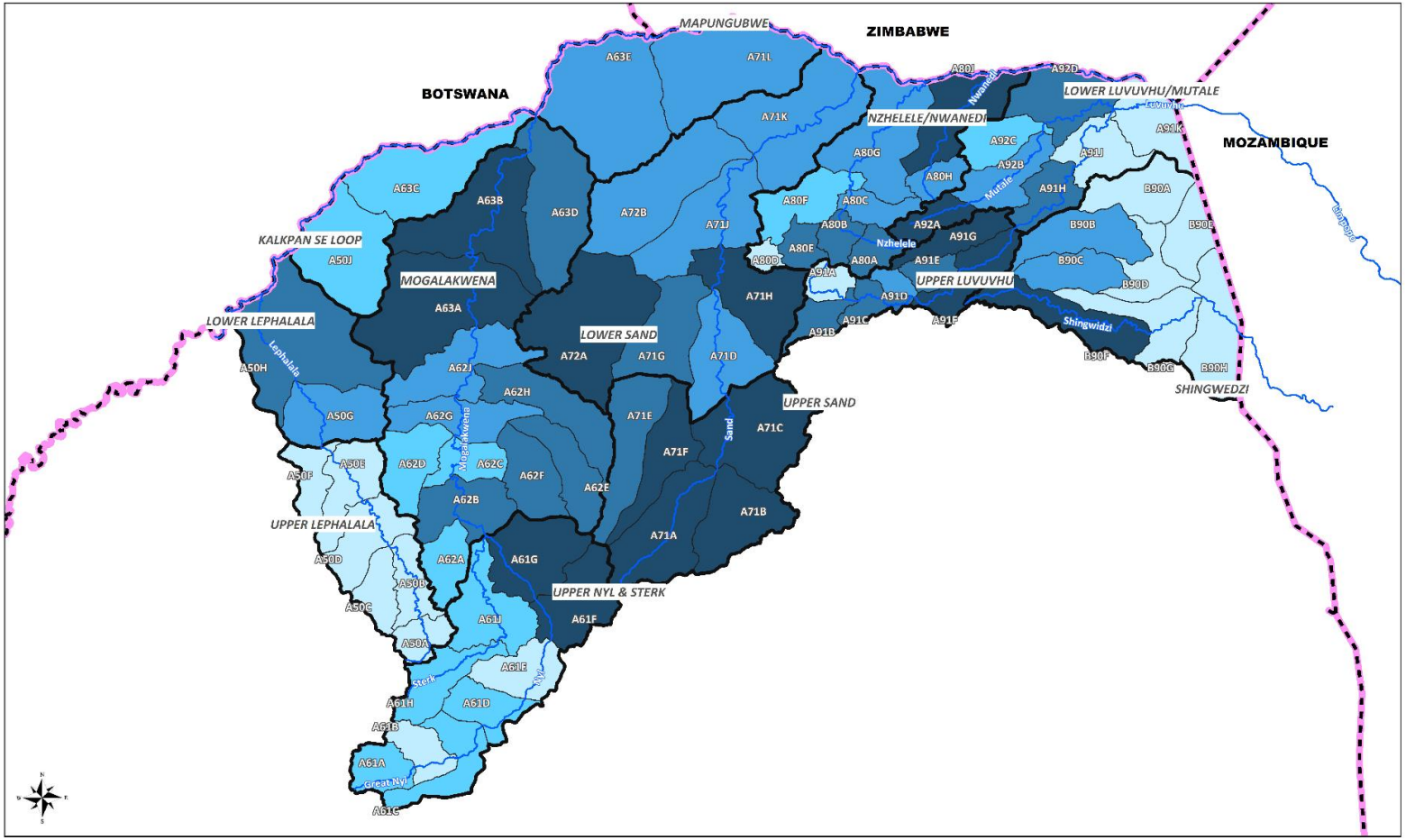
Percentage of quaternary Population dependent on Groundwater Resources

Legend

% of Quaternary Population dependent on Groundwater

- 0 to 1
- 1.1 to 2.5
- 2.6 to 5
- 5.1 to 10
- 10.1 +
- Quaternary
- IUA
- International Boundaries
- Main Rivers

BHNR FROM GROUNDWATER SOURCES (M³/YEAR) PER QC (2022)



LOCALITY MAP

TITLE :

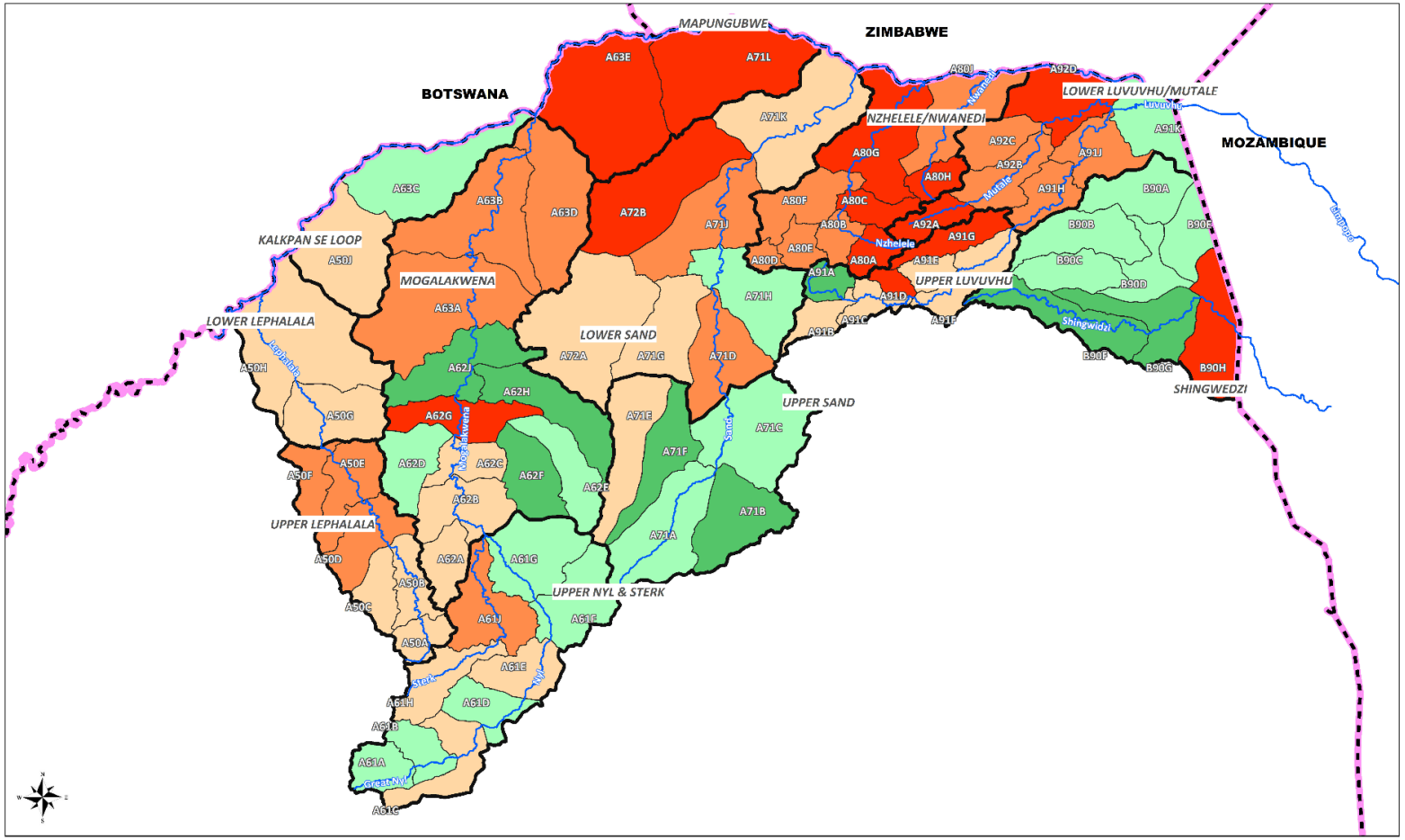
WATER RESOURCE CLASSES, RESERVE & RQO DETERMINATION IN THE A5-A9 & B9 SECONDARY CATCHMENTS

Basic Human Needs Reserve (BHNR): Groundwater sources (m³/year)

BHNR Groundwater (m³/year)
- 0 to 15000
- 15001 to 35000
- 35001 to 70000
- 70001 to 120000
- 120001+

Legend
- Quaternary
- IUA
- International Boundaries
- Main Rivers

% POPULATION DEPENDENT ON SURFACE WATER BY QC (2022)



LOCALITY MAP

TITLE :

WATER RESOURCE CLASSES, RESERVE & RQO DETERMINATION IN THE A5-A9 & B9 SECONDARY CATCHMENTS

Percentage of quaternary Population dependent on Surface Water Resources

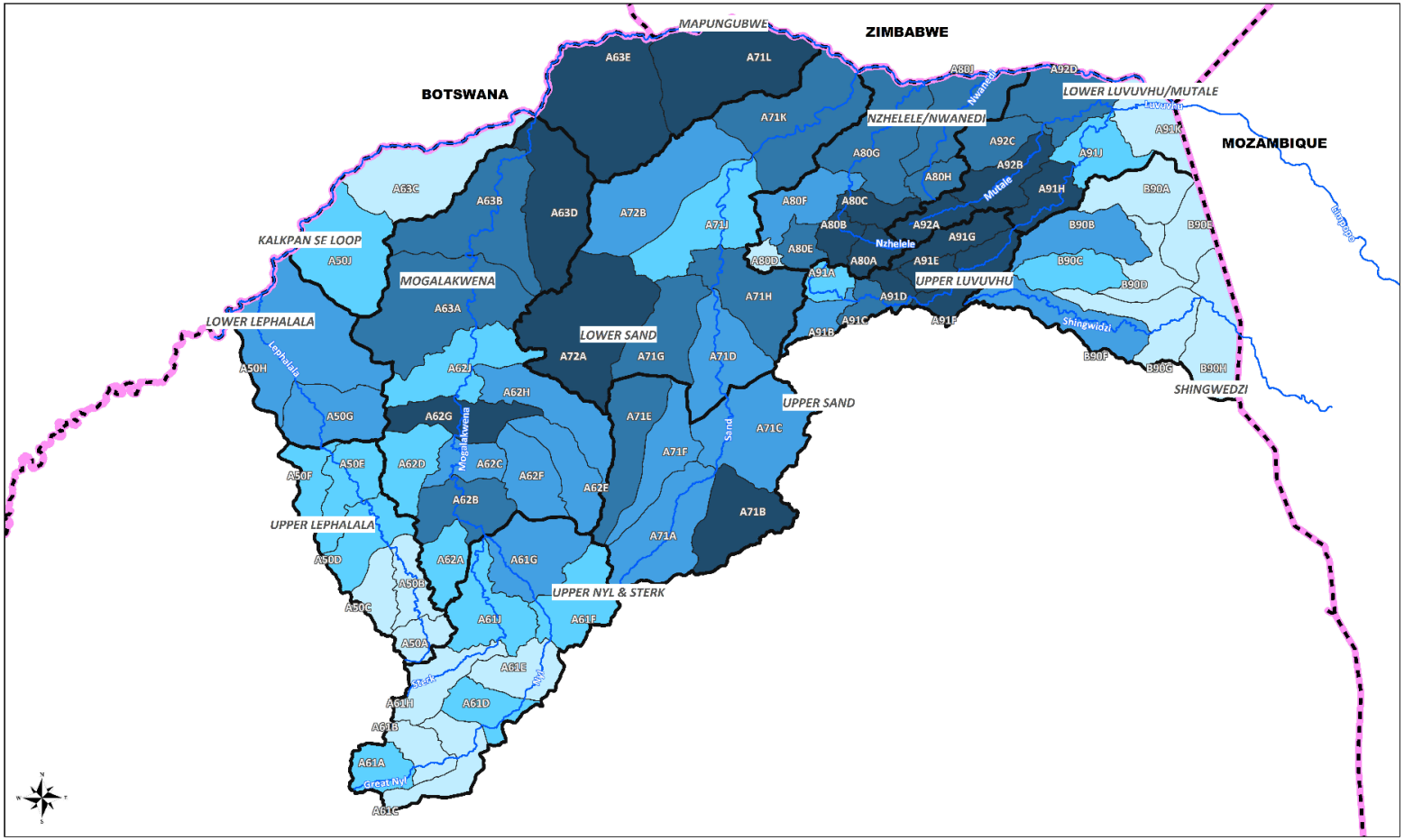
Legend

% of Quaternary catchment Population dependent on Surface Water

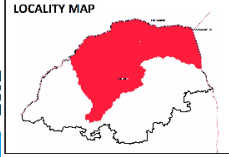
- 0 to 1
- 1.1 to 2.5
- 2.6 to 5
- 5.1 to 10
- 10.1 +

Quaternary
IUA
International Boundaries
Main Rivers

BHNR FROM SURFACE SOURCES (M³/YEAR) PER QC (2022)



LOCALITY MAP



TITLE :

WATER RESOURCE CLASSES, RESERVE & RQO DETERMINATION IN THE A5-A9 & B9 SECONDARY CATCHMENTS

Basic Human Needs Reserve (BHNR): Surface water sources (m³/year)

BHNR Surface water (m³/year)
- 0 to 1000
- 1001 to 6500
- 6501 to 20000
- 20001 to 40000
- 40001+

Legend
- Quaternary
- IUA
- International Boundaries
- Main Rivers

PROJECTED BHNR BY IUA

IUA	BHNR GW 2022 (million m^3/y)	BHNR GW 2032 (million m^3/y)	BHNR GW 2042 (million m^3/y)	BHNR SW 2022 (million m^3/y)	BHNR SW 2032 (million m^3/y)	BHNR SW 2042 (million m^3/y)
Upper Lephalala	0.027	0.025	0.022	0.003	0.003	0.003
Lower Lephalala	0.090	0.084	0.075	0.019	0.021	0.019
Upper Nyl & Sterk	0.345	0.321	0.288	0.017	0.017	0.013
Mogalakwena	0.494	0.459	0.411	0.128	0.135	0.117
Kalkpan se Loop	0.022	0.020	0.018	0.001	0.001	0.001
Upper Sand	0.666	0.619	0.555	0.079	0.079	0.059
Lower Sand	0.457	0.425	0.380	0.092	0.098	0.088
Mapungubwe	0.053	0.049	0.044	0.044	0.050	0.052
Nzhelele/Ṅwanedi	0.298	0.276	0.247	0.229	0.244	0.221
Upper Luvuvhu	0.362	0.335	0.300	0.318	0.344	0.323
Lower Luvuvhu/Mutale	0.177	0.163	0.146	0.249	0.285	0.301
Shingwedzi	0.127	0.118	0.106	0.013	0.014	0.013
Total	**3.116**	**2.891**	**2.590**	**1.189**	**1.287**	**1.206**