



**water & sanitation**

---

Department:  
Water and Sanitation  
**REPUBLIC OF SOUTH AFRICA**

**GH4446**

**Groundwater level status assessment  
for the Hydrogeological regions in  
the KwaZulu-Natal and the Eastern  
Cape Provinces  
-Volume 1-**

## REPORT STATUS

**Report Title:** *Groundwater status for hydrogeological regions of the Eastern Cape and KwaZulu-Natal Provinces (Volume 1)*

**Author:** *Tholeka Mafanya*

**Status of Report:** *Final Report*

**First Version:** *12 March 2026*

**Second Version**

**Third Version**

**Reviewers** *Dr. Lindelani Lalumbe*

*Scientist Manager: Geohydrological Information Services*



*Date: 16/03/2026*

**Approval**



*Mr. Zacharia Maswuma*

*Director: National Hydrological Services*

*2026/03/17*

*Date:*

## Table of Contents

1. Introduction.....	6
1.1 Report Objectives .....	6
2. Methodology.....	6
3. The results .....	7
3.1 The Southern Cape Ranges Hydrogeological Region.....	9
3.2 The Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges Hydrogeological Region 11	
3.3 The Algoa Bay Hydrogeological Region.....	15
3.4 The Eastern Great Karoo Hydrogeological Region .....	19
3.5 The Ciskeian Coastal Foreland and Middleveld region Hydrogeological Region .	22
3.6 The Southeastern Highland Hydrogeological Region.....	25
3.7 The Transkeian Coastal Foreland and Middleveld Hydrogeological Region .....	28
3.8 The Northwestern Middleveld Hydrogeological region .....	31
3.9 The Northeastern Middleveld Hydrogeological Region.....	34
3.10 The Southern Lebombo Hydrogeological Region .....	37
3.11 The Northern Zululand Coastal Plain Hydrogeological Region.....	39
3.12 The KwaZulu-Natal Coastal Foreland Hydrogeological Region .....	42
3.13 The Northeastern Upper Karoo Hydrogeological Region .....	45
3.14 The Eastern Upper Karoo Hydrogeological Region .....	47
4. Groundwater level status summary .....	50
5. Conclusions .....	51

## List of Figures

Figure 1: Hydrogeological regions covering the Eastern Cape and KwaZulu Natal Provinces. .....	8
Figure 2: An extent of Southern Cape Ranges Hydrogeological region and its monitoring boreholes. ....	9
Figure 3: Rainfall trends for the Southern Cape Ranges Hydrogeological Region (SAWS Districts 8, 10, 11&12) .....	10
Figure 4: The Southern Cape Ranges- Groundwater level drawdown fluctuations .....	10
Figure 5: The Southern Cape Ranges mean groundwater level drawdown fluctuation trends .....	11

Figure 6: The extent of Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges hydrogeological region and its monitoring boreholes .....	13
Figure 7: Rainfall trends for the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges Hydrogeological Region.....	14
Figure 8: Groundwater level drawdown trends the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges boreholes .....	14
Figure 9: The Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges - Mean groundwater level drawdown fluctuations.....	15
Figure 10: The Algoa Bay Hydrogeological Region extent and its monitoring boreholes .....	17
Figure 11: Rainfall trends for the Algoa Bay Hydrogeological Region .....	18
Figure 12: The Algoa Bay groundwater level drawdown fluctuations .....	18
Figure 13: The Algoa Bay Hydrogeological Region- Mean groundwater level drawdown fluctuations .....	19
Figure 14: The Eastern Great Karoo Hydrogeological Region extent and its boreholes .....	20
Figure 15: Rainfall trends for the Eastern Great Karoo Hydrogeological Region .....	21
Figure 16: The groundwater level drawdown fluctuations for Eastern Great Karoo.....	21
Figure 17: The Eastern Great Karoo- mean groundwater level drawdown fluctuations .....	22
Figure 18: An extent and distribution of boreholes for the Ciskeian Coastal Foreland and Middleveld .....	23
Figure 19: Rainfall trends for the Ciskeian Coastal Foreland and Middleveld Hydrogeological Region.....	24
Figure 20: The Ciskeian Coastal Foreland and Middleveld groundwater level drawdown fluctuations .....	24
Figure 21: Mean groundwater level drawdown fluctuations for the Ciskei and Coastal Foreland and Middleveld Hydrogeological Region.....	25
Figure 22: The extent of the Southeastern Highland Hydrogeological region and its monitoring boreholes .....	26
Figure 23: Rainfall trends for the Southeastern Highlands Hydrogeological Region .....	26
Figure 24: The Southeastern Highland groundwater level drawdown fluctuations .....	27
Figure 25: The mean groundwater level drawdown for Southeastern Highland Hydrogeological region.....	27
Figure 26: Borehole distribution and the extent of Transkeian Coastal Foreland and Middleveld .....	29

Figure 27: Rainfall trends for the Transkeian Coastal & Middleveld Hydrogeological Region .....	30
Figure 28: The Transkeian Coastal Foreland and Middleveld groundwater level drawdown fluctuations .....	30
Figure 29: The mean groundwater levels drawdown trends for the Transkeian Coastal Foreland and Middleveld Hydrogeological Region.....	31
Figure 30: Borehole distribution and the extent of the Northwestern Middleveld Hydrogeological region.....	32
Figure 31: Rainfall trends for the Northeastern Middleveld Hydrogeological Region .....	33
Figure 32: The Northwestern Middleveld groundwater level drawdown fluctuations .....	33
Figure 33: The Northwestern Middleveld mean groundwater level drawdown fluctuations .	34
Figure 34: Borehole locality and the extent of the Northeastern Middleveld Hydrogeological region .....	35
Figure 35: Rainfall trends for the Northeastern Middleveld hydrogeological Region .....	36
Figure 36: Groundwater level drawdown fluctuations for the Northeastern Middleveld Hydrogeological Region .....	36
Figure 37: The mean groundwater level drawdown for the Northeastern Middleveld Hydrogeological region.....	37
Figure 38: The extent of the Southern Lebombo Hydrogeological Region and its monitoring boreholes .....	38
Figure 39: Locality and monitoring borehole distribution map of the Northern Zululand Coastal Plain Hydrogeological region.....	40
Figure 40: Rainfall trends for the Northern Zululand Coastal Plain Hydrogeological Region	41
Figure 41: The Northern Zululand Coastal Plain groundwater level drawdown fluctuations	41
Figure 42: The mean groundwater level drawdown for the Northern Zululand Coastal Plain Hydrogeological region.....	42
Figure 43: Monitoring boreholes and the extent of the KwaZulu-Natal Coastal Foreland Hydrogeological Region.....	43
Figure 44: Rainfall trends for the KwaZulu-Natal Coastal Foreland.....	44
Figure 45: The KwaZulu-Natal Coastal Foreland groundwater level drawdown fluctuations .....	44
Figure 46: The KwaZulu-Natal Coastal Foreland- Mean GW level drawdown fluctuation....	45
Figure 47: Monitoring boreholes and the extent of the Northeastern Upper Karoo Hydrogeological Region.....	46

Figure 48: Monitoring borehole distribution and the extent of the Eastern Upper Karoo Hydrogeological Region..... 48

Figure 49: Rainfall trends for the Eastern Upper Karoo Hydrogeological Region..... 48

Figure 50: Groundwater level drawdown fluctuations: Eastern Upper Karoo Hydrogeological Region ..... 49

Figure 51: Mean groundwater level drawdown fluctuations for the Eastern Upper Karoo Hydrogeological Region..... 49

Figure 52: Groundwater level drawdown status for the EC and KZN hydrogeological regions ..... 51

# **1. Introduction**

The Department of Water and Sanitation is mandated to protect develop and conserve water resources of the country. This is acknowledged by the National Water Act (Act 36 of 1998). The act further states that monitoring of the water resources is required and further outlines the number of required monitoring programmes to be established are outlined. Groundwater resources form part of these monitoring programmes to be established. Strides have been made over the years with monitoring of groundwater resources for the country, with datasets (albeit having monitoring gaps) dating back more than 40years. Several information products which are the conversion of these datasets into information have been produced, aiding the public, the scholars and groundwater consultants with understanding of basic groundwater information (quality and quantity) at national scale.

As with any data gathering programme, there will always be areas for development needed when it comes to analysis and interpretation of the datasets gathered to expand the audience benefiting from the information. This starts with internal stakeholders (whom are the data gatherers so that they get to understand the latest information about groundwater resources and where active effort on management is required. This report aims to interpret groundwater trends over identified periods to ascertain whether any active management efforts or interventions are required.

South Africa is subdivided into sixty-four (64) hydrogeological regions, which define the groundwater units based on unique hydrogeological characteristics. These have been utilized to interpret the groundwater datasets. They crosscut the catchment and provincial boundaries, as geology or groundwater knows no catchment of provincial boundaries. These hydrogeological units, however, give a better understanding of the groundwater performance for those regions.

## **1.1 Report Objectives**

The object of this report is to outline both the historic and the latest groundwater trends, give status quo of national groundwater resources and zoom-in into areas where impacts are observed, discuss them further and offer recommendations on management steps to take. Its primary focus is to alert the management to imminent impacts that might affect groundwater resources. This is in line with the mandate of protection of water resources.

# **2. Methodology**

The existing datasets from the groundwater database (the National Groundwater Archive) were extracted with the purpose of analyzing water level trends of the monitoring boreholes from the various hydrogeological regions alluded to earlier. The processing of datasets was primarily done on MS Excel. The initial plan was to utilize data dating back to 2015. However, this was not possible with other hydrogeological regions. Some of the shortcomings included a delayed comprehensive monitoring programme which commenced recently. In some instances, the gaps were too big to close them using both the forward and backward data patching method that MS Excel offers. A summary of step by step into ensuring completeness and accuracy of datasets involved:

- Assessing the data gaps and how best they could be closed.
- Gap closure/ data patching utilizing the forecasting method to obtain consistent trends. This was limited to small gaps using linear regression to project future data points along a line that best fits the historical data.
- Data smoothing, utilizing the exponential method to define clearly the trends. This forecasting technique for time-series data assigns exponentially decreasing weights to past observations, placing more importance on recent data than older datasets. The utilized statistical formula is as follows:

$$s(t) = \alpha x(t) + (1-\alpha)s_{t-1}$$

Where:

$s(t)$  is the smoothed value (or forecast) for the current period.

$\alpha$  is the smoothing factor.

$x(t)$  is the actual observed value for the current period.

$s_{t-1}$  is the smoothed value (or forecast) from the previous period.

Subsequently, hydrographs could be generated. The water level elevations were chosen as these have a better-defined reference point i.e. the mean sea level. These hydrographs were coupled with zoom-in analysis of level fluctuations, setting the initial water level where dataset starts (as the reference point) to determine the gains or losses, indicated as a declining or a rising trend, over the assessment period.

Because the emphasis was on hydrogeological regions, the individual borehole trends were aggregated and an average water level trend for the hydrogeological region was determined using the formula:

$$\text{Average GWL} = \sum (\text{GWL of individual wells}) / \text{Number of wells}$$

This allowed for determination of the groundwater level trends with reference to the selected background point, determining whether there is a general water level decline or a rise and how steep or gradual it is.

### **3. The results**

With the methodology set out, the first areas tackled included the hydrogeological regions covering the Eastern Cape and KwaZulu Natal Provinces. These are geographically indicated in Figure 1, with provincial boundaries.

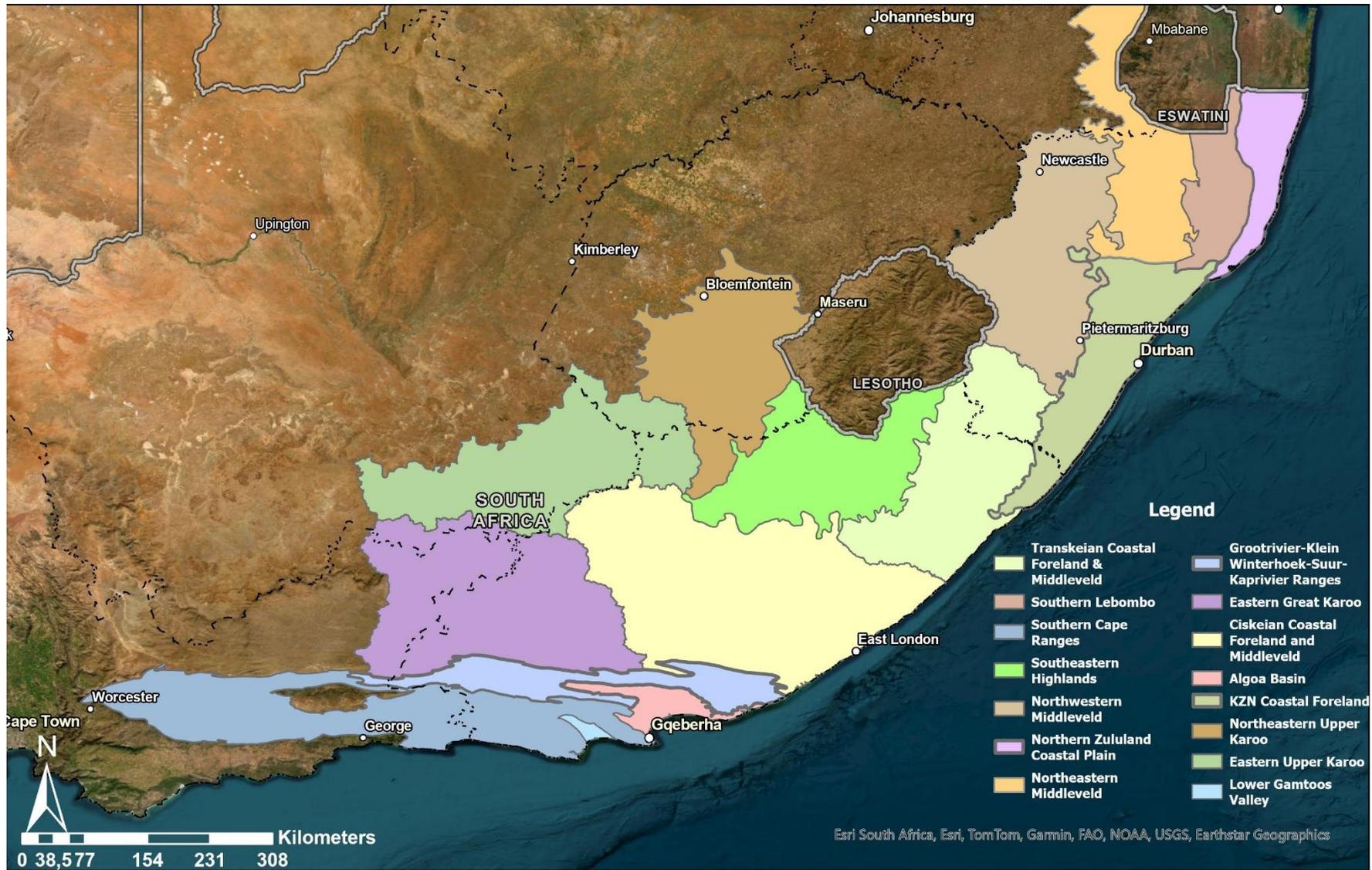


Figure 1: Hydrogeological regions covering the Eastern Cape and KwaZulu Natal Provinces.

### 3.1 The Southern Cape Ranges Hydrogeological Region

As the name suggests, the Southern Cape Ranges Hydrogeological Region is located to the southern end of the country, covering coastal towns such as Gqebera on the eastern side, and extending to the west where Swellendam is located, while on the south it cuts off at Mosselbay.

Approximately 75 boreholes are monitored for this region (Figure 2). The region is well represented with monitoring boreholes.

The 10yr rainfall trends for the region were derived from the average of SAW District 8,10,11 and 12 rainfall stations. The rainfall trends revealed a period of lower rainfall between 2016 and 2019, thereafter, the rain increased gradually, peaking in 2023-2024 (Figure 3). Prominent water level drawdown decline between 15m and 70m were observed over the period October 2016 to October 2020, evident mostly in the boreholes located in far western side of Southern Cape Ranges and to a lesser degree the central boreholes (Figure 2 and Figure 4). This is the period that was marked by the low rainfall. Furthermore, the towns in the far western side of the Southern Cape Ranges heavily rely on agricultural activities, supported by both surface and groundwater, as their form of economic activities. It is no surprise that such declines could be observed during drought periods as users tend to rely heavily on groundwater. The positive though is that this was for a short while, the boreholes recovered from the beginning of 2021 and the latest data is marked by a slight water level drawdown decline. An exception is with borehole GZ0009, located in the central part of the Southern cape Ranges. Due to the large number of boreholes monitoring this region, the legend for hydrograph (Figure 4) isn't included but the trends only.

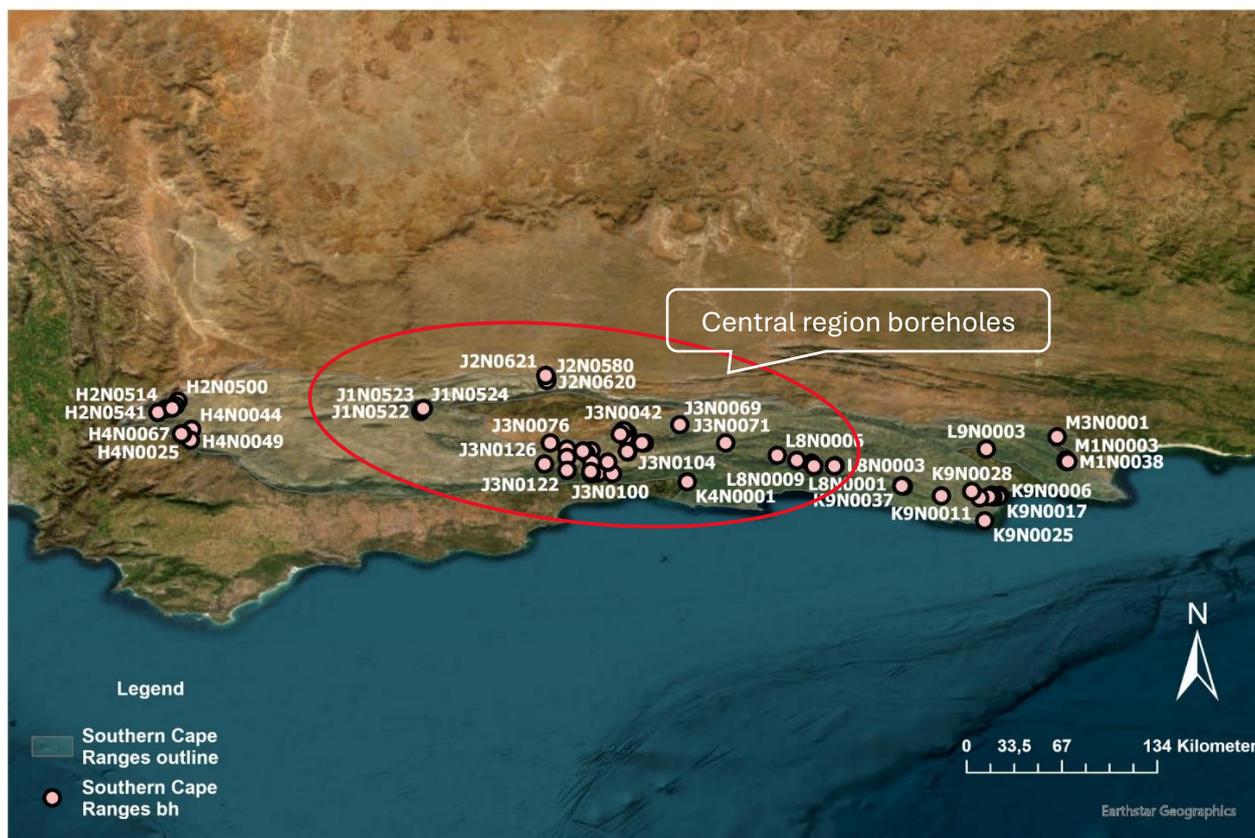
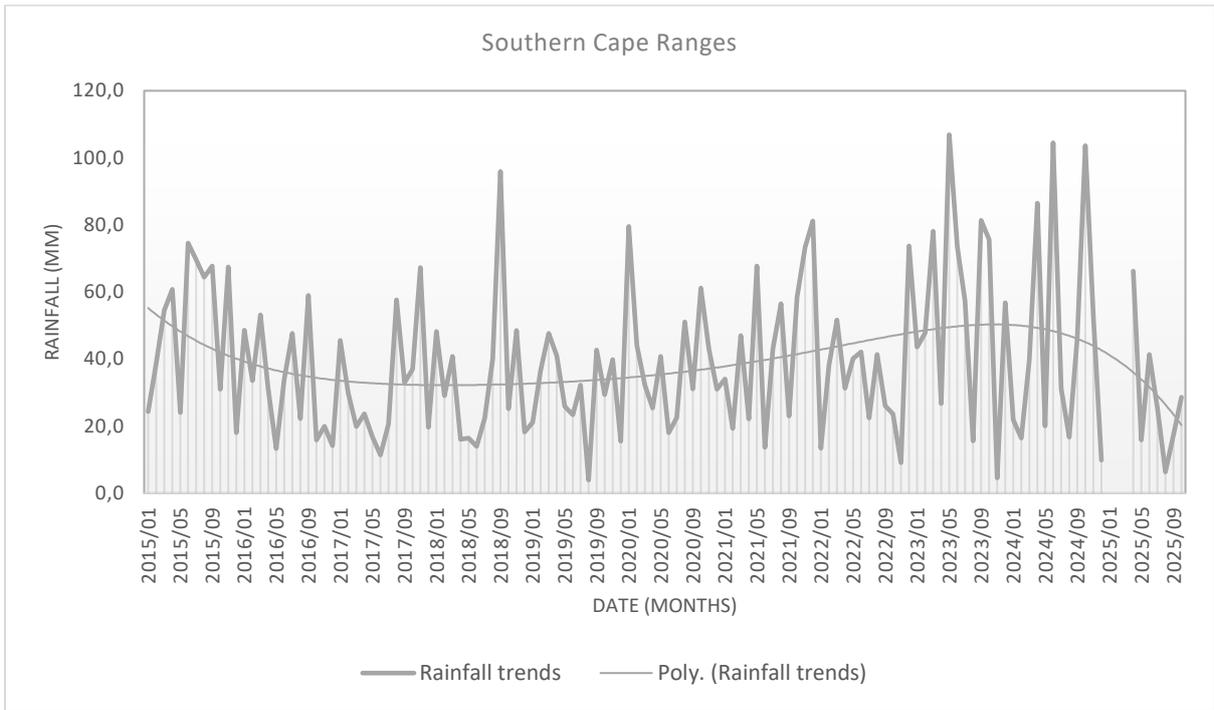
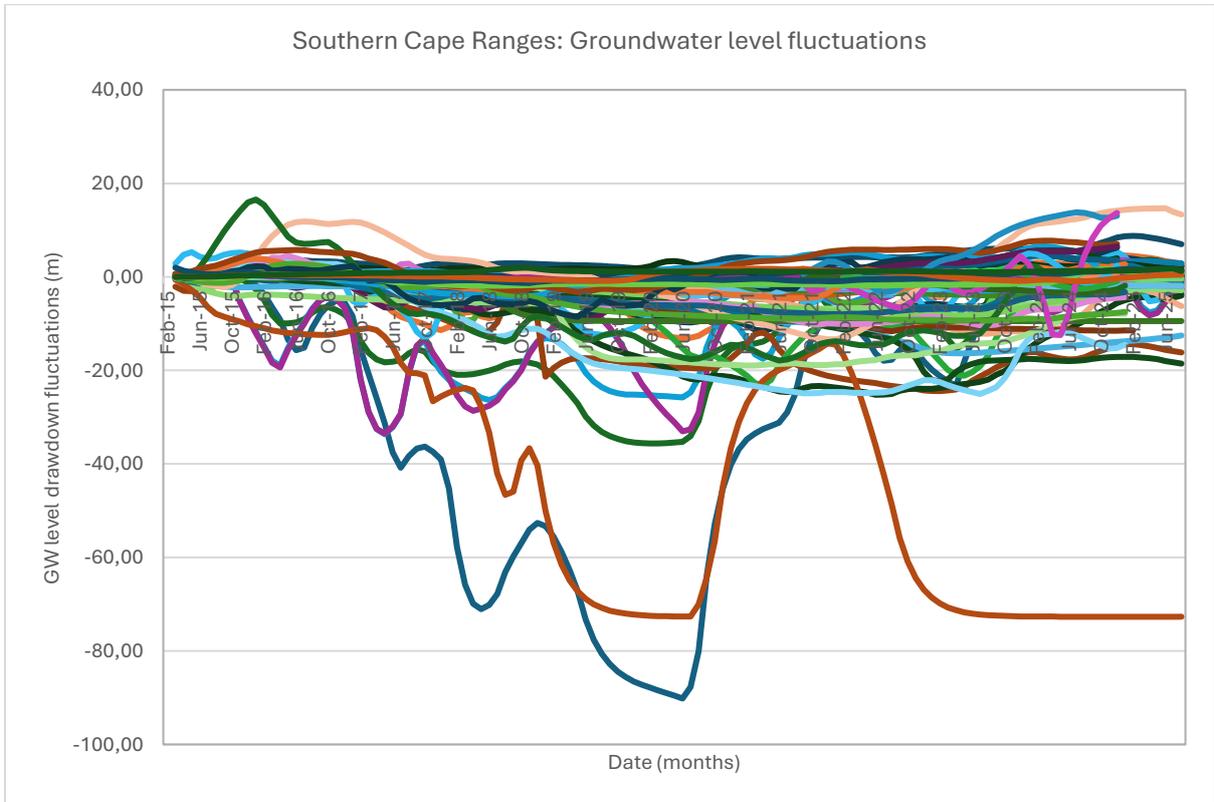


Figure 2: An extent of Southern Cape Ranges Hydrogeological region and its monitoring boreholes.



**Figure 3: Rainfall trends for the Southern Cape Ranges Hydrogeological Region (SAWS Districts 8, 10, 11&12)**

The average groundwater level drawdown for the entire region in Figure 5 suggest a downward trend with forecasted horizontal-to-downward trends with the latest data, after a peak rise was obtained in October 2024, more aligned with regional rainfall trends. Close monitoring of groundwater levels is recommended as this could be an onset to another drier season.



**Figure 4: The Southern Cape Ranges- Groundwater level drawdown fluctuations**

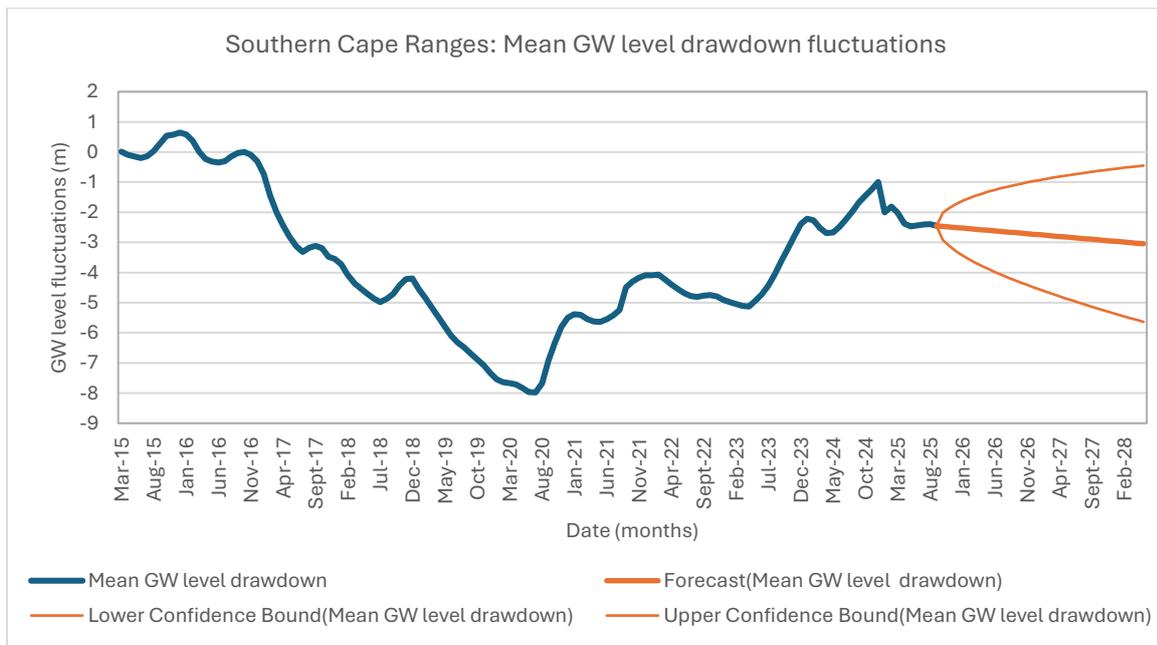


Figure 5: The Southern Cape Ranges mean groundwater level drawdown fluctuation trends

### 3.2 The Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges Hydrogeological Region

The Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges lies just north of the Southern Cape ranges hydrogeological region. Its extent covers the towns of Paterson, Steytleville and Willowmore. Like the Southern Cape Ranges, it has a portion that protrudes to the coastline.

About 15 boreholes are actively monitored for the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges (Figure 6). These boreholes spread evenly over the hydrogeological region, although an improvement can still be aimed for, so that a good representation of the groundwater conditions for the region is captured. The borehole sets were split into two i.e. those close to the coastline and the inland boreholes.

The rainfall patterns showed that the region has experienced good rain throughout. However, lower than average rains were noted between 2017 and 2021 (Figure 7).

The groundwater level drawdown for the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges boreholes presented in Figure 8 indicated two patterns **where the inland boreholes maintained the positive horizontal trends while negative fluctuations for mostly the boreholes located along the coastline were observed.** The downward trends from these boreholes were more prominent from July 2020 i.e. towards the end of the lower-than-average rainfall period. One borehole, EC/P40/0158, recorded a water level drawdown decline of approximately 50m in 2022, but later bounced back to its original level, responding to rain observed between 2021 and 2023. This was short-lived as low rainfall was observed in 2024 to date, impact negatively groundwater levels. This is shown by a downward trend for the latest water level records. The shoreline boreholes (Figure 6) seemed to be very sensitive to slight changes in rainfall patterns, suggesting other stressors (possible human induced/ abstraction relation) to the groundwater system hence the fast response of groundwater levels. Figure 9 shows the mean groundwater level drawdown fluctuations for the region, with the latest records showing an upward trend. No immediate management actions are recommended for this hydrogeological unit. However, close monitoring

and possible investigation on water quantity impacts is recommended for the boreholes that had a significant decline in water levels in the past.

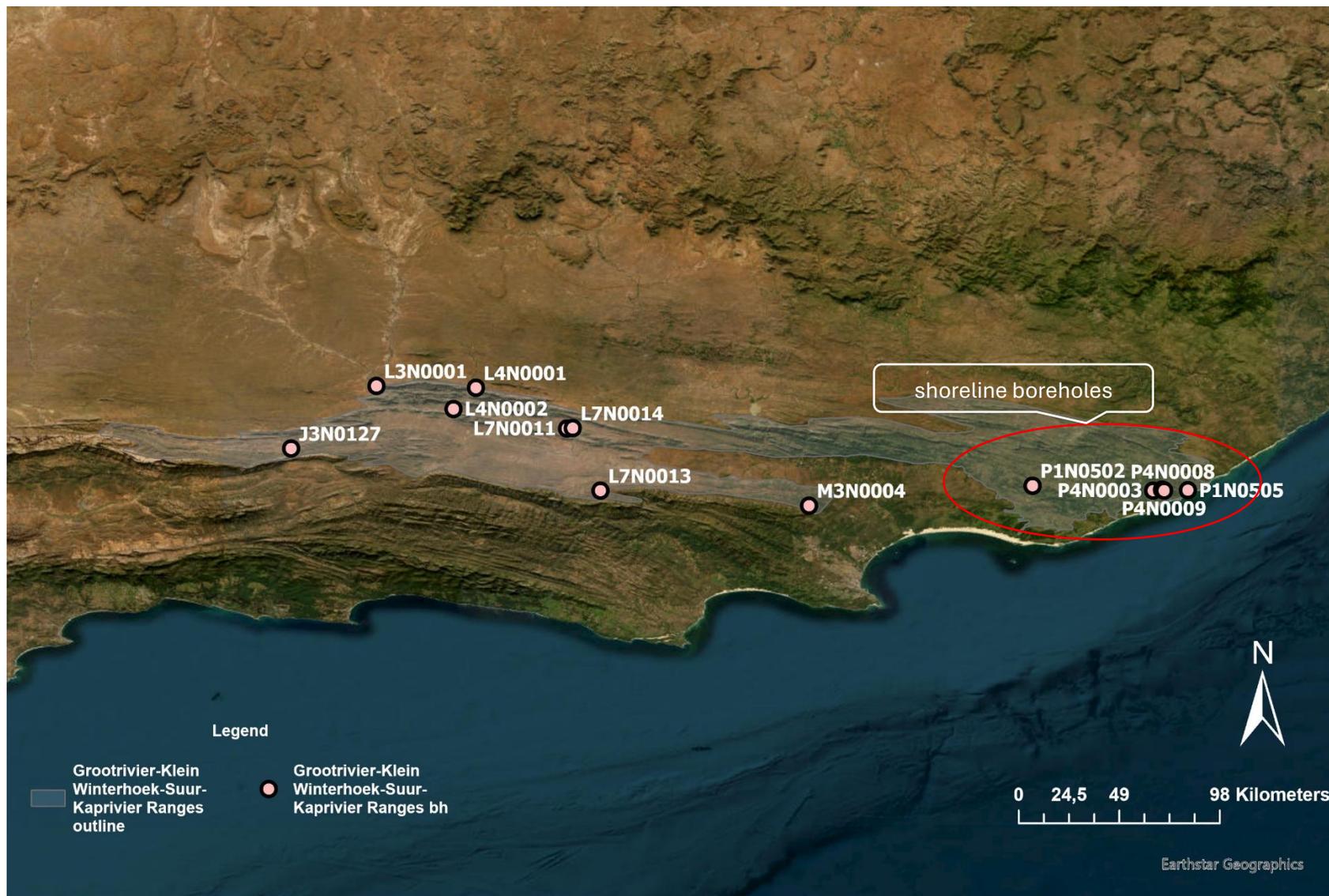
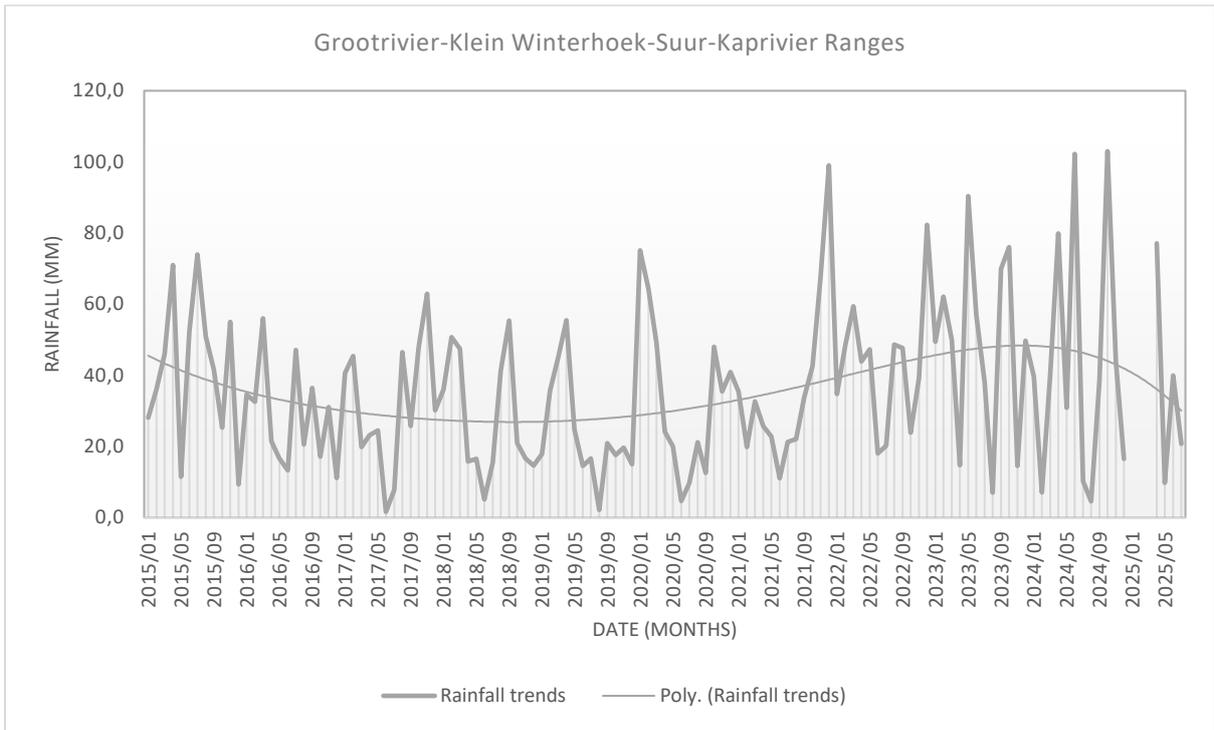
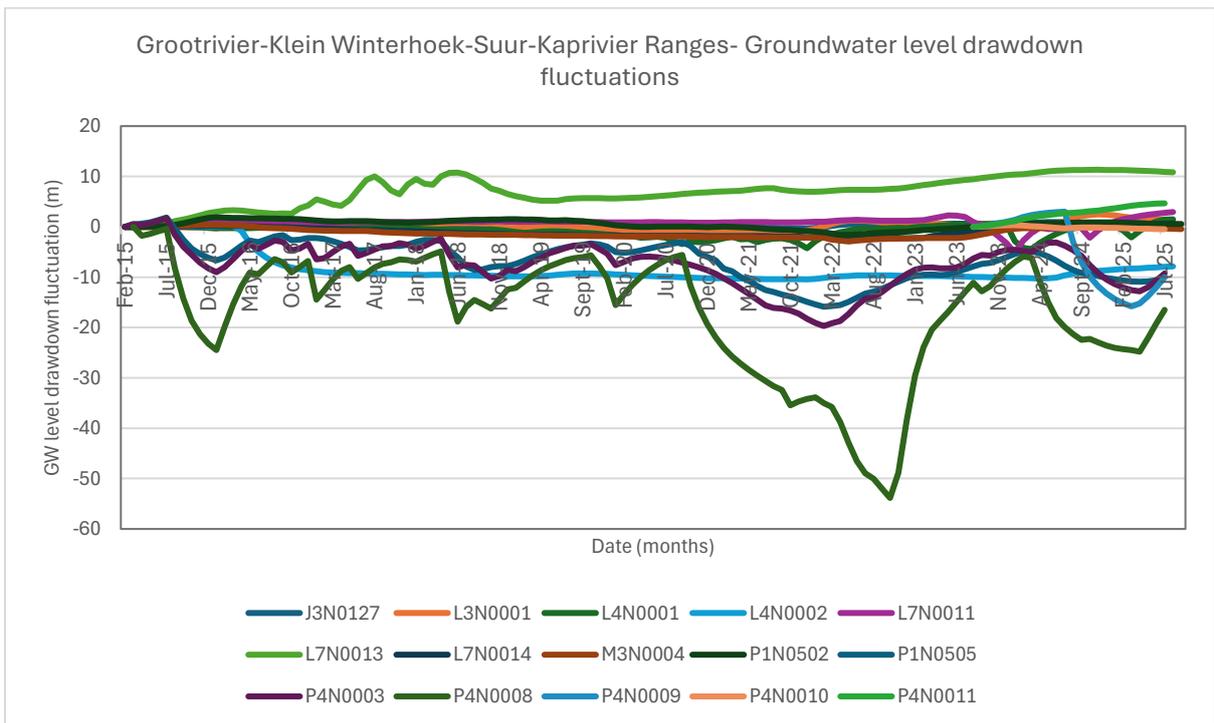


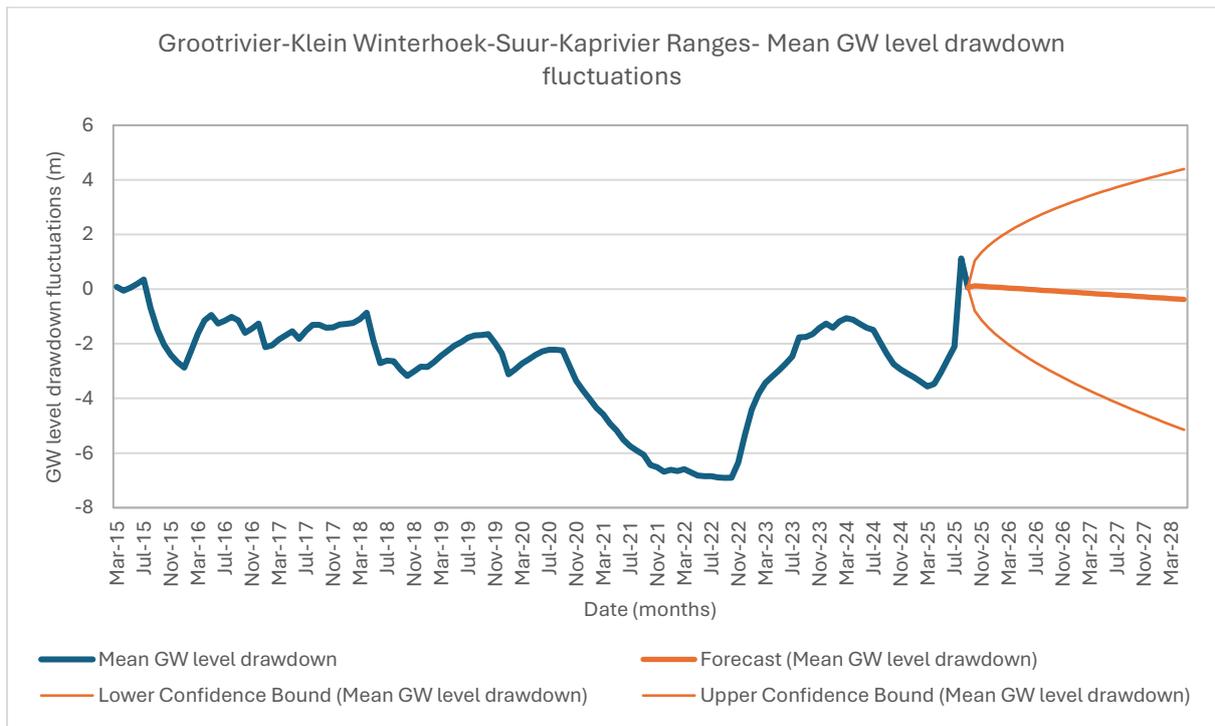
Figure 6: The extent of Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges hydrogeological region and its monitoring boreholes



**Figure 7: Rainfall trends for the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges Hydrogeological Region**



**Figure 8: Groundwater level drawdown trends the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges boreholes**



**Figure 9: The Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges - Mean groundwater level drawdown fluctuations**

### 3.3 The Algoa Bay Hydrogeological Region

The Algoa Bay hydrogeological region lies as a small piece of land sandwiched between the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges and the Southern Cape Ranges. It's mainly made up of primary aquifers (semi consolidated sediments). Its exact extent lies between Gqeberha and Alexandria, with the northern boundary made up of Steytleville.

About 10 boreholes exist for monitoring in this region. However, they are not evenly distributed in the entire area (Figure 10)

The rainfall trends presented in Figure 11 revealed that the region has been experiencing low rainfall for a longer period (mid-2016-late 2021). This excludes the year 2017-2018 though. Relatively good rains were increasingly observed from 2022 and peaking in 2024 before another cycle of low rainfall started in 2025.

The groundwater level drawdown trends as represented by the boreholes for this region mimicked rainfall patterns but with a delayed response (Figure 12). A decline in water level was observed from late 2016. This was not the case with all the monitoring though. Some maintained positive horizontal trends whilst borehole M1N0036, P2N0003 and M3N0002 showed a downward trend below the initial water levels (Figure 12). A combination of environmental stressors and over-abstraction is suspected from these boreholes as the water level decline is showing to be regional. From January 2023, these boreholes showed a rise in water level drawdown responding to the good rains observed since 2022. Although the recovery is seen, they are still below the initial water levels, and some are already responding to the latest decline in rainfall. This is clearly shown in Figure 13 where the average groundwater levels of Algoa Bay are presented. The forecast shows that a water level decline will be prevalent for a while. *These trends resemble similarities with the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges coastal*

*boreholes suggesting a possible groundwater abstraction impacts in this primary aquifer. The recommended investigation and action under Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges for its coastal boreholes must be extended to Algoa Bay hydrogeological region.*



Figure 10: The Algoa Bay Hydrogeological Region extent and its monitoring boreholes

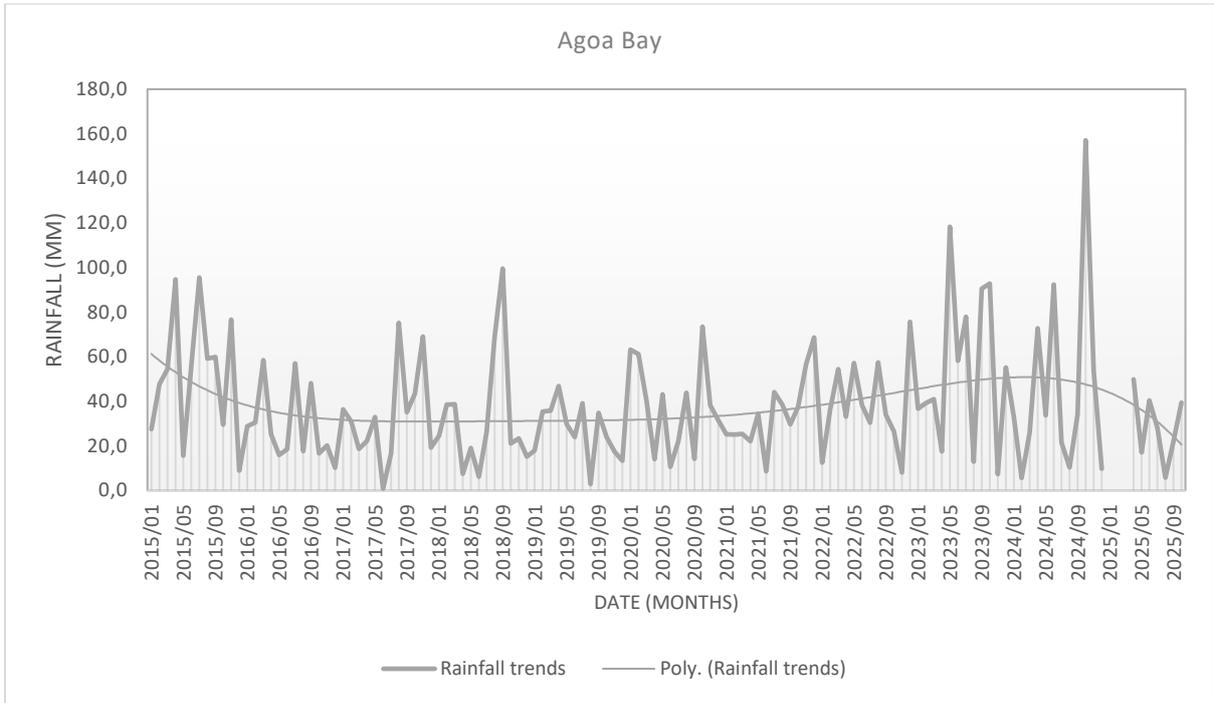


Figure 11: Rainfall trends for the Algoa Bay Hydrogeological Region

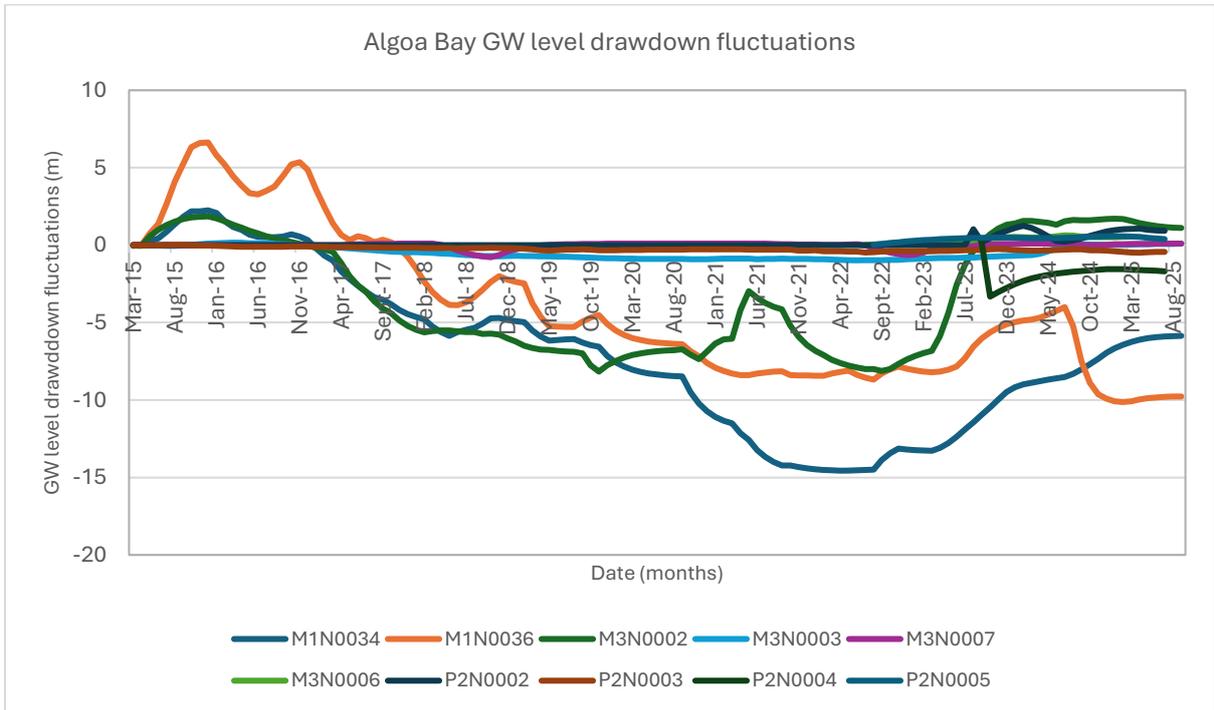


Figure 12: The Algoa Bay groundwater level drawdown fluctuations

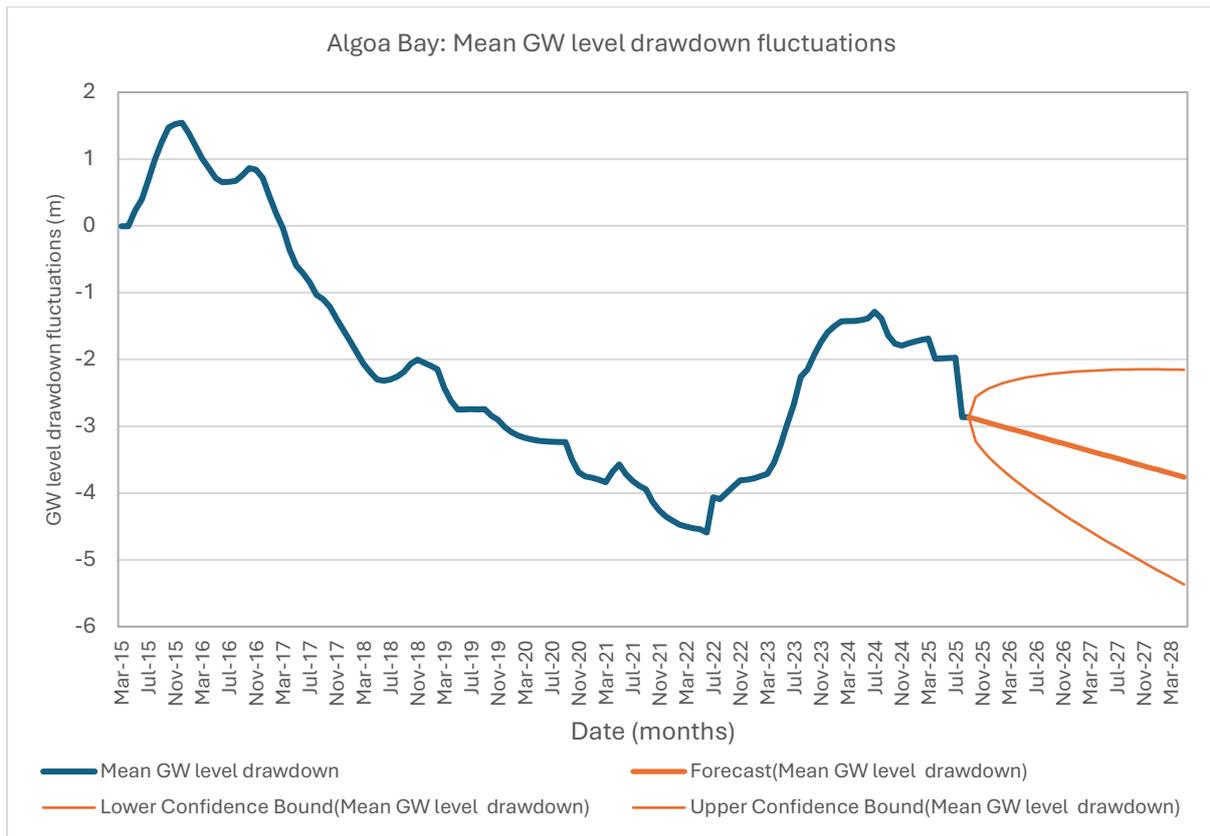


Figure 13: The Algoa Bay Hydrogeological Region- Mean groundwater level drawdown fluctuations

### 3.4 The Eastern Great Karoo Hydrogeological Region

The Eastern Great Karoo stretches from Pearston in the east and stops just short of covering Leeu-Gamka to the west, The northern border is formed by parts of Victoria West and Richmond while southwards Rietbron and the neighboring parts of Willowmore serve as the border.

About 31 boreholes were utilized for this assessment and are indicative of latest monitoring efforts done for this region. Revisitation and review of the monitoring programme can improve the distribution of boreholes, especially in the lowveld and to a lesser degree the escarpment (Figure 14).

The rainfall trends for the Eastern Great Karoo Hydrogeological Region are presented in Figure 15. The region experienced low rainfall prior to between 2025 and late 2019. Thereafter a gradual increase was observed peaking in early 2022 and gradually declining up to date.

The groundwater level drawdown for this region responded to the rain patterns experienced. Most borehole water levels showed a downward trend from August 2017 until October 2021 whereafter an upward trend was observed. The water level drawdown trends dropped significantly, with some boreholes recording 30- 35m decline. Nevertheless, by April 2022 most boreholes had recovered and were above the initial water level and still climbing, suggesting optimal recovery in response to rains observed between 2020 and late 2022. From August 2023 up to date the aquifers indicated to be almost fully recovered. An exception was with borehole J2N0111 which had recorded a 35m decline and took a while to fully recover. These fluctuations

are clearly indicated in Figure 17, with a marked water level drawdown decline from 2016 until late 20221 and the full recovery up to date.

Given the 'healthy' water level rebound, it appears that the groundwater resources in this region are well within sustainable management objectives. There is no immediate action or intervention required.

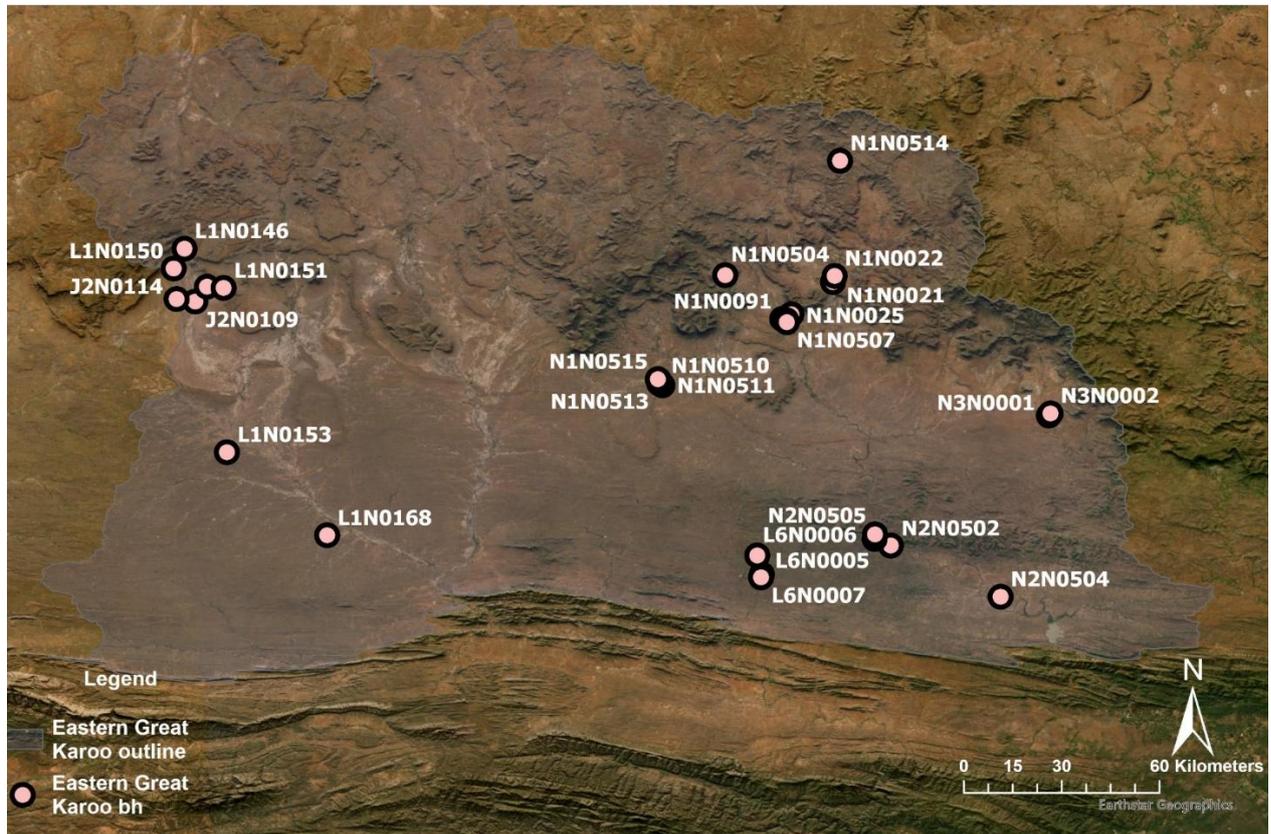


Figure 14: The Eastern Great Karoo Hydrogeological Region extent and its boreholes

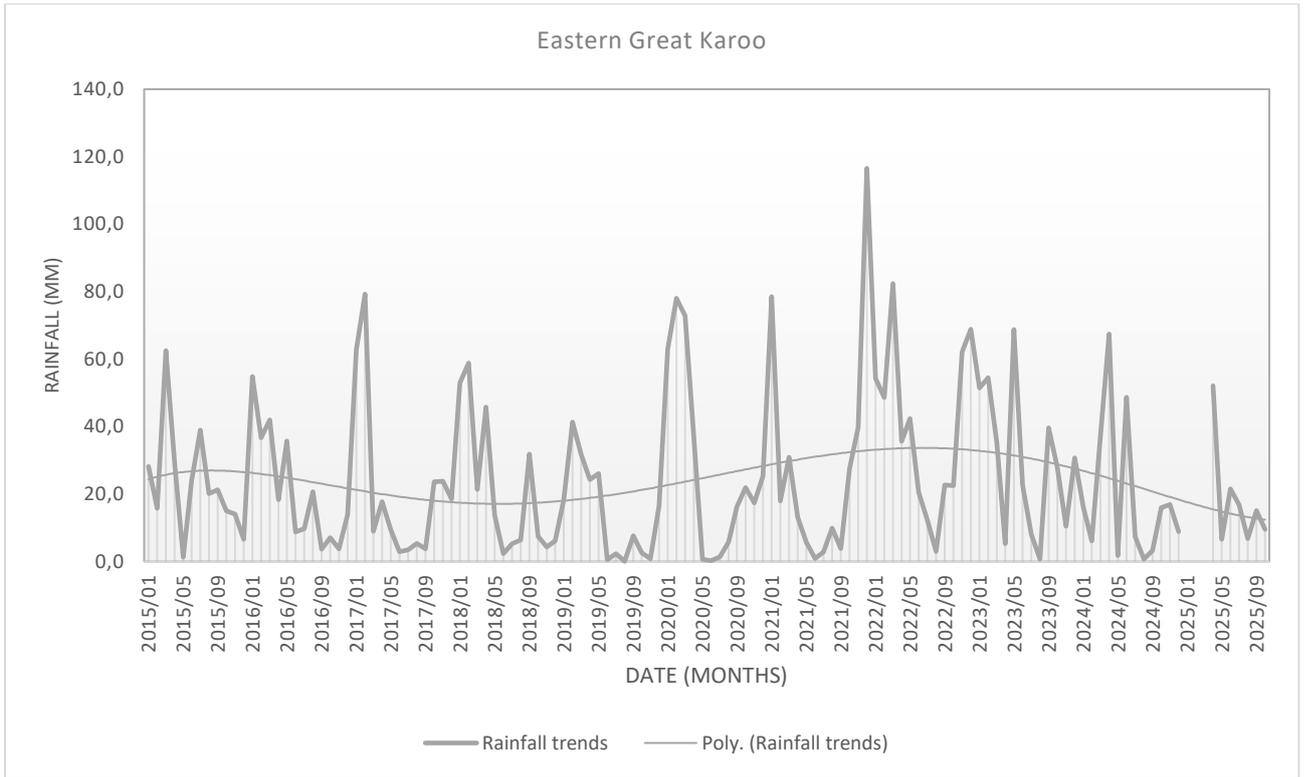


Figure 15: Rainfall trends for the Eastern Great Karoo Hydrogeological Region

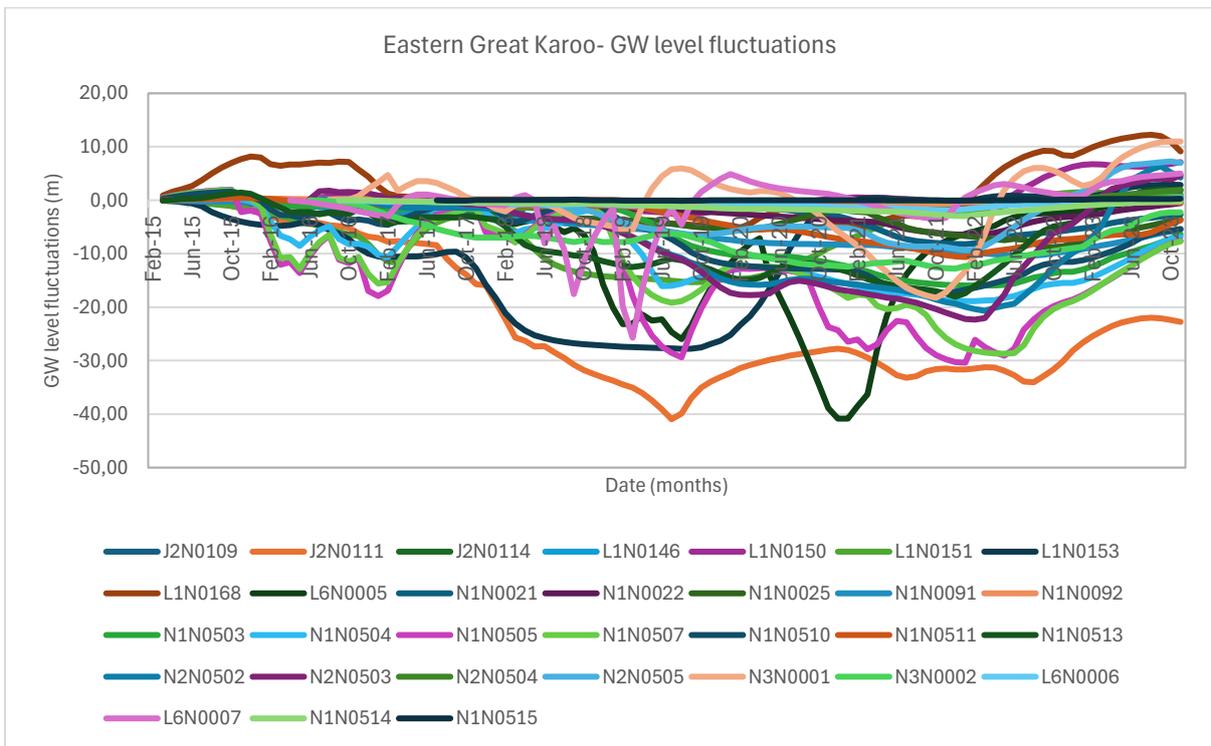


Figure 16: The groundwater level drawdown fluctuations for Eastern Great Karoo

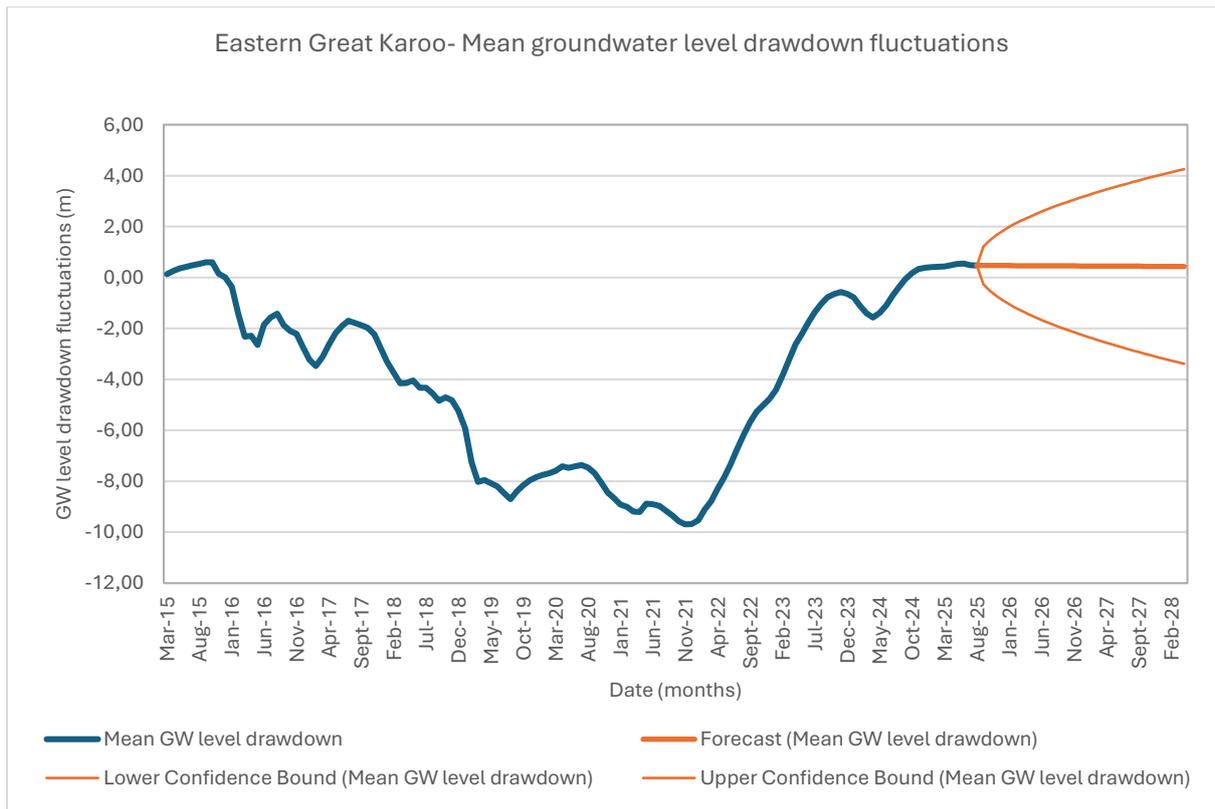


Figure 17: The Eastern Great Karoo- mean groundwater level drawdown fluctuations

### 3.5 The Ciskeian Coastal Foreland and Middleveld region Hydrogeological Region

The Ciskeian Coastal Foreland and Middleveld hydrogeological region covers the coastal area just off Alexandria in the south and to Centane in the north and stretches inland to Middelburg/ Molteno.

About 28 boreholes were utilized for assessment of water level status for the Ciskeian Coastal Foreland and Middleveld hydrogeological region (Figure 18). The borehole distribution is satisfactory but can be improved to the southeast of the region.

The rainfall for the region over the past 10yrs has indicated a steady increase from 2015, slowed a little in intensity between 2018 and early 2020, peaked from late 2020-2022 and declined from 2023 onwards (Figure 19). The rainfall intensity showed a gradual increase towards 2022 and while the latest years (2023 onwards) revealed a slowdown. It appears that this could, once again, be an onset of another cycle of relatively drier period.

Generally, the groundwater level drawdown for the boreholes of this region showed seasonal reported negative trends from the onset of the observation period, declining further towards 2019 to 2020 in response to relatively lower rains (Figure 20). In mid-2021, a response to higher rainfall intensity saw the declining levels reaching an inflection point and rising gradually. This period marked a general rise in groundwater levels for all the observed boreholes until October 2023. Thereafter, the groundwater levels slowed down with a slight decline. The present status indicates a slight rise, though. These trends are related to cyclical seasonal changes associated

with wet and dry years. Figure 21 shows the average fluctuations clearly, marking seasonality and the forecasted levels to be observed in the next few years.

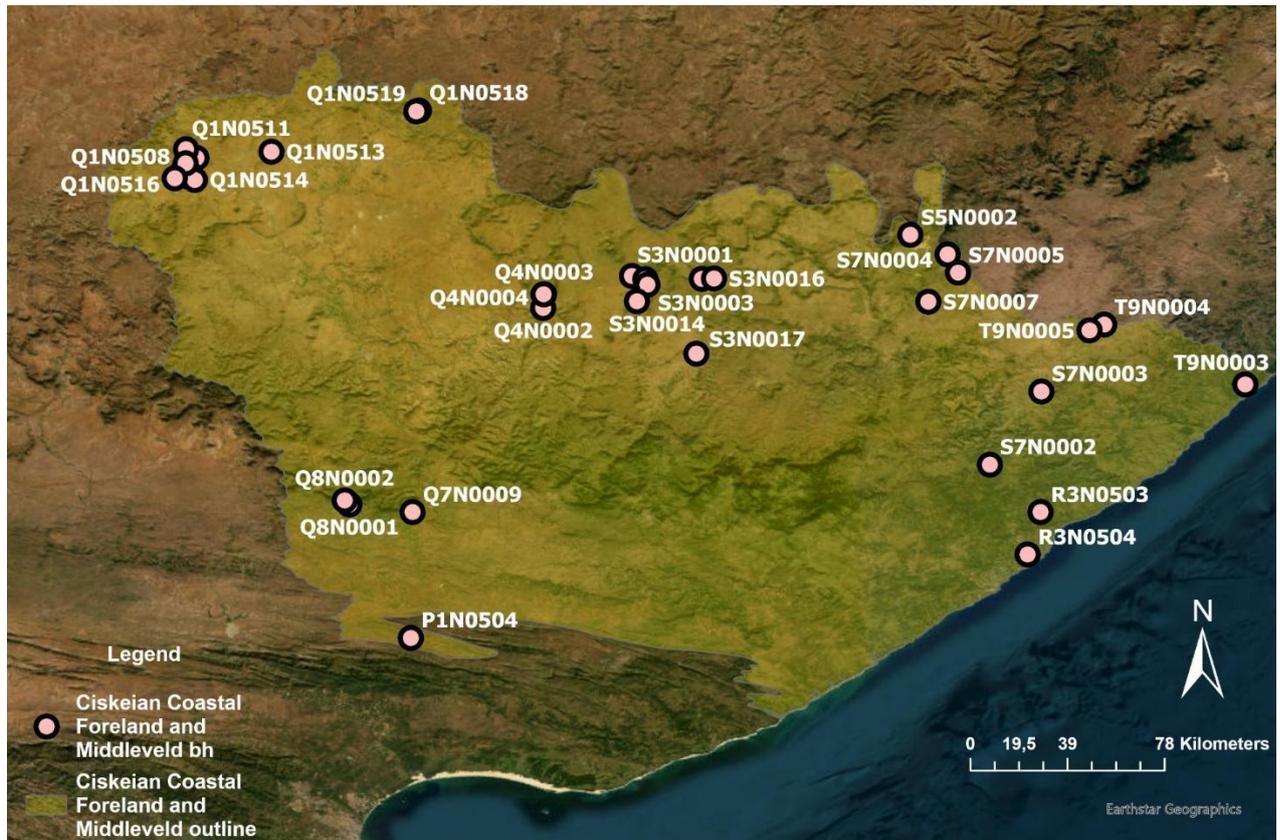


Figure 18: An extent and distribution of boreholes for the Ciskeian Coastal Foreland and Middleveld

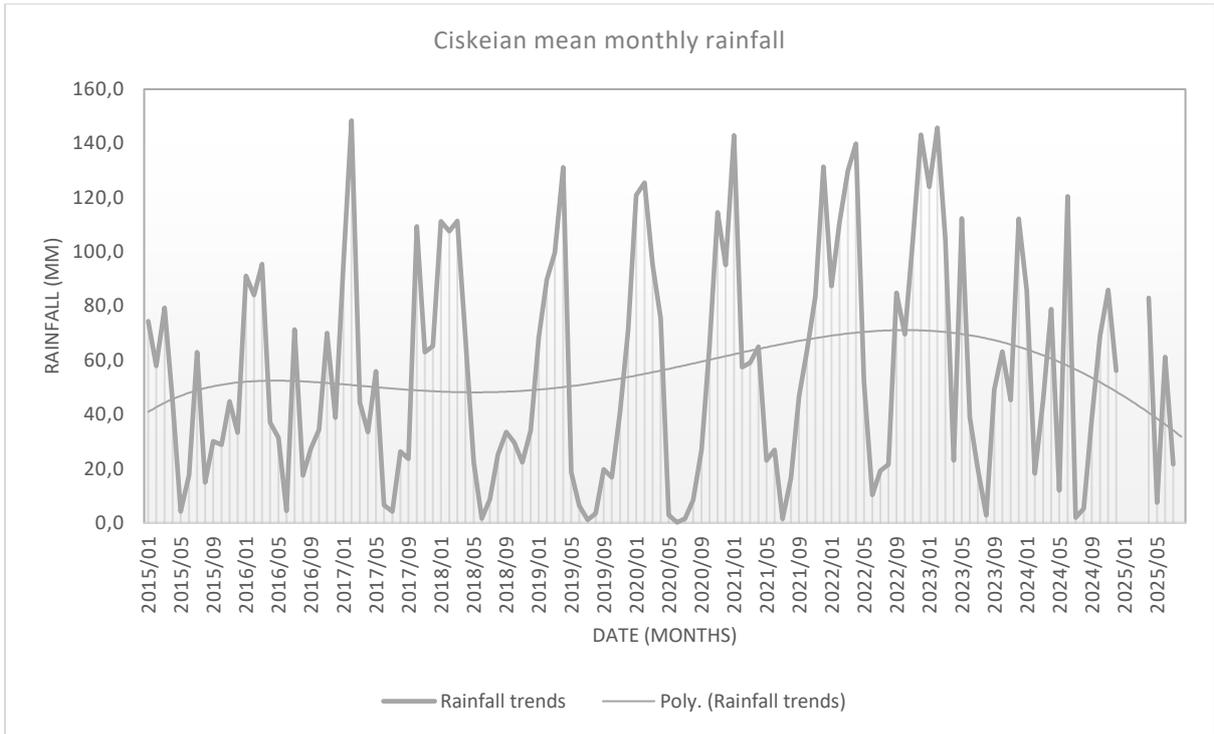


Figure 19: Rainfall trends for the Ciskeian Coastal Foreland and Middlelevel Hydrogeological Region

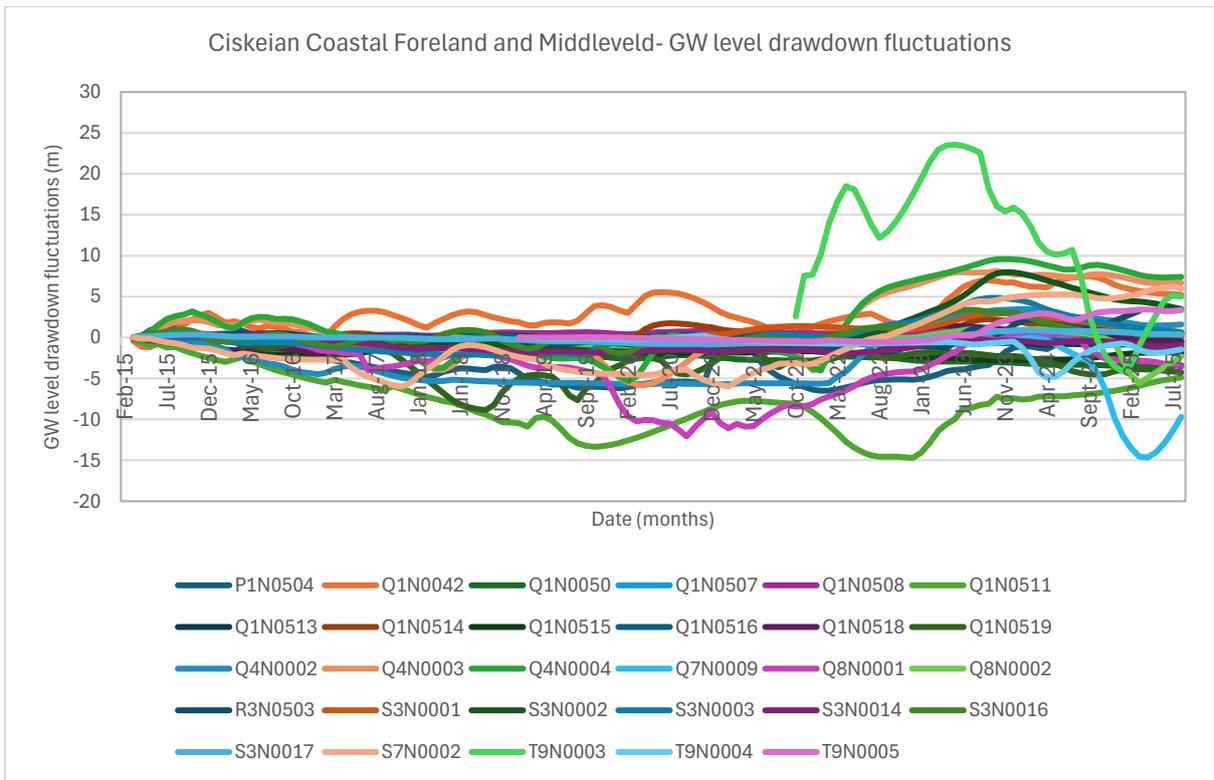
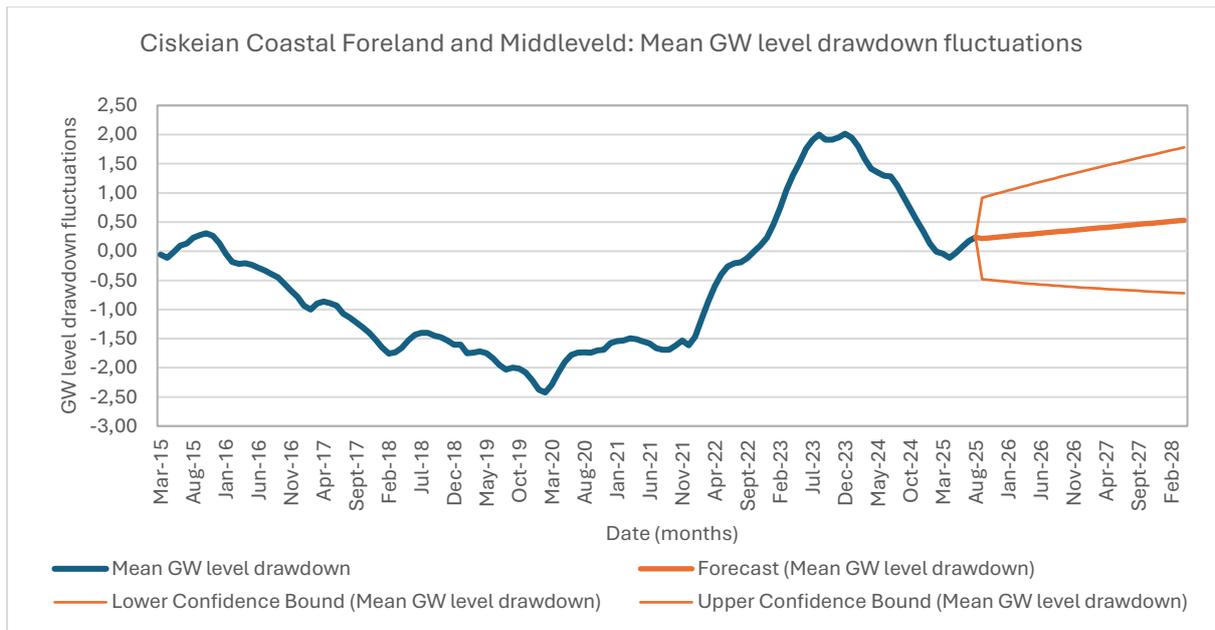


Figure 20: The Ciskeian Coastal Foreland and Middlelevel groundwater level drawdown fluctuations



**Figure 21: Mean groundwater level drawdown fluctuations for the Ciskei and Coastal Foreland and Middlelevel Hydrogeological Region**

### 3.6 The Southeastern Highland Hydrogeological Region

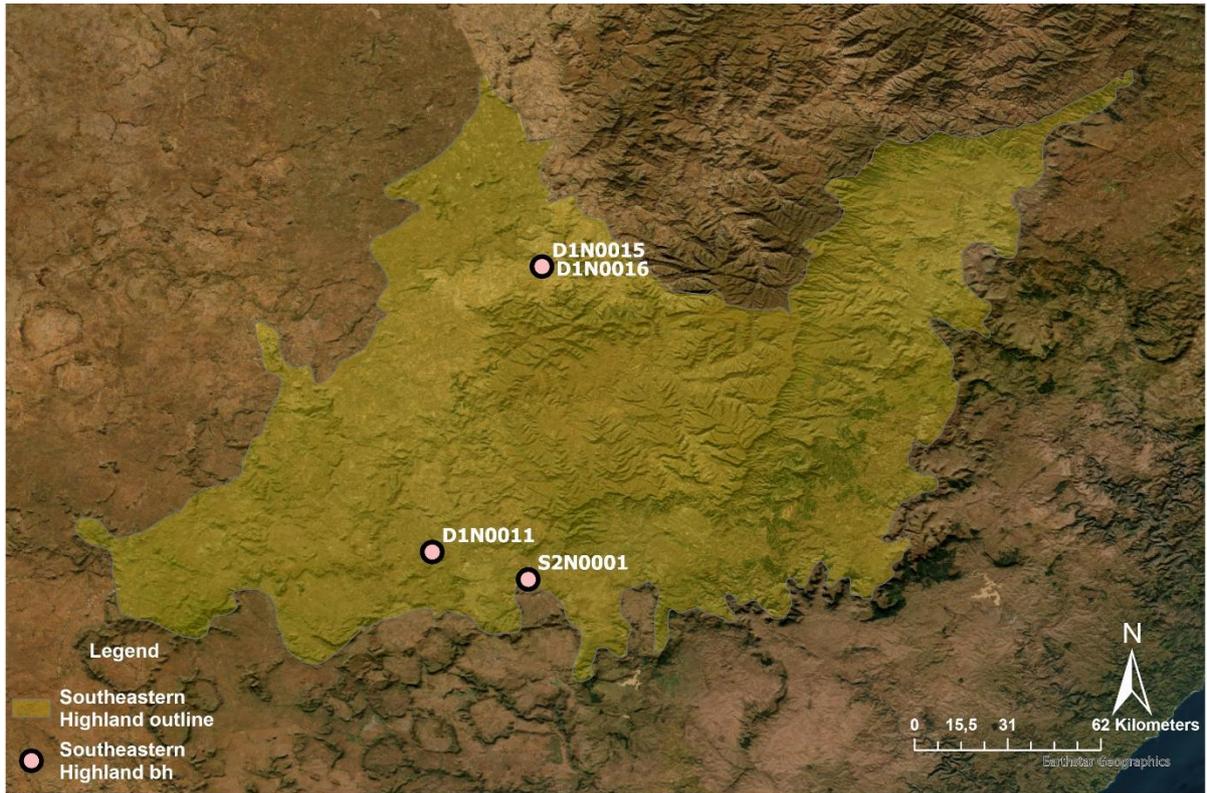
The Southeastern Highland lies south of the southern Lesotho border. The town of Molteno forms its southwestern border whilst Mount Fletcher serves as the northeastern border.

There is limited monitoring covering this hydrogeological region. About four (4) boreholes were utilized for assessment of groundwater level status for this region (Figure 22). Even with that, the data trends available to have a meaningful assessment start in 2023. Nevertheless, an attempt was made to assess the groundwater status. ***It is recommended that the network be expanded with representative boreholes.***

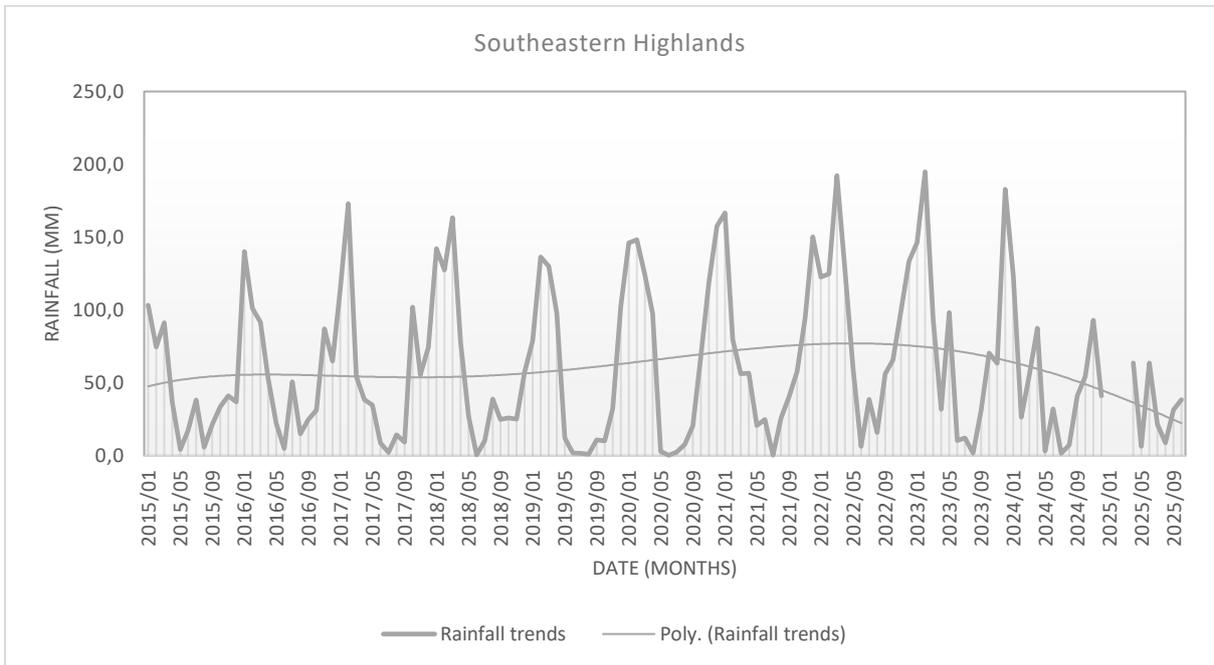
The rainfall has been steadily increasing since 2015, although a slowdown between mid-2018 and mid-2020 was observed. Thereafter, a significant increase that lasted until mid-2024 was noted. The past two years to date have been marked by low rainfall.

The groundwater level drawdown for the Southeastern highland boreholes in Figure 23 suggests a cyclic rise and decline in the order of 0.8m over the assessment period in response to rains. The latest data recorded an upward trend (Figure 24). The current trends do not suggest any anthropogenic or significant climatic related changes in groundwater levels of this region.

The mean groundwater level drawdown for the region is shown in Figure 25, with an upward trend suggesting replenishment of the aquifers. With limited historical data the forecasted trends could possibly show large variations. Given the current level status, no intervention recommended for this groundwater region.



**Figure 22: The extent of the Southeastern Highland Hydrogeological region and its monitoring boreholes**



**Figure 23: Rainfall trends for the Southeastern Highlands Hydrogeological Region**

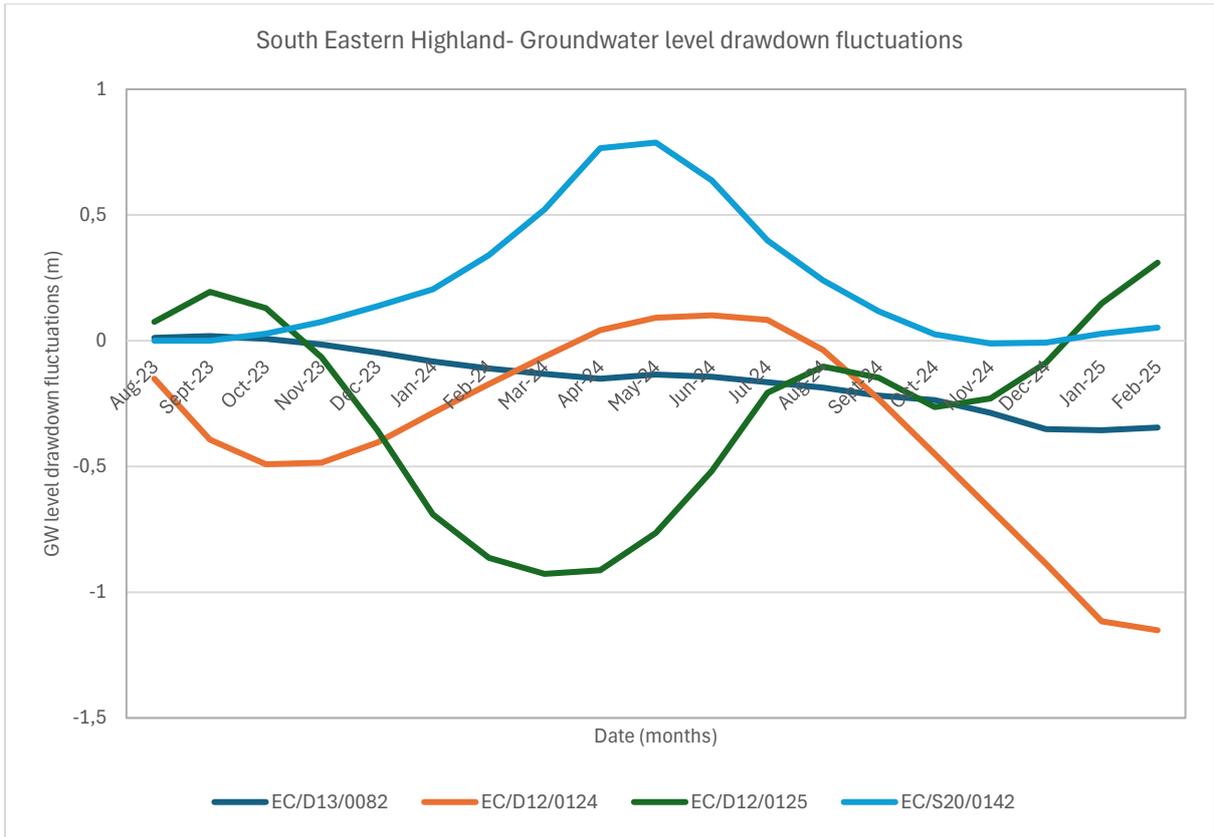


Figure 24: The Southeastern Highland groundwater level drawdown fluctuations

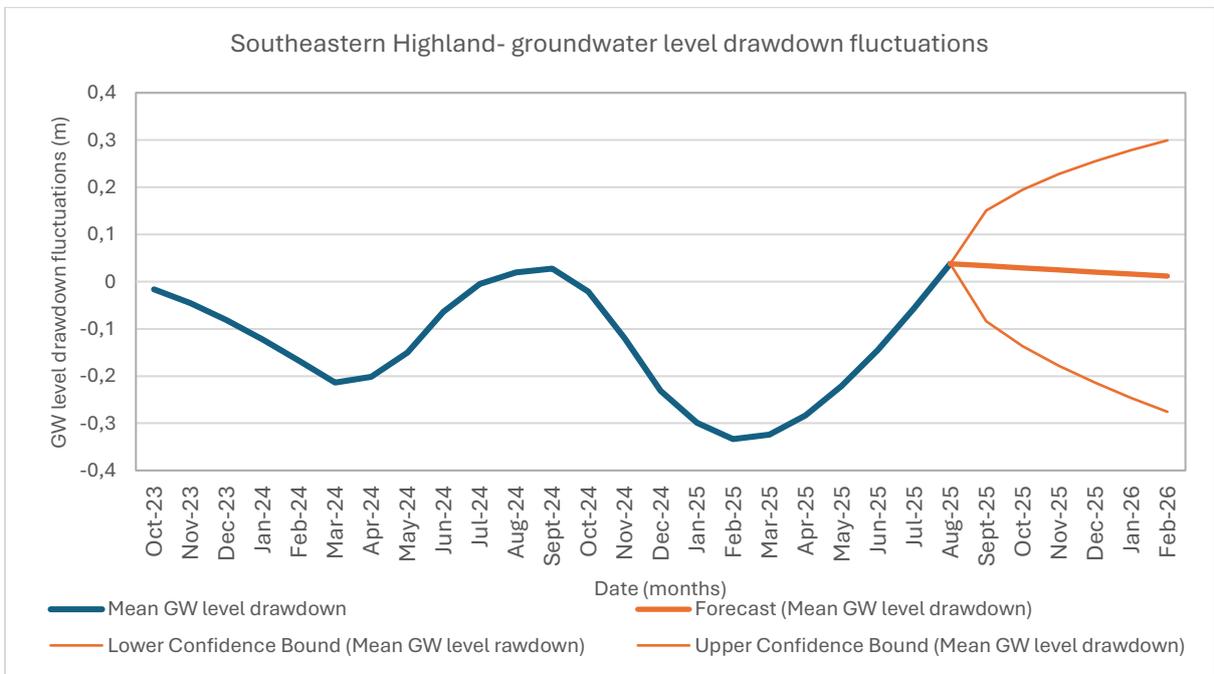


Figure 25: The mean groundwater level drawdown for Southeastern Highland Hydrogeological region

### 3.7 The Transkeian Coastal Foreland and Middleveld Hydrogeological Region

The Transkeian Coastal Foreland and Middleveld hydrogeological region cover the Transkei coast, stretching from where Mbhashe River distributes its water into the Indian Ocean to the northwestern side where the town of Cala lies. To the northeastern side, the town of Underberg serves as the border.

The dataset used for assessment of water level status for the Transkeian Coastal Foreland and Middleveld dates to 2023. This is when consistent monitoring could be observed with limited data gaps. Datasets from about twenty-six (26) boreholes which spread across the Transkeian Coastal Foreland and Middleveld hydrogeological region (Figure 26) were used for assessment of the water level status. *The monitoring network programme needs to be extended to the north where currently there are no monitoring boreholes*

An average rainfall has been observed in the Transkeian Coastal Foreland and Middleveld Hydrogeological Region from 2015 until 2020. Thereafter, an above average rainfall was experienced but lasted for 2-3yrs. A significant decline in rainfall from mid-2024 to date was observed (Figure 27).

The groundwater level drawdown for the boreholes of this region have maintained horizontal trends throughout the observation period with a slight downward curvature for the latest water level records (Figure 28). Few exceptions were noted where both positive and negative fluctuations were recorded in the order of +/-5m. The effects of the latest rainfall (lower than the average rainfall) are starting to show with a slight groundwater level drop in this region. The exception holds for boreholes T1N0019 and T6N0005 whose trends are strongly downward, affecting the overall average groundwater levels for the region (Figure 29). Given the status of the groundwater levels (slight decline with latest records, but still on positive fluctuations, no immediate management interventions are recommended.

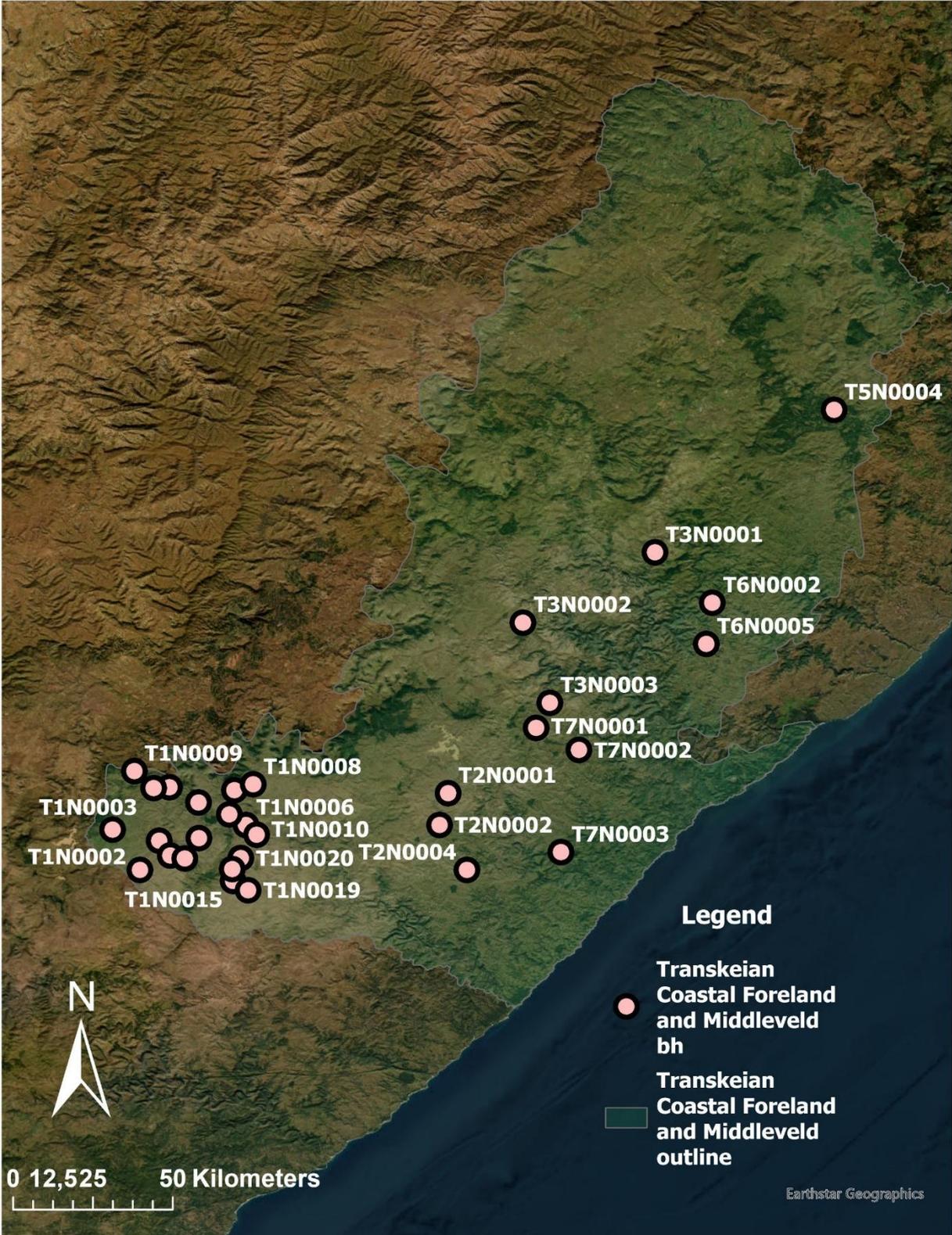


Figure 26: Borehole distribution and the extent of Transkeian Coastal Foreland and Middleveld

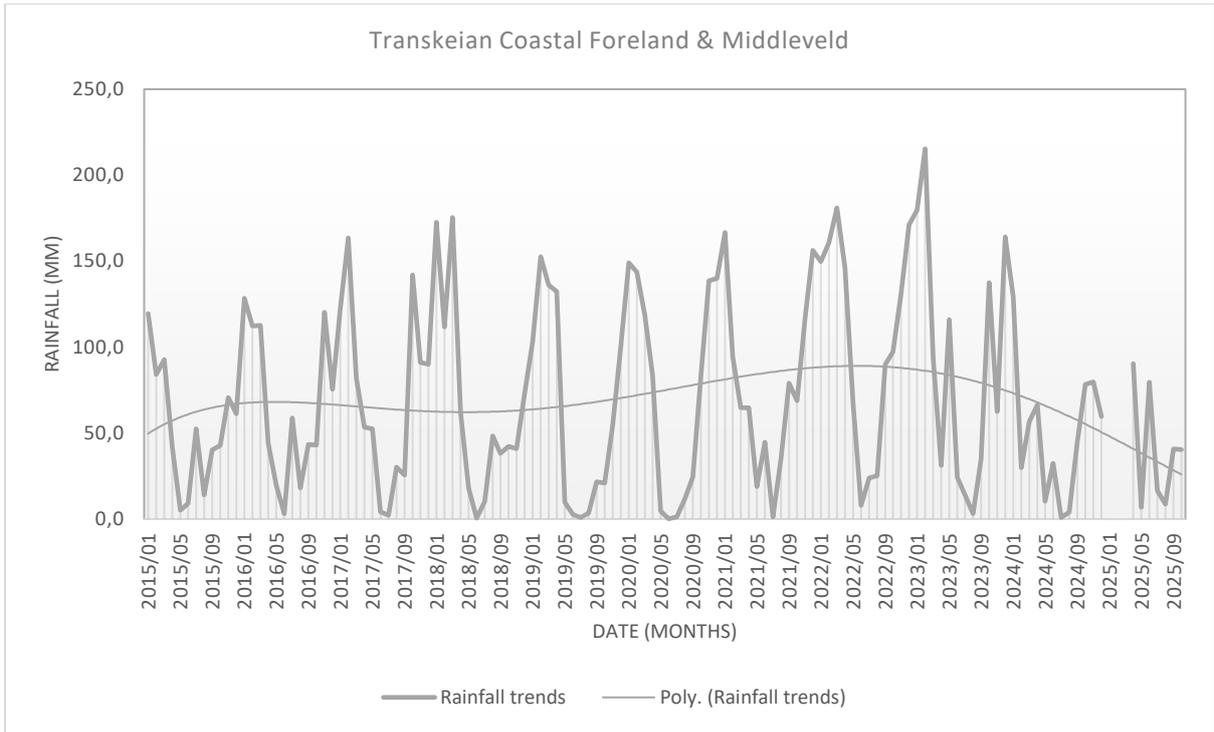


Figure 27: Rainfall trends for the Transkeian Coastal & Middleveld Hydrogeological Region

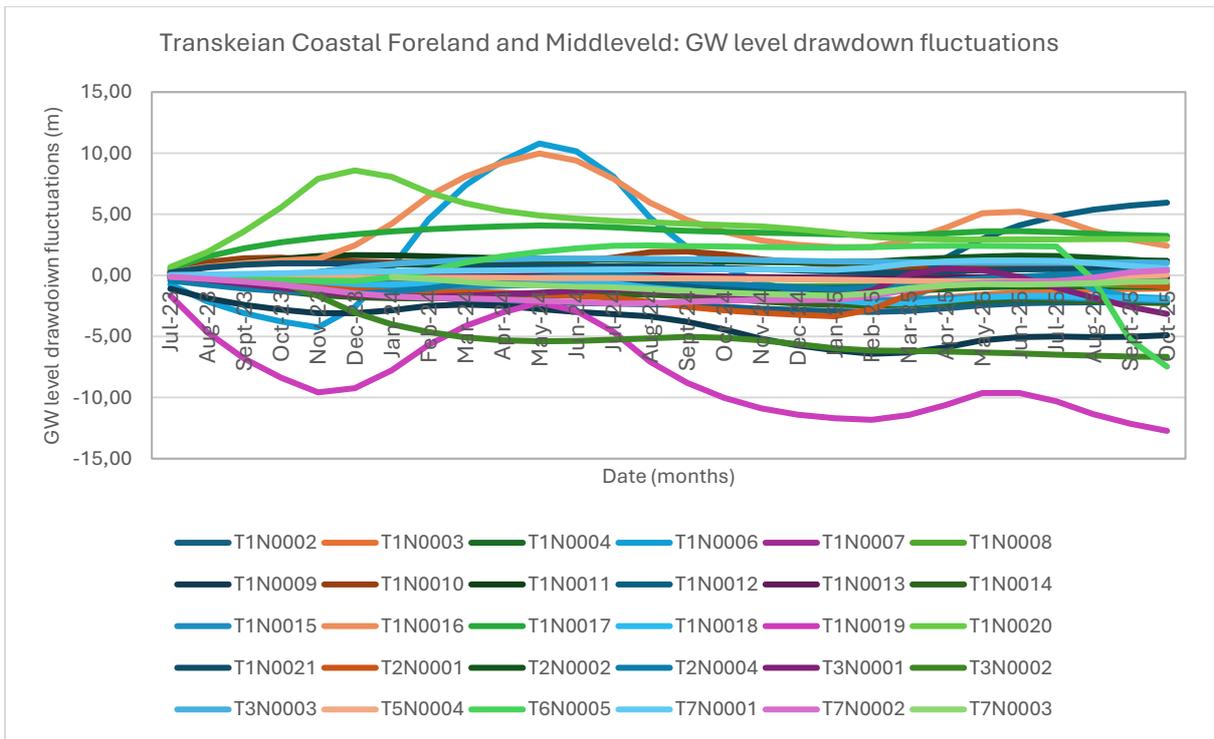
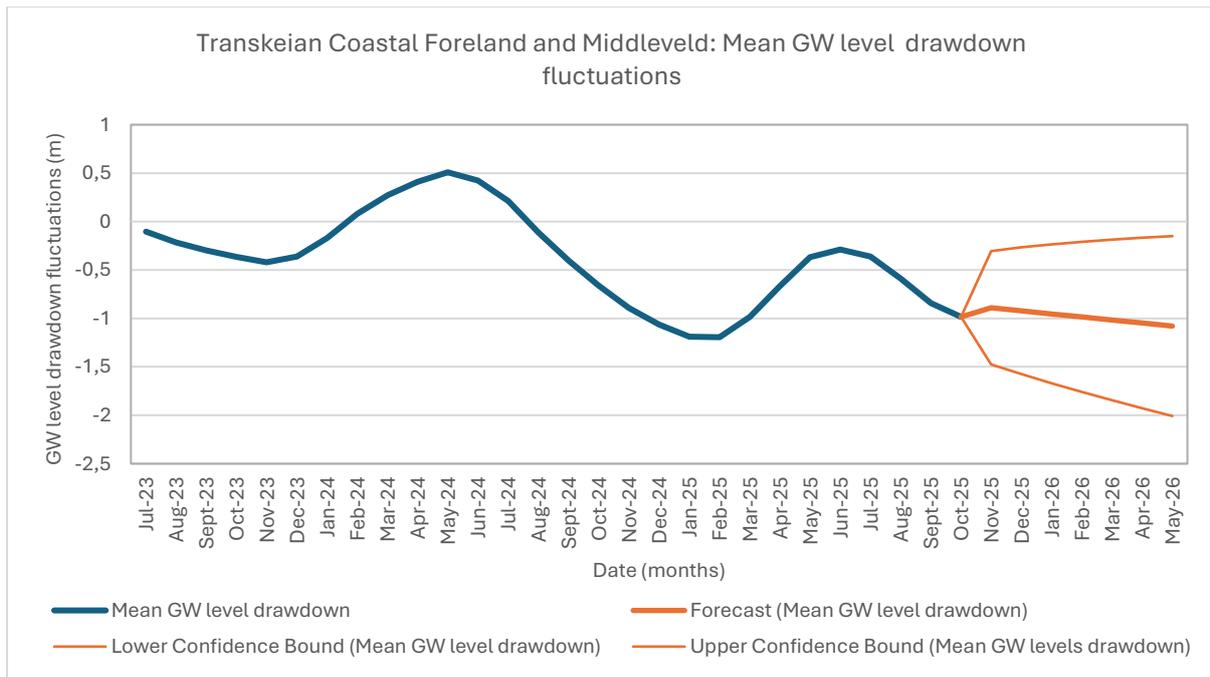


Figure 28: The Transkeian Coastal Foreland and Middleveld groundwater level drawdown fluctuations



**Figure 29: The mean groundwater levels drawdown trends for the Transkeian Coastal Foreland and Middlelevel Hydrogeological Region**

### 3.8 The Northwestern Middleveld Hydrogeological region

The Northwestern Middleveld hydrogeological region lies on the western side of the KwaZulu-Natal Province. It forms the northeastern border with Lesotho. The main towns encompassed in this region include Ladysmith, in the central zone, while Newcastle and Vryheid form the uppermost section. To the south, Umzimkhulu serves as the border.

About twenty-two (22) boreholes were used for the assessment of water level trends for the Northwestern Middleveld hydrogeological region (Figure 30). The selection was based on the available consistent monitoring data since 2015.

The Northwestern Middleveld Hydrogeological Region has enjoyed consistent rains throughout the observation period (Figure 31). According to Figure 31, from 2015, the trend started off increasing, plateauing from mid-2016 until mid-2021. Thereafter, a slight increase was observed until a gradual decline from mid-2024 to date.

The groundwater level levels (depicted as drawdown) for this region enjoyed the consistent rains and showed replenishment with time in the form of gradual water level rise until 2022 where the rise was more upward in response to consistent wet years observed in the region (Figure 32). This lasted until 2014 when the declining trends in rainfall also translated to a slight downward trend for groundwater levels until early 2025. Since then, upward trends till to date were observed. Figure 33 depicts this trend well with the average groundwater level fluctuations for the region. At this stage no management interventions are required as the downward trend with latest water level records is still above the initial water levels and doesn't indicate threat to water availability. However, monitoring should continue.

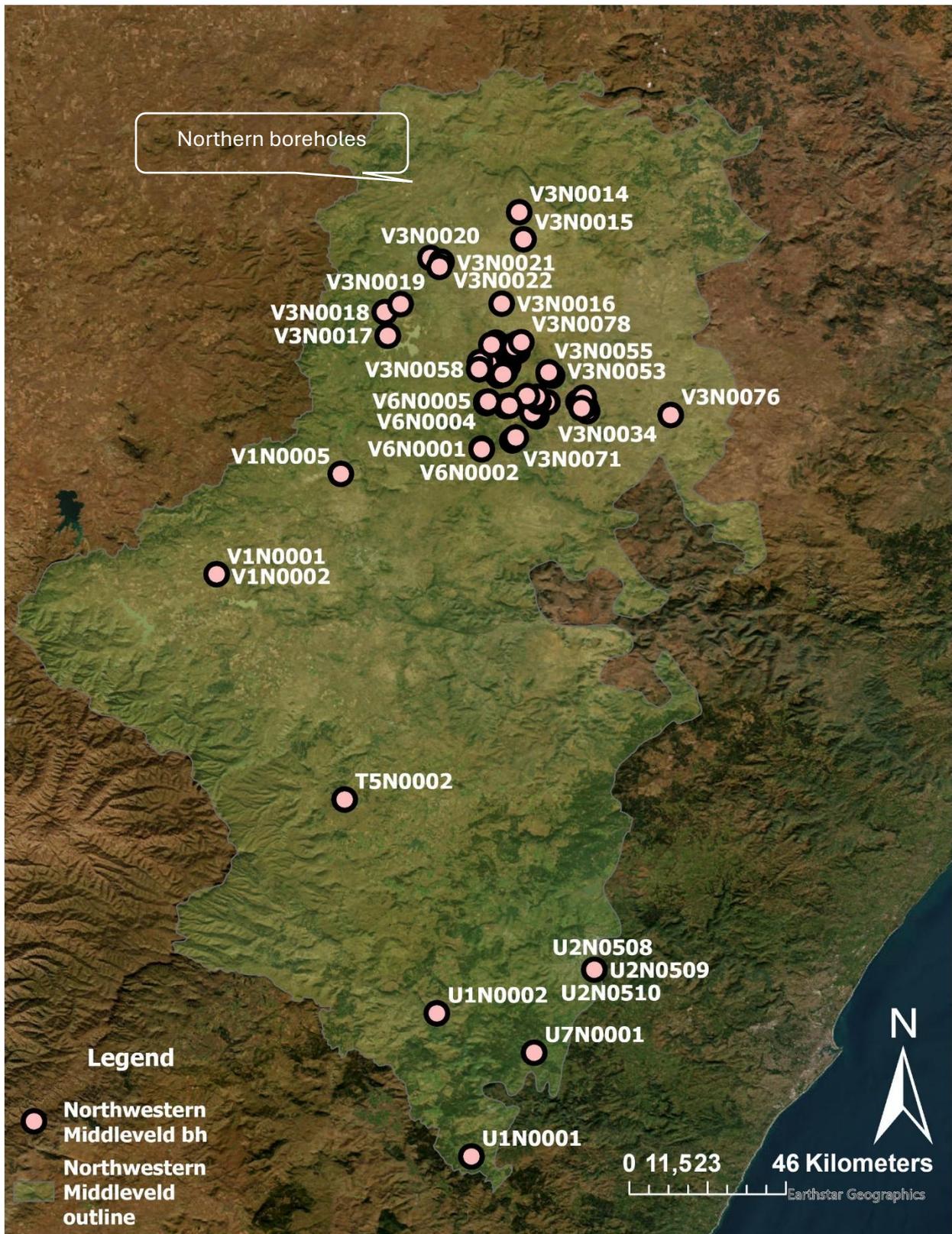


Figure 30: Borehole distribution and the extent of the Northwestern Middleveld Hydrogeological region.

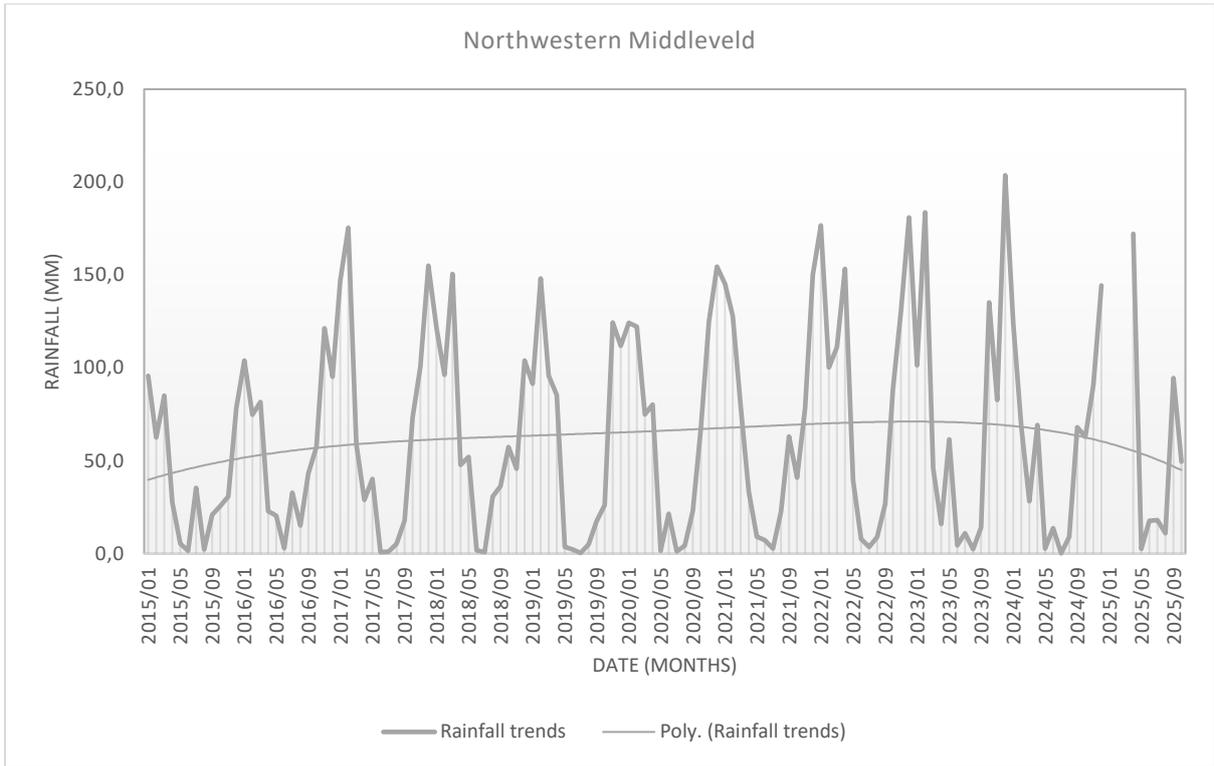


Figure 31: Rainfall trends for the Northeastern Middlelevel Hydrogeological Region

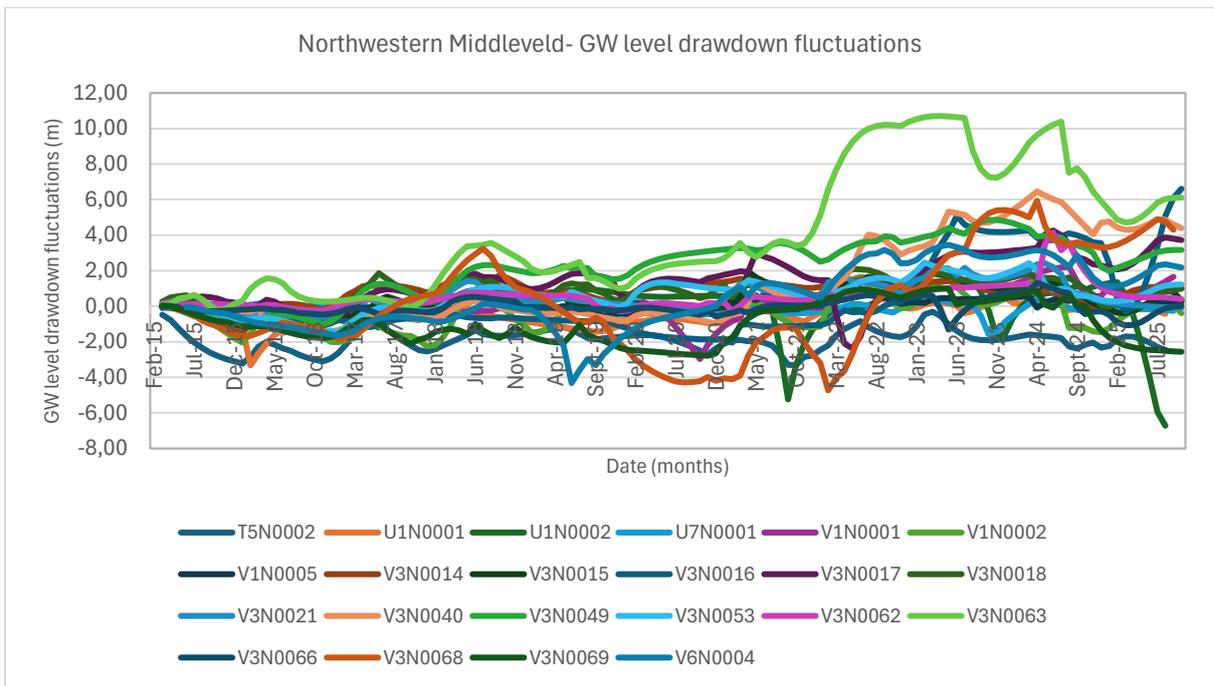


Figure 32: The Northwestern Middlelevel groundwater level drawdown fluctuations

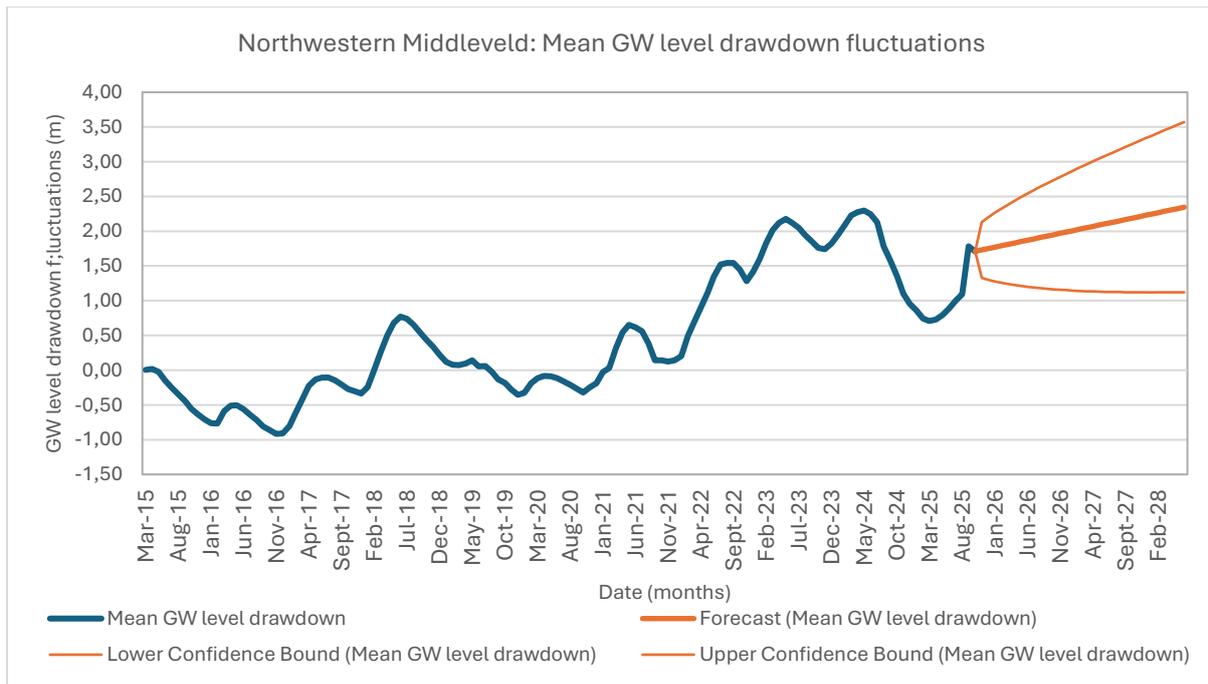


Figure 33: The Northwestern Middleveld mean groundwater level drawdown fluctuations

### 3.9 The Northeastern Middleveld Hydrogeological Region

The Northeastern Middleveld Hydrogeological Region surrounds the southern, western and northern borders of Eswatini, with its far northern border formed by the town of Mbombela.

Twenty-two (22) boreholes were utilized for assessment of water level trends for the Northeastern Middleveld Hydrogeological Region (Figure 34). The distribution of these boreholes is in the north, leaving the southern portion of the region unrepresented. **The monitoring network needs to be expanded to cover the entire region.**

The rainfall trends for the Northeastern Middleveld Hydrogeological Region indicated a similar pattern to the Northwestern Middleveld Hydrogeological Region, where the observation period started off with a slight rise, plateaued for a while (mid-2016 until mid-2021) before an increase was recorded until mid-2024 and later took a downward trend with the latest rainfall records (Figure 35).

A zoom-in into groundwater level drawdown fluctuations suggest that this region has been enjoying positive trends throughout the assessment period (Figure 36). This holds true for all boreholes but X1N0013 and W5N0007, which showed a water level decline of up to 3.5m between February 2015 to June 2018 and August 2016 to May 2022 respectively. This borehole has since recovered and showed a water level rise, while X1N0017 has maintained a horizontal negative trend throughout the observation period. Generally, seasonal fluctuations are demonstrated by most of the observed boreholes with positive peaks ranging between 2m and 6m common.

From an overview point, the groundwater levels for this region are indicating sustenance as a resource without showing negative climatic effects or negative anthropogenic impacts. Figure 37 serves as a testament to this, with mean groundwater fluctuations showing positive trends.

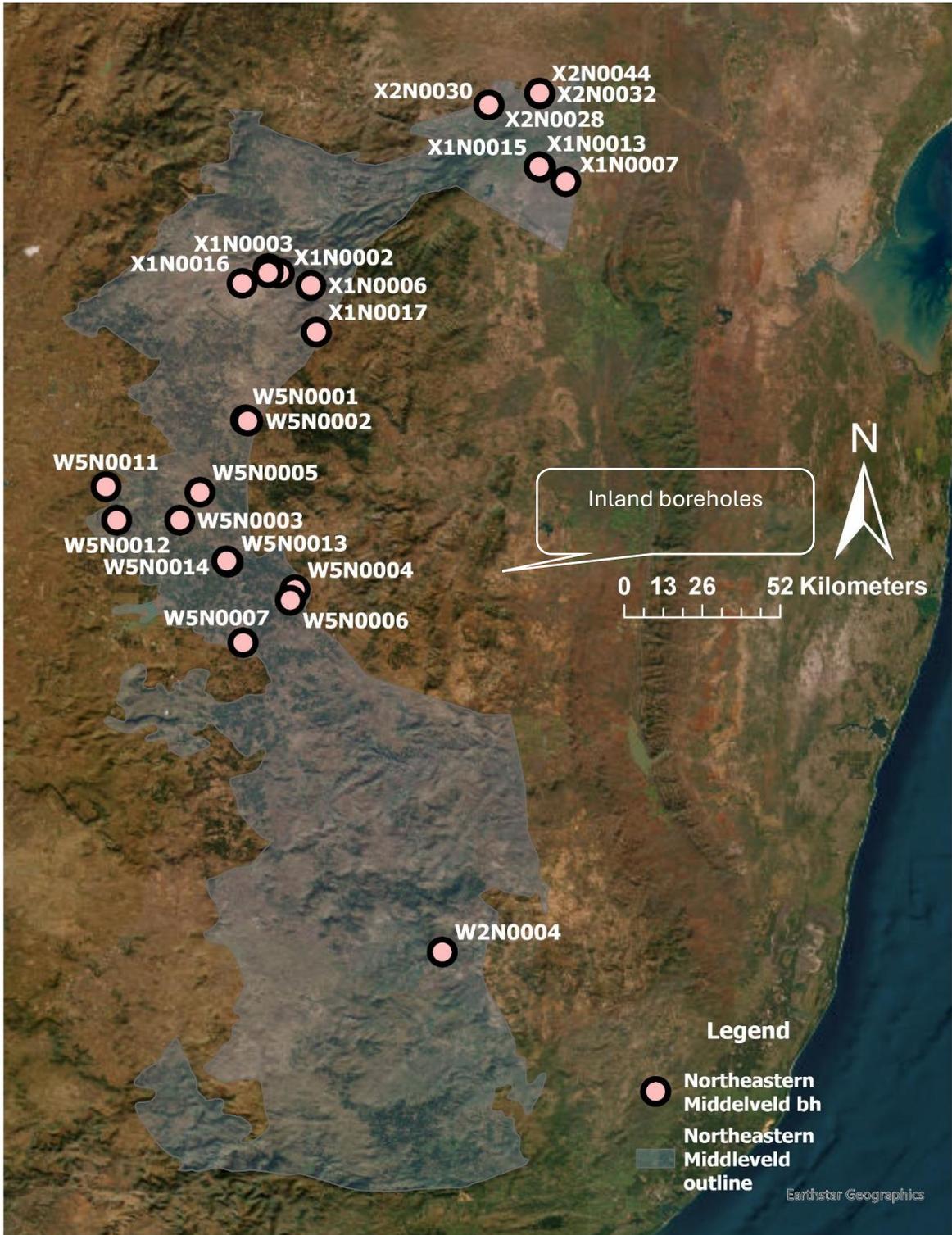


Figure 34: Borehole locality and the extent of the Northeastern Middleveld Hydrogeological region

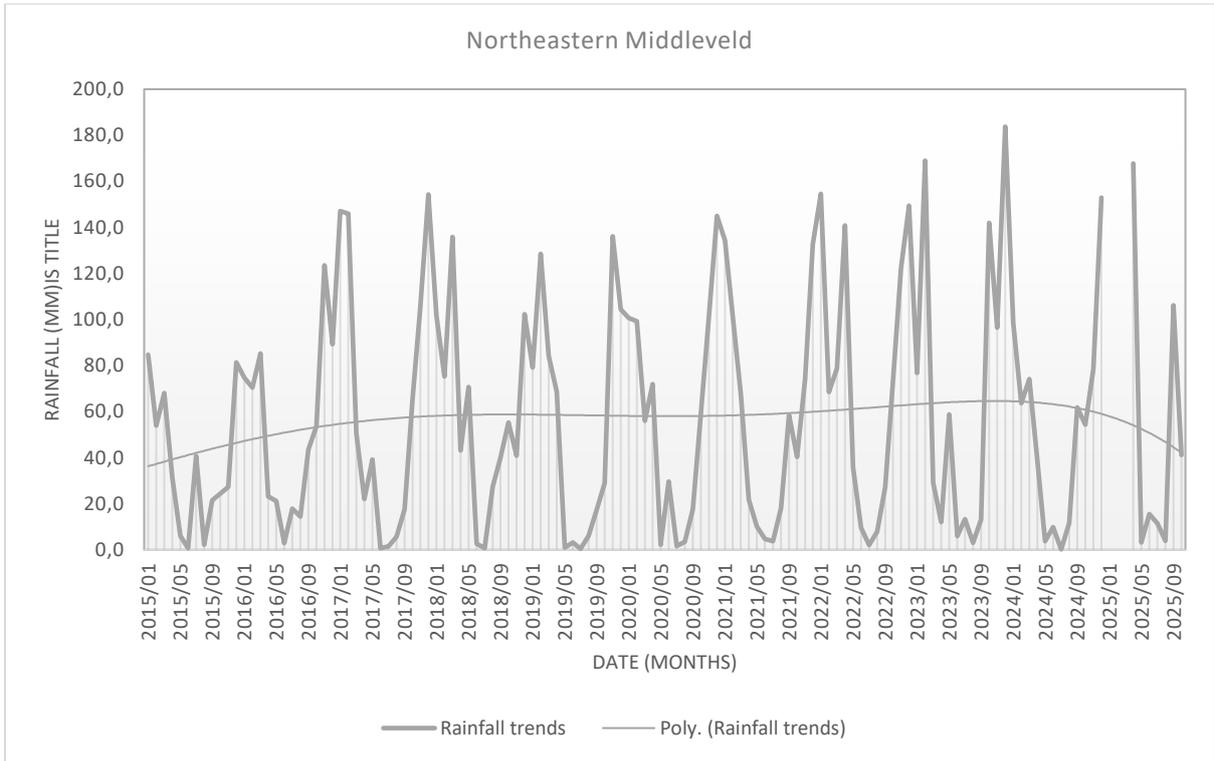


Figure 35: Rainfall trends for the Northeastern Middleveld hydrogeological Region

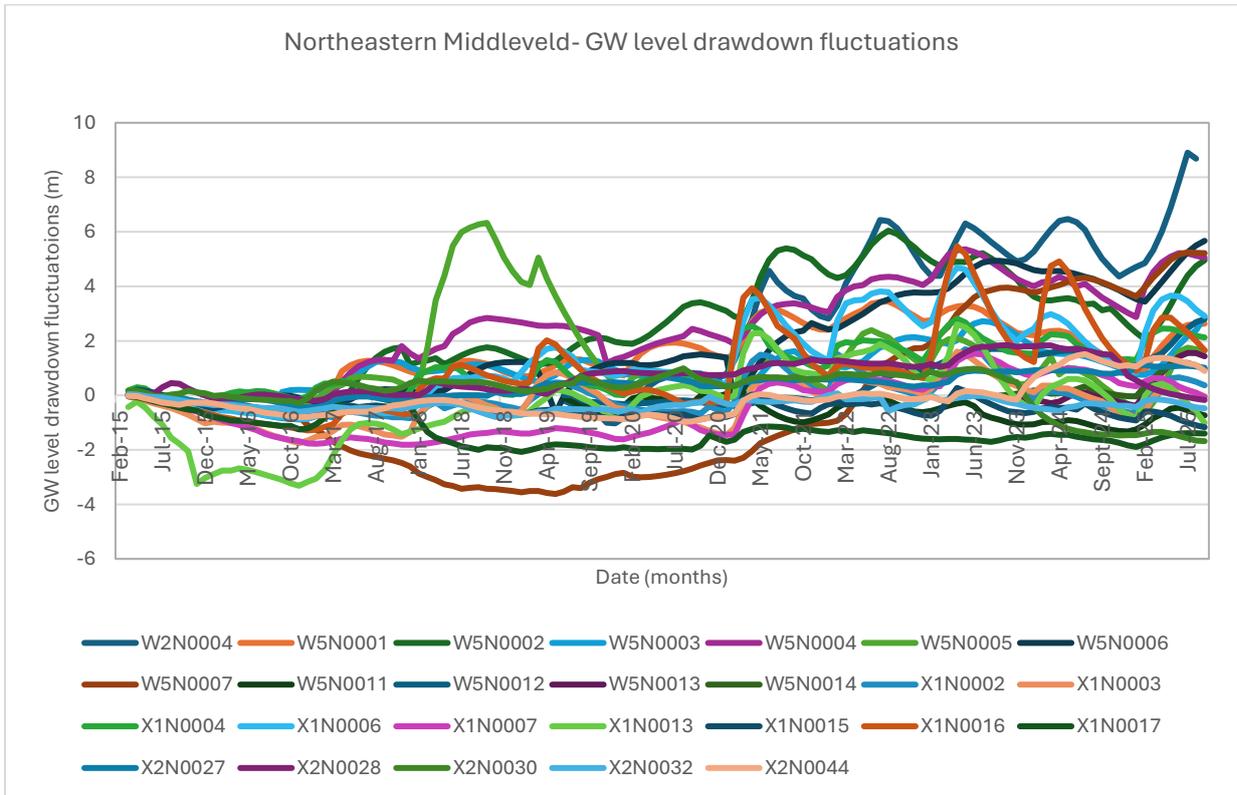


Figure 36: Groundwater level drawdown fluctuations for the Northeastern Middleveld Hydrological Region

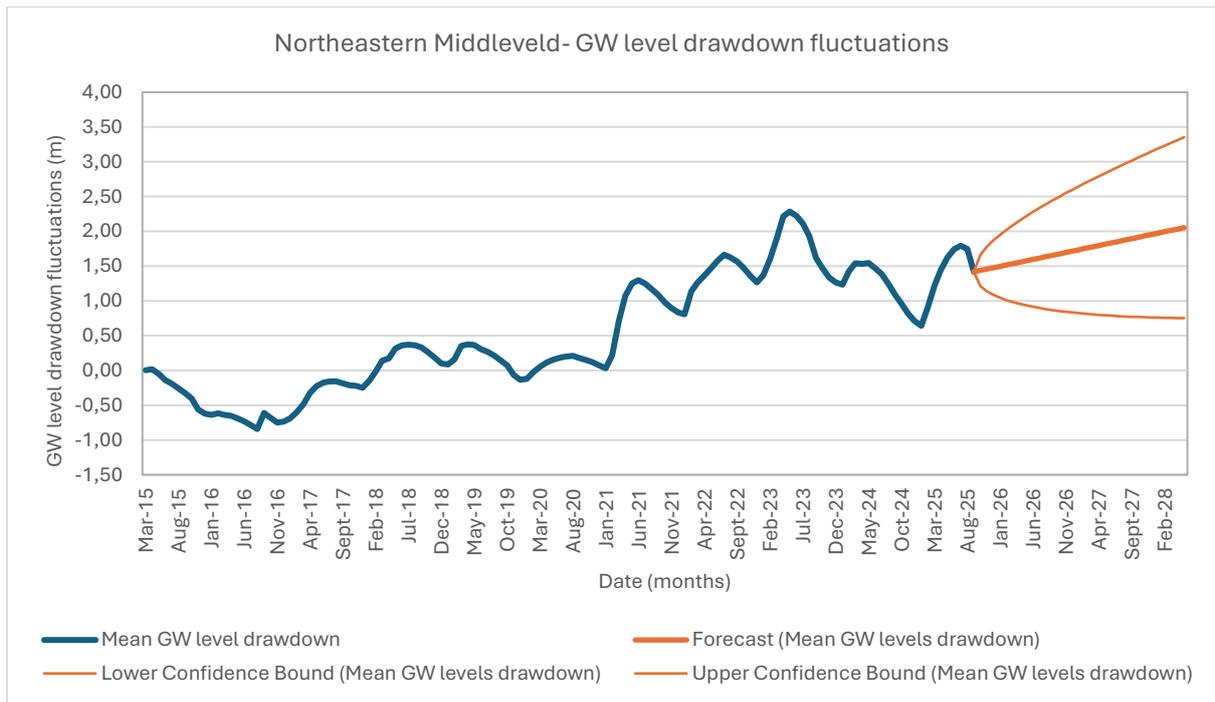


Figure 37: The mean groundwater level drawdown for the Northeastern Middleveld Hydrogeological region

### 3.10 The Southern Lebombo Hydrogeological Region

As the name suggests, the Southern Lebombo Hydrogeological Region is southerly of the Lebombo mountain ranges, bordered by Eswatini to the north and town of Eshowe to the south (Figure 38).

Two boreholes are currently monitored for this region (Figure 38). This makes the available data insufficient to have water level assessments for the entire region. *It is recommended that the monitoring programme be expanded for this region to understand the status quo of groundwater and its impacts and ultimately manage groundwater better as a resource.*

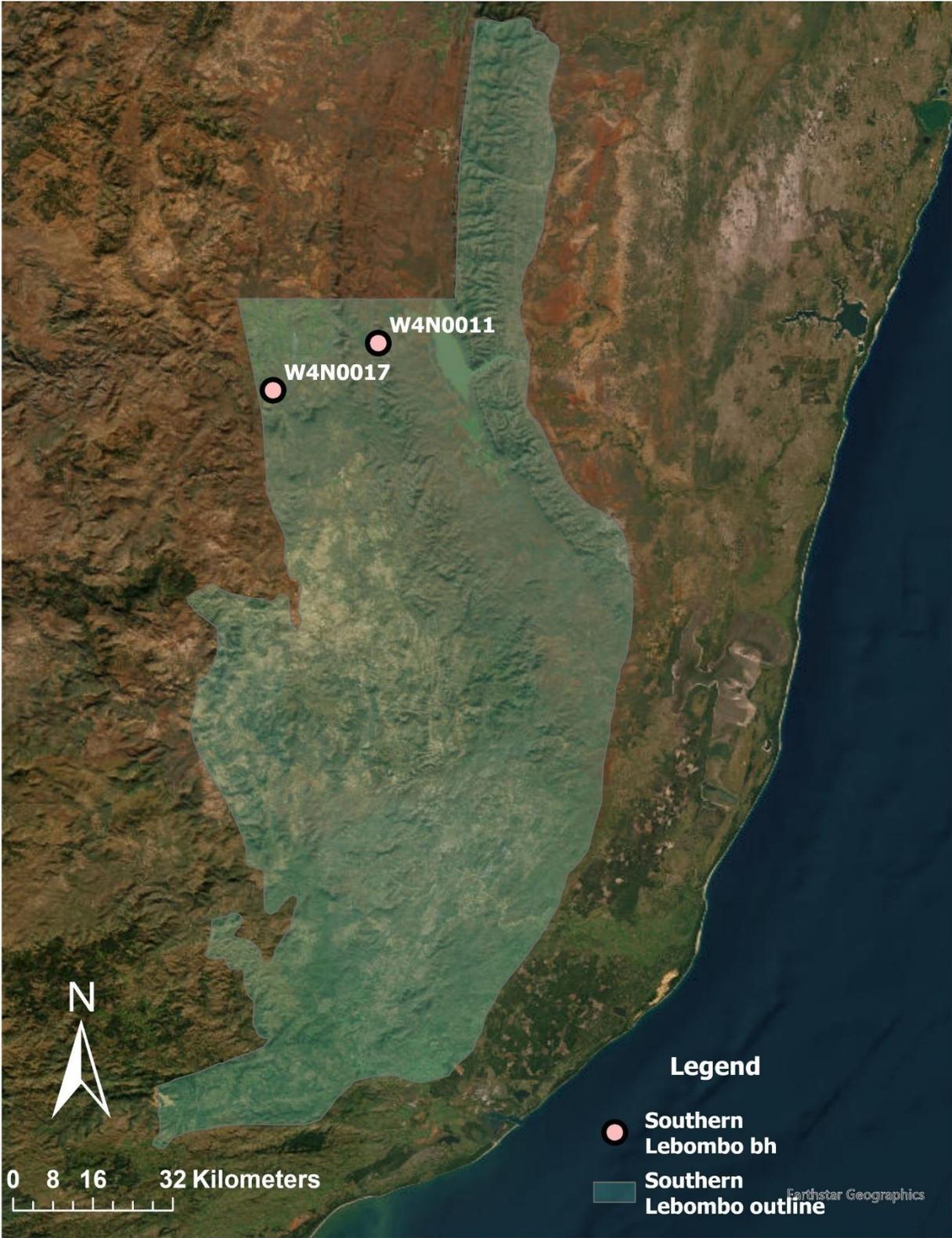


Figure 38: The extent of the Southern Lebombo Hydrogeological Region and its monitoring boreholes

### **3.11 The Northern Zululand Coastal Plain Hydrogeological Region**

The Northern Zululand Coastal Plain Hydrogeological Region stretches along the east coast of KwaZulu Natal. To the north it forms a border with Mozambique, while Richards Bay town serves as the border in its southern extreme.

For the assessment of the groundwater level status for the Northern Zululand Coastal Plain Hydrogeological region, water level data from twenty-eight (28) boreholes was used with historic data dating back to 2015 (Figure 39).

The rainfall for the Northern Zululand Coastal Plain Hydrogeological Region has been steadily increasing since 2015 to date (Figure 40). This saw two patterns developing with the groundwater level drawdown of this region as observed from monitoring boreholes i.e. positive groundwater levels that continued with climbing groundwater levels and declining groundwater levels that continued taking a downward trend despite the steadily increasing rainfall over the region. This pattern changed slightly in 2023 to late 2024, whereafter most of the observed boreholes took a negative trend suggesting, possibly that groundwater usage is surpassing the replenishment of aquifers. This is in contrast with the water level drawdown records observed since early 2025 which indicate that the groundwater levels of this region are going back to default settings, showing a rise with time (Figure 41 and Figure 42). With these trends, groundwater drawdown levels for the region are well above the initial water levels observed in 2015 and are replenished with every cycle of rainfall. Given this information, no management interventions are recommended.

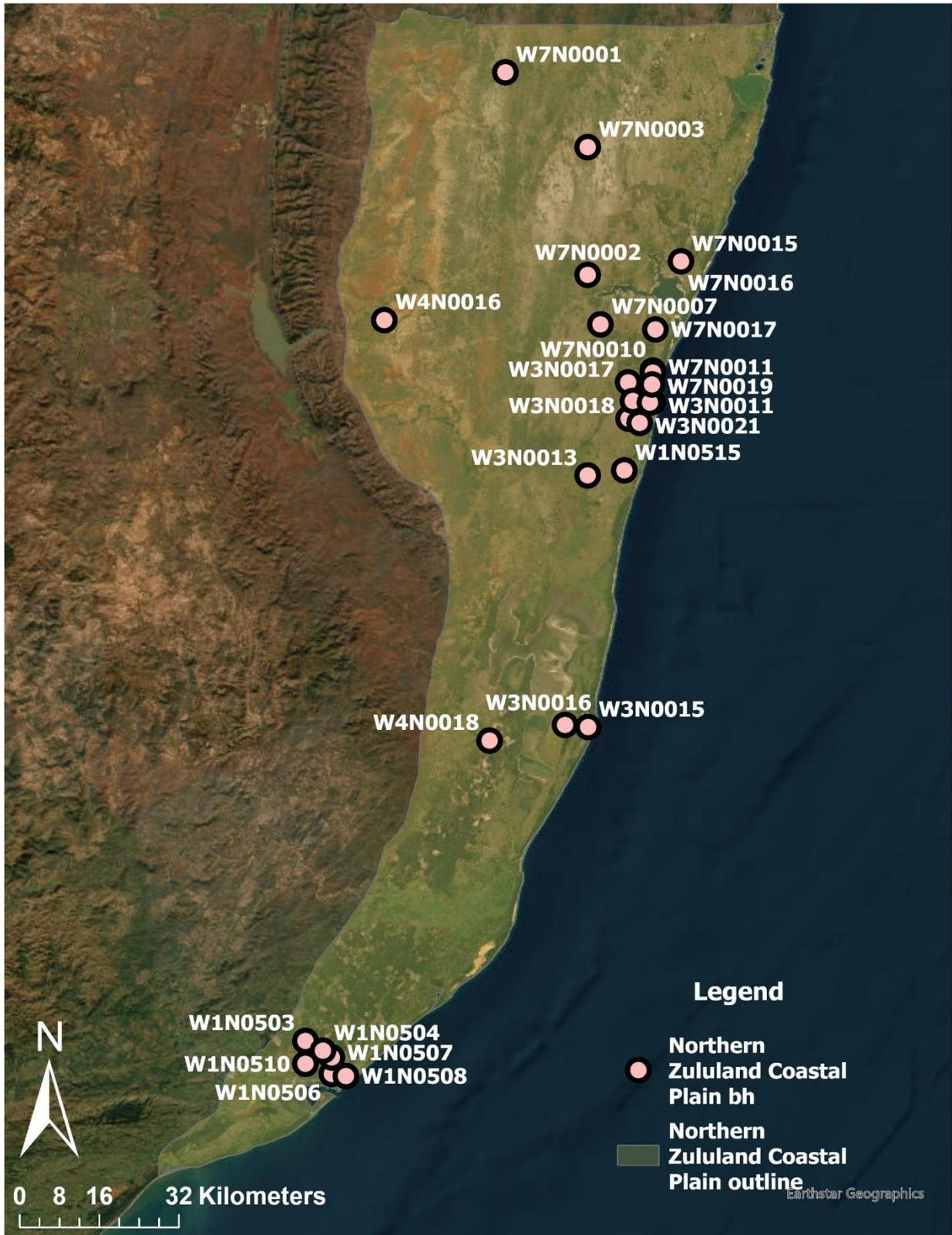


Figure 39: Locality and monitoring borehole distribution map of the Northern Zululand Coastal Plain Hydrogeological region.

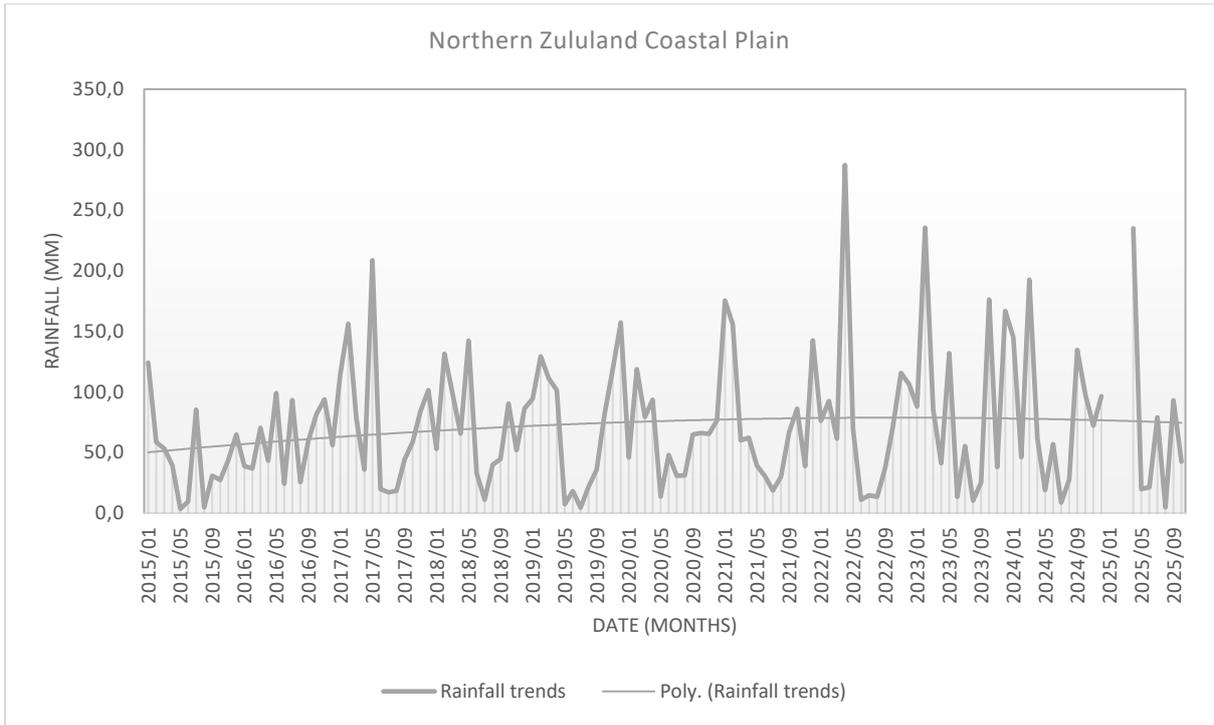


Figure 40: Rainfall trends for the Northern Zululand Coastal Plain Hydrogeological Region

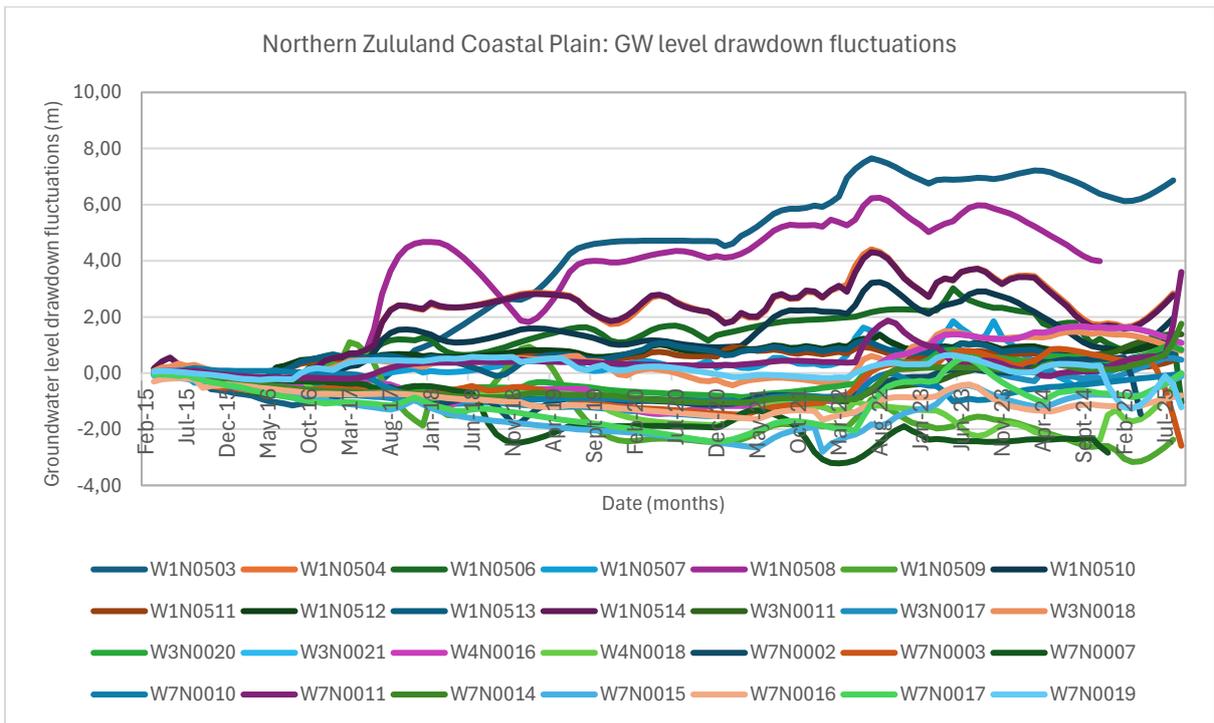
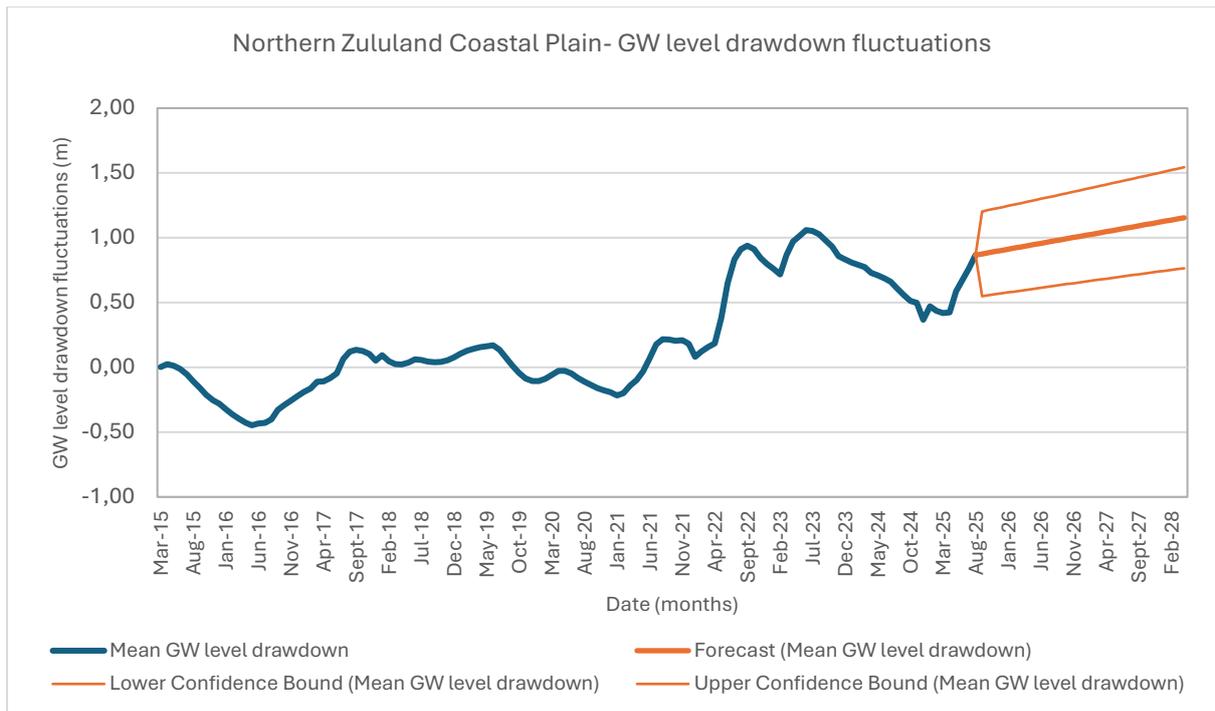


Figure 41: The Northern Zululand Coastal Plain groundwater level drawdown fluctuations



**Figure 42: The mean groundwater level drawdown for the Northern Zululand Coastal Plain Hydrogeological region**

### 3.12 The KwaZulu-Natal Coastal Foreland Hydrogeological Region

The KwaZulu-Natal Coastal Foreland Hydrogeological Region lies just south of Richards Bay and stretches along the coast further south to where Port St John’s is located. It encompasses major towns like Durban and Port Shepstone. More inland, the region stretches to Richmond in the north and tapers towards the coast in the south (Figure 43). About 12 boreholes (as shown in Figure 43) are currently monitored for water levels in the KwaZulu-Natal Coastal Foreland Hydrogeological Region.

The rainfall trends for the KwaZulu-Natal Coastal Foreland Hydrogeological Region showed a slight rise at the onset of the observation period, plateaued for a while (mid-2016 until mid-2021), with a slight rise thereafter which lasted for two years before a downward trend to date could be observed (Figure 44).

The groundwater drawdown levels for KwaZulu-Natal Coastal Foreland Hydrogeological Region maintained horizontal trends for most of the observation period. This holds true for all the boreholes but T6N0003 which had a fluctuating downward trend until early 2020, thereafter a rise was recorded. This is the same time that other borehole water levels showed an increase with time in response to rainfall recharge. Figure 46 indicates clearly the consistent rise in groundwater level drawdown in the past 5 years. Given the latest trends, no management interventions are recommended for this region.

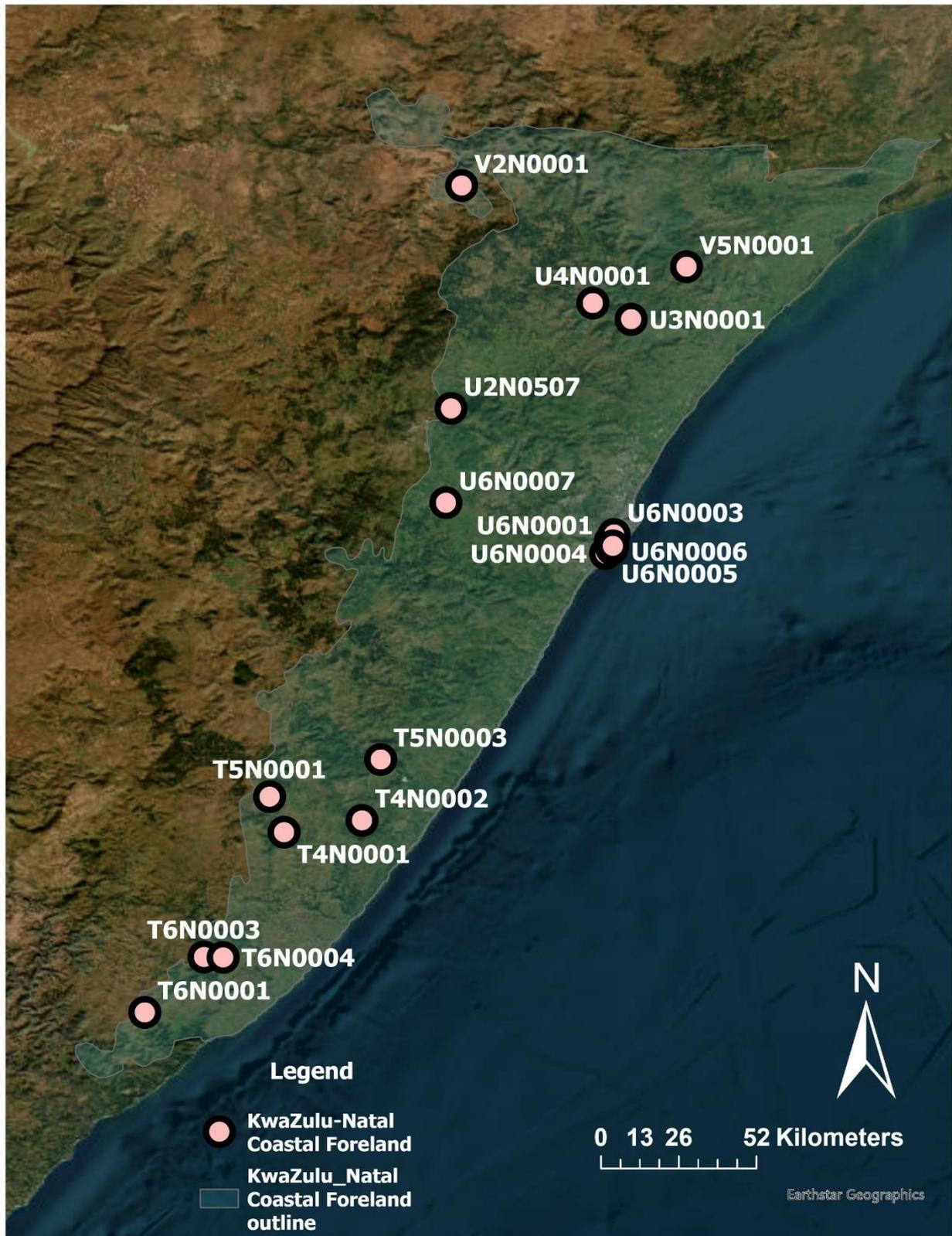


Figure 43: Monitoring boreholes and the extent of the KwaZulu-Natal Coastal Foreland Hydrogeological Region

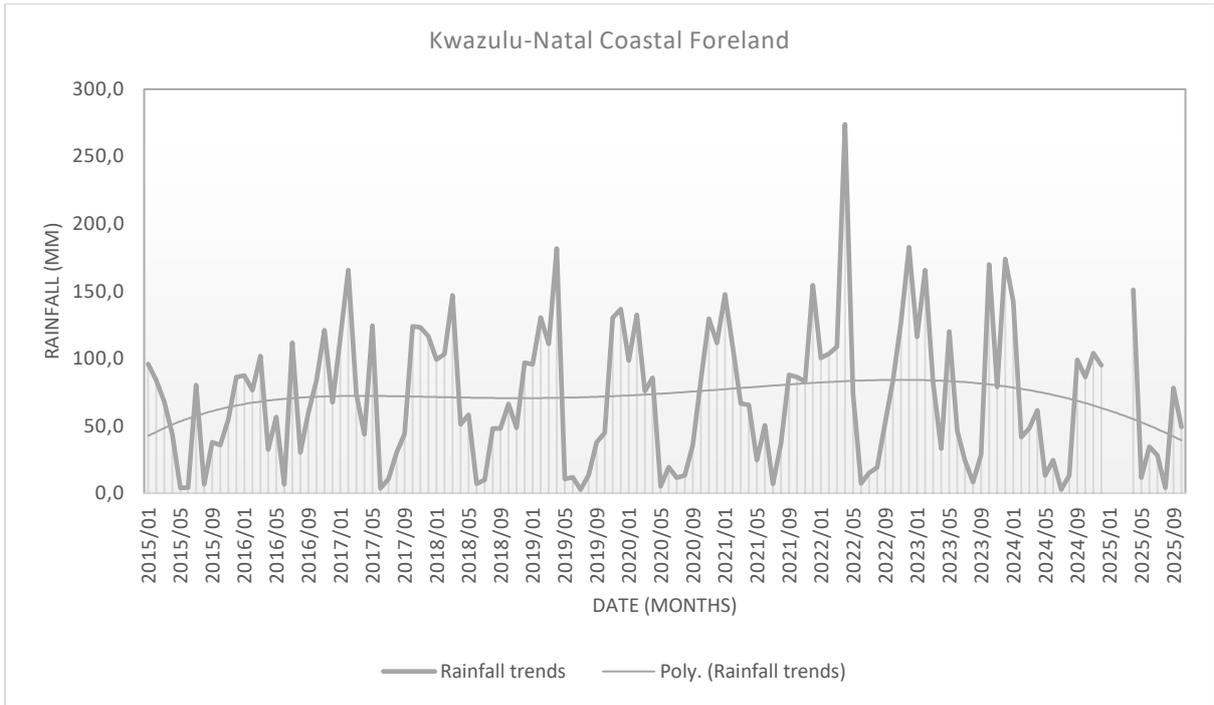


Figure 44: Rainfall trends for the Kwazulu-Natal Coastal Foreland

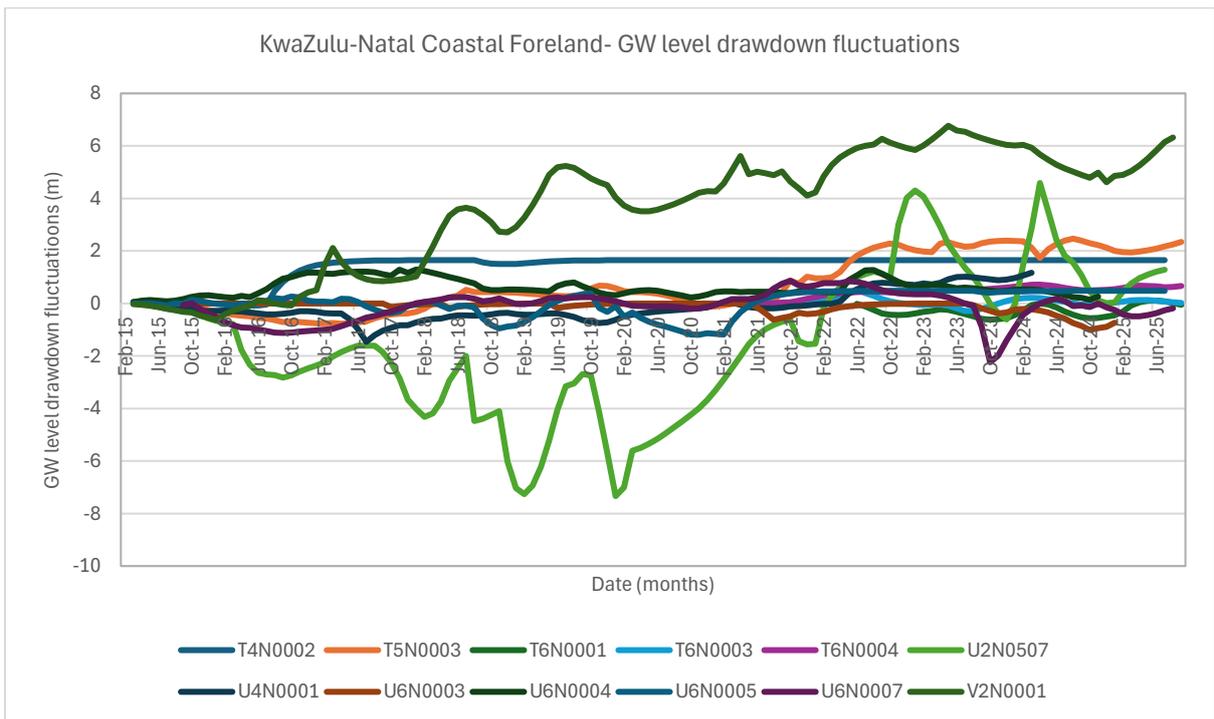


Figure 45: The KwaZulu-Natal Coastal Foreland groundwater level drawdown fluctuations

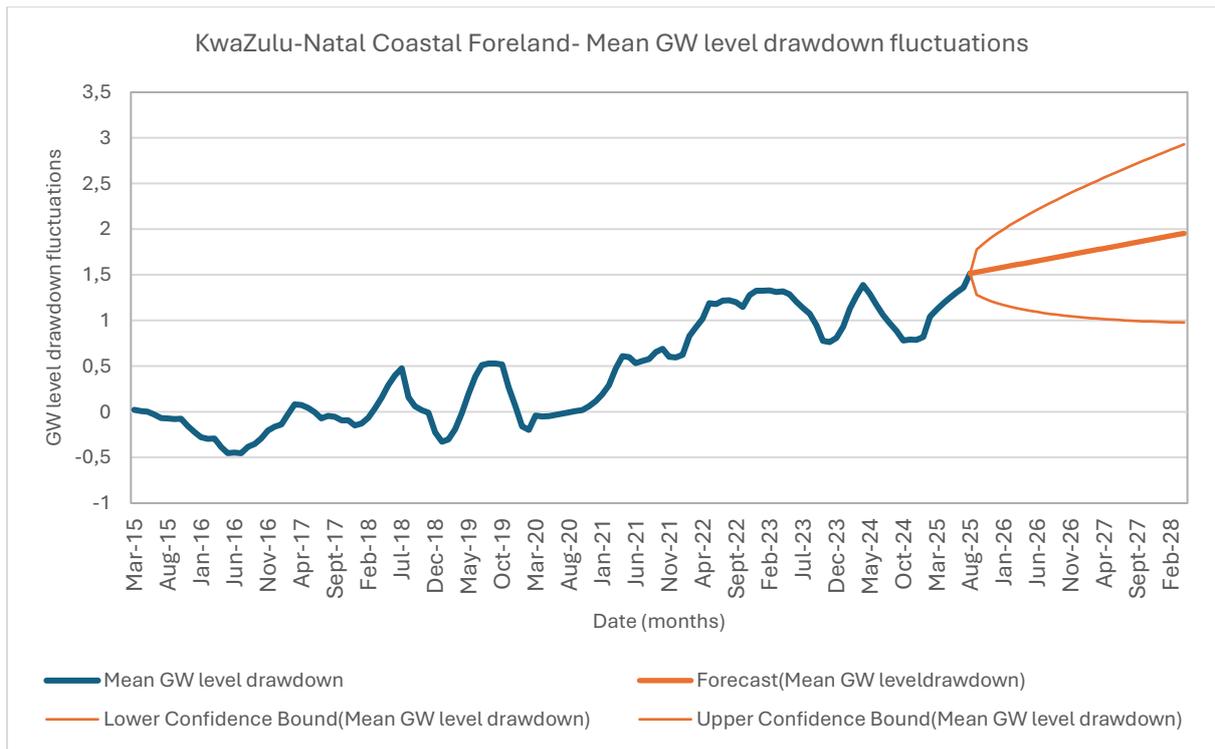


Figure 46: The KwaZulu-Natal Coastal Foreland- Mean GW level drawdown fluctuation

### 3.13 The Northeastern Upper Karoo Hydrogeological Region

The Northeastern Upper Karoo Hydrogeological Region lies, largely, in the Free state, with a small portion falling in the Eastern Cape. Its eastern side bordered by Lesotho while the southern side is formed by the town of Molteno. To the north, the major town of Bloemfontein serves to border the region.

Four boreholes are currently monitored for this region (Figure 47) and their monitoring data is limited to make a meaningful analysis of water levels for the entire region. *It is recommended that the monitoring programme be expanded for this region to understand the status quo of groundwater and its impacts and ultimately better management of groundwater as a resource.*

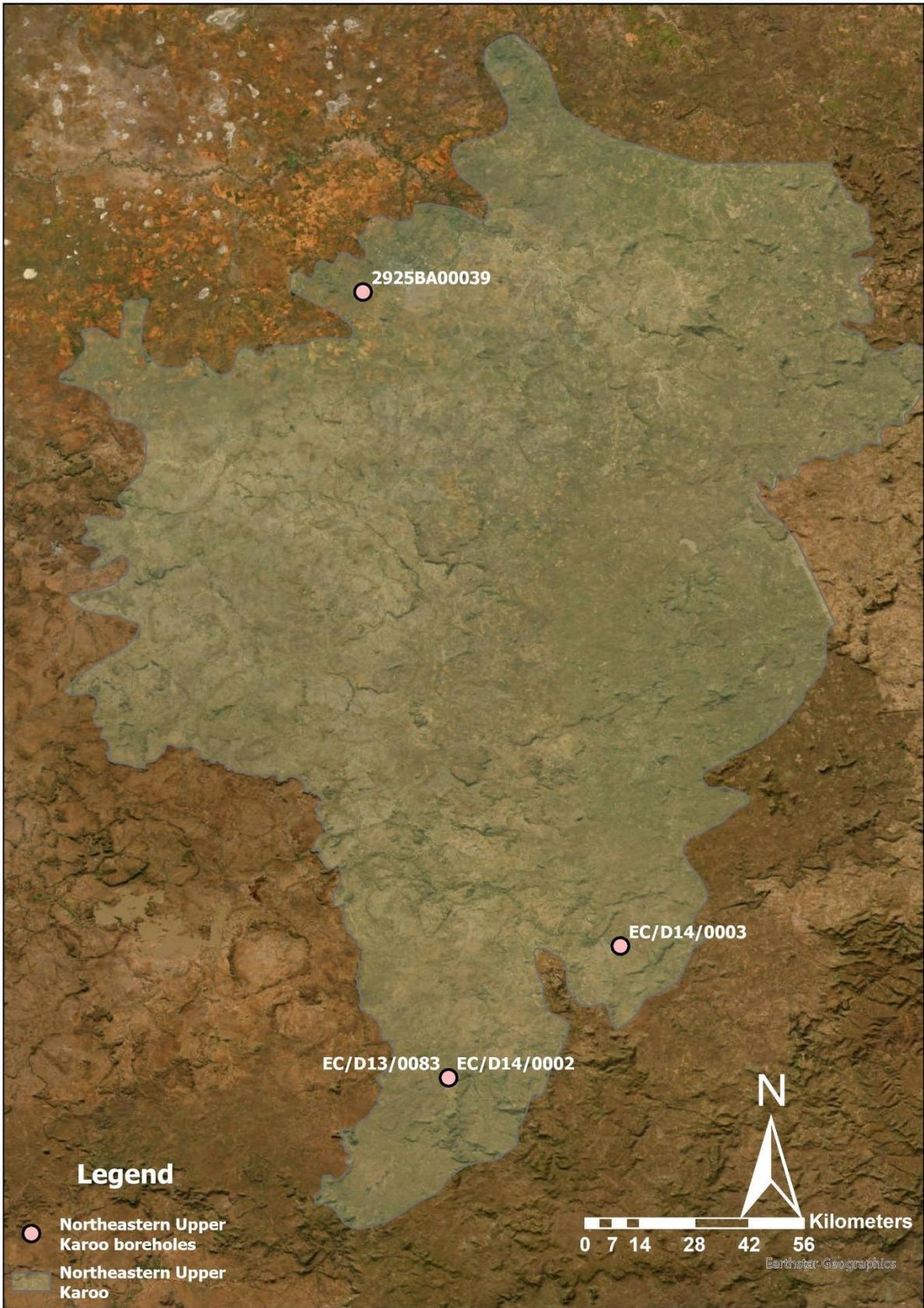


Figure 47: Monitoring boreholes and the extent of the Northeastern Upper Karoo Hydrogeological Region

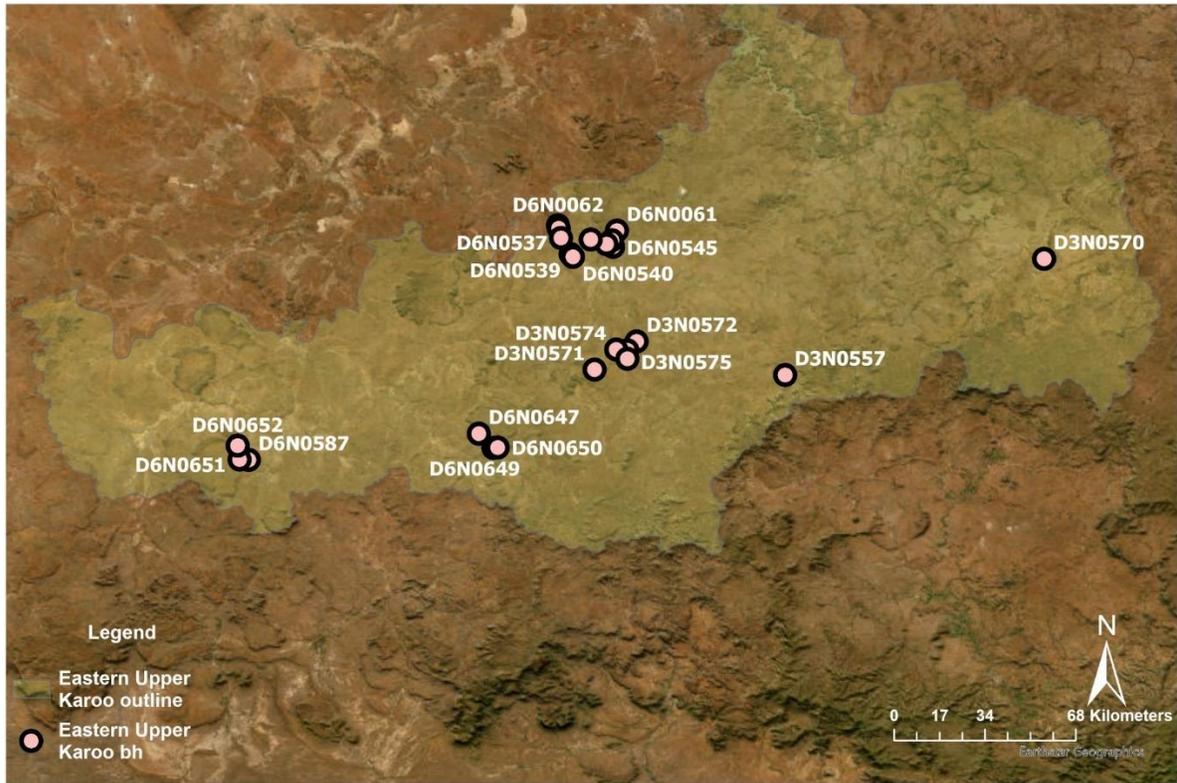
### **3.14 The Eastern Upper Karoo Hydrogeological Region**

Just like Northeastern Upper Karoo Hydrogeological Region, the Eastern Upper Karoo Hydrogeological Region lies largely in the Northern Cape Province. It is added here for the completion of the two provinces currently assessed. It doesn't have significant influence in the area being analyzed. Its extent covers the towns such as De Aar, Noupoot and Springfontein to the north.

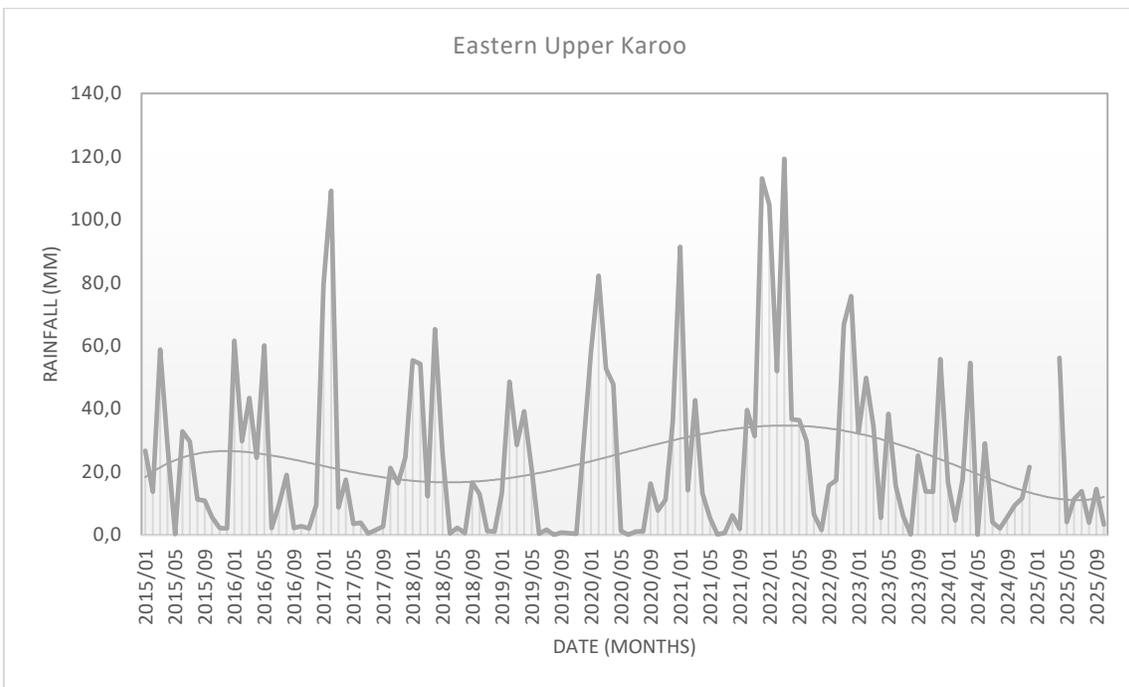
About 23 boreholes were used for analyses and interpretation of water level data from the boreholes located in the Eastern Upper Karoo Hydrogeological Region (Figure 48).

Like the other hydrogeological regions, the Eastern Upper Karoo experienced higher rains from 2020, peaking in 2022 before it declined from mid-2023 onwards (Figure 49). The groundwater level assessment will therefore be analyzed from this basis.

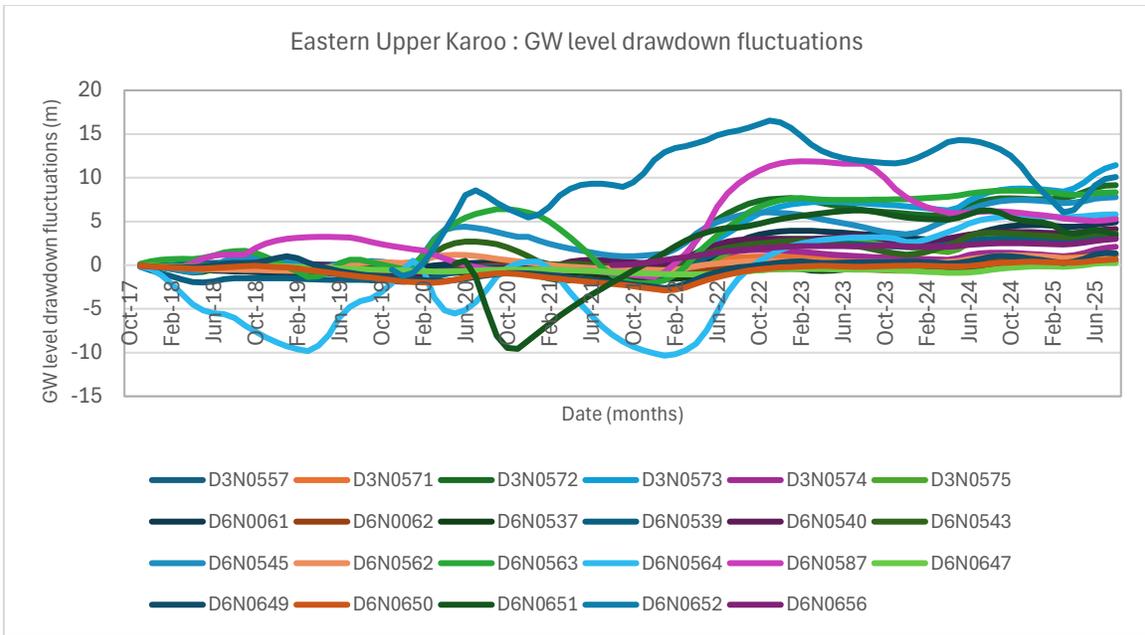
Due to data inconsistency, the groundwater level drawdown analyses could be considered for dataset dating back to 2017. Generally, the groundwater levels for the Eastern Upper Karoo Hydrogeological region have responded to rainfall cycles with positive fluctuations, above the initial water levels, marking a consistent fluctuating water level rise with time. Since February 2022, a consistent rise has been maintained all in response to rainfall experienced in this region (Figure 50). These trends are supported by the mean groundwater level drawdown fluctuations for the region, cementing that the groundwater levels for this area are replenished well (Figure 51). Given the latest information, there are no immediate interventions needed to manage the groundwater resource for this region.



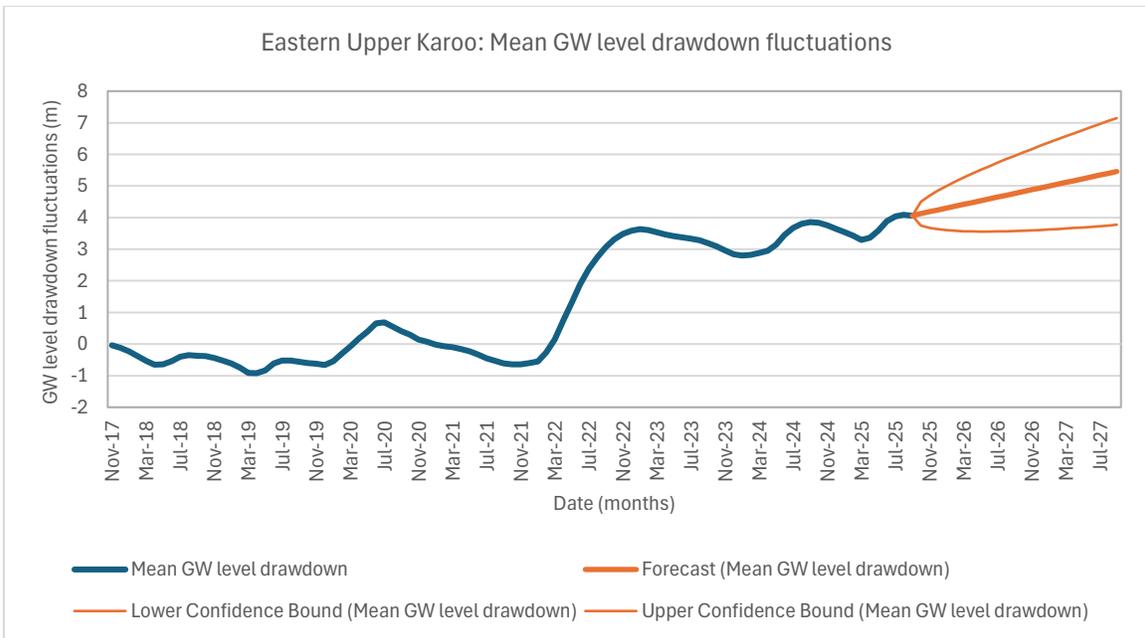
**Figure 48: Monitoring borehole distribution and the extent of the Eastern Upper Karoo Hydrogeological Region**



**Figure 49: Rainfall trends for the Eastern Upper Karoo Hydrogeological Region**



**Figure 50: Groundwater level drawdown fluctuations: Eastern Upper Karoo Hydrogeological Region**



**Figure 51: Mean groundwater level drawdown fluctuations for the Eastern Upper Karoo Hydrogeological Region**

#### **4. Groundwater level status summary**

The mean groundwater level drawdown for each of the regions discussed were graphed to indicate the overall picture for the 2 provinces assessed. Figure 52 indicates the performance of groundwater for the hydrogeological region in the KwaZulu-Natal and the Eastern Cape over a 10-year observation period. What is evident from the graph is that the groundwater resources for the two provinces experienced deficit between November 2016 and April 2022 in response to environmental stressors/ low rainfall the two provinces experienced. The impacts varied from region to region as Figure 52 shows that water level drawdown decline was prominent in some regions while others experienced a slight decline. The Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges, the Ciskeian Coastal Foreland and Middleveld, the Algoa Bay, the Eastern Great Karoo, the Southern Cape Ranges and to a lesser degree the Transkeian Coastal Foreland and Middleveld were largely impacted over the period. Although these regions showed water level recovery from April 2022 to May 2024, the latest information indicates another downward trend for them. The rainfall trends for these regions also indicated a decline from 2024 onwards, suggesting an onset of a drier cycle of rain. Therefore, these regions should brace themselves for another period of groundwater scarcity.

The water level assessment for Algoa Bay and the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges hydrogeological regions indicated more than just environmental stressors on their groundwater levels. The resources barely replenished even when good rains were prevalent in the area. An investigation into impacts of water quantity is therefore recommended.

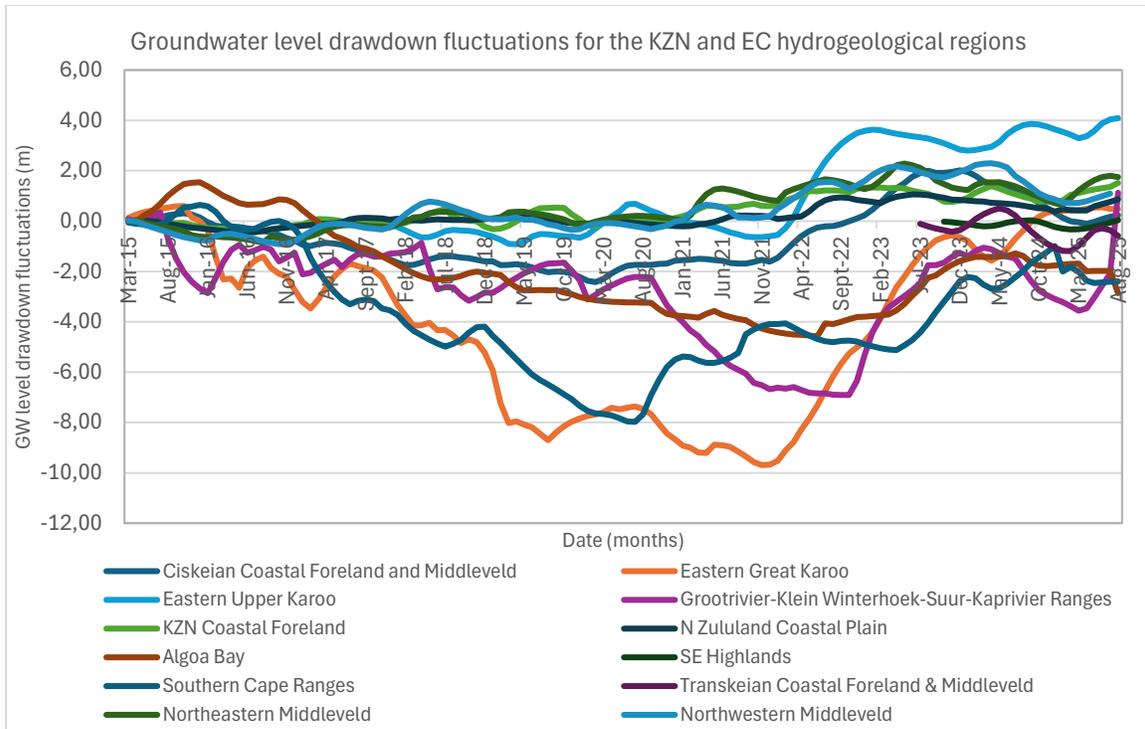


Figure 52: Groundwater level drawdown status for the EC and KZN hydrogeological regions

## 5. Conclusions

Groundwater levels were evaluated for the various hydrogeological regions in the Eastern Cape and KwaZulu-Natal Provinces. The aim of the assessment was to ascertain whether the groundwater resource for these two provinces could be under threat from natural or anthropogenic impacts. Fourteen hydrogeological regions were assessed with meaningful historic datasets varying from 2015 to 2023 in some regions. The fifteenth (15<sup>th</sup>) region, Lower Gamtoos Valley, was not assessed due to no available data. No adverse impacts were identified from the assessment. However, seasonal related fluctuations were noted, attributed to climatic variations. This holds true for all the observed hydrogeological regions but Algoa and Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges coastal boreholes, whose water levels didn't show signs of replenishment with time but gradual decline. An investigation needs to be followed for these regions to understand in detail the underlying impacts contributing to water level drawdown decline. Given the proximity of these boreholes to the coast/ shoreline, if no intervention is undertaken, seawater intrusion is a possibility.

Included in the assessments are the forecasts of water level trends for given years as indicative of future water levels; they are based on historic information and should be treated purely as basic indicators/ forecasts and not detailed modelling.

On the monitoring front, the monitoring programme for most of the regions needs to be reviewed to close the gaps and have a better representation of the monitoring programme. Some regions worth mentioning where urgent intervention is needed with upgrade of monitoring programme include the Northeastern Upper Karoo, the Southern Lebombo, the Southeastern Highlands and the Lower Gamtoos Valley where there is no monitoring at all, yet groundwater is used for irrigation purposes. The consistency with monitoring is another issue to be addressed as the datasets have gaps and some large inexplicable gaps that cannot be patched to get meaningful trends.

With regards to understanding of aquifer behaviour, the depths of the boreholes will need to be incorporated into the analysis. This will give an understating of the groundwater system unto which the boreholes tap water from. This will also allow the sorting and analysis of data based on groundwater systems rather than just geographically or purely from an elevation viewpoint.